



The effects of content-related shared book reading on the language development of preschool dual language learners



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ABSTRACT

This study was designed to experimentally examine the effects of content-based shared book reading instruction on the vocabulary development of Spanish-speaking preschool children who were learning English as a second language. Using shared book reading as the mode of instruction, 42 preschool teachers and 252 children from their classrooms were randomly assigned at the class level to either a highly specified content-related book reading intervention or a practice-as-usual shared book reading condition. Children were screened using the preLAS[®] and were selected for the study based on their scores at the pre-functional and beginning level of English proficiency. Intervention teachers implemented the curricular intervention in small groups of 5–6 students, five days per week, for 20 min per session, for 18 weeks. Based on multilevel models, findings indicated significant effects of this intervention approach on proximal vocabulary outcomes with no significant effects on standardized vocabulary measures. Implications for practice are discussed.

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1. Oral language and content knowledge acceleration

Oral language development, especially during preschool, contributes strongly to a child's later reading ability (Adams, 1990; National Early Literacy Panel [NELP], 2009; National Reading Panel [NRP], 2000; Scarborough, 2001; Storch & Whitehurst, 2002; Snow, Burns, & Griffin, 1998). Oral vocabulary, a critical component of oral language, plays an important role in the development of conceptual knowledge (e.g., science, social studies), which strengthens and builds background knowledge essential for comprehension of text

materials (August & Shanahan, 2006; Hirsch, 2006; Nagy, 2005; NRP, 2000; Verhoeven & Perfetti, 2011). Because language serves as the primary medium through which early content learning occurs (Boals, Kenyon, Blair, Wilmes, & Wright, 2015), instruction that targets content-specific vocabulary is crucial and exposes children to a broader “network of concepts” and ideas associated with a given word (Nagy, 1988; Stahl & Nagy, 2006). More effective preschool vocabulary instruction, therefore, should maximize instructional time by providing intentional opportunities for language interactions around vocabulary and connected concepts to deepen children's understanding of the surrounding world (McCardle, Chhabra, & Kapinus, 2008). In the present intervention study, 23 preschool teachers provided daily instruction around content related vocabulary in brief interactive book discussions to build lexical networks of knowledge important for academic learning and text comprehension.

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1.1. The socio-economics of early content learning

Hirsch (2006) suggested that knowledge acceleration is dependent on early exposure to the “worlds of nature and culture” (p. 17) because these knowledge domains represent conceptual networks essential for text comprehension. The world of nature refers to science-related experiences while the world of culture refers to social studies concepts about the human condition in a diverse world (Hirsch, 2006; National Council for Social Studies [NCSS], 2010). Because children have an inherent curiosity about the worlds of science (Duschl, Schweingruber, & Shouse, 2007; Kuhn & Pearsall, 2000) and social studies (NCSS, 2007), world knowledge is initially accelerated via adult-child conversations and experiences in the home and community (Bronfenbrenner, 1979; Charlesworth & Lind, 2013; Farkas & Beron, 2004).

Research findings, however, have documented sizeable discrepancies between economically disadvantaged children and their socioeconomically more advantaged peers in the depth and breadth of their conceptual understandings (Hart & Risley, 1995; Hirsch, 2006; Lareau, 2003) and access to rich knowledge and vocabulary-building resources (e.g., literacy materials, stimulating educational experiences) that parents use to foster their children's oral language and knowledge acquisition (Bradley, Corwyn, McAdoo, & Coll, 2001; Neuman & Celano, 2001). Overall, vocabulary size seems to be the one aspect of language development that is most impacted by SES (Hoff, 2013).

Equally important, these early disadvantages may generate a “social stratification of knowledge” (Neuman, 2006) that is initiated at home and perpetuated in school settings when teachers of young children have little guidance in how to accelerate oral language and vocabulary learning (Neuman & Dwyer, 2009; Neuman & Roskos, 2005) or are not equipped to respond to the multidimensional needs of low-SES children who are also acquiring academic knowledge in English as a second language (Janzen, 2008). Learning to read and speak in two languages is not a risk factor as such but has far-reaching benefits (e.g., cross-cultural sensitivity, executive functioning, analytical thinking) (Bialystok & Craik, 2010; Bialystok & Hakuta, 1994; Rodríguez, Carrasquillo, & Lee, 2014). The vast majority of children who speak a non-English native language, however, live in high poverty settings with lower levels of parental education (Snow et al., 1998), limited economic resources (literacy materials in the home), and may have little exposure to rich adult/child home conversations in English prior to entering preschool (Hindman & Wasik, 2015). Overall, children's socioeconomic status, initial knowledge, and home language experiences are highly associated with their vocabulary learning (Tabors & Snow, 2001).

A dual language preschool setting, therefore, may provide the optimal context and conditions for oral language stimulation and exposure to vocabulary and knowledge acceleration for children from high-poverty settings whose second language competencies are still emerging. There is evidence that children who attend bilingual preschools can make gains in English while still developing their Spanish language abilities (Winsler, Díaz, Espinosa, & Rodríguez, 1999). In our preschool intervention study, we included 252 children residing in a geographical region of Texas that has been federally identified as one of the most economically distressed counties in the nation (Mier et al., 2013). In our study, we refer to these children as dual language learners.

1.2. Oral language and knowledge acceleration in dual language learners

The federal office of Head Start refers to preschool emergent bilinguals, children who are still developing native oral language abilities while acquiring second-language proficiency, as dual lan-

guage learners (DLLs) (Goldenberg, Hicks, & Lit, 2013). These students are in the process of becoming bilingual and, therefore, often receive some amount of instructional support in the classroom to accelerate linguistic proficiency in two languages while developing the ability to discuss new subject-area content in English (García, Kleifgen, & Falchi, 2008). Currently, there are more than four million DLLs enrolled in early childhood programs (Goldenberg, 2013) and, by the 2030s, it is projected that 40% of the U.S. school population in general will be children who speak a language other than English in the home (American Speech, Language, Hearing Association, 2015; Magruder, Hayslip, Espinosa, & Matera, 2013).

Spanish-speaking children are the fastest growing group (National Center for Education Statistics, 2013; Passel, Cohn & Lopez, 2011), with more than 2 million Latino DLL children enrolled in preschool and early elementary grades K-3 (Kindler, 2002). Overall, Latino DLLs have lower academic achievement than non-Hispanic whites (National Center for Educational Statistics, 2013). Due to the increasing school population of Latino DLLs who are acquiring English as a second language (Lopez & Gonzalez-Barrera, 2015), many teachers will be responsible for the future instructional planning for a Spanish-speaking DLL child (Zehler et al., 2003), and must be attentive to approaches that make challenging academic content assessable when children are not English proficient. Overall, young DLLs have greater school readiness needs due to the key role that oral English plays in English literacy development and subject-area learning (Hoff, 2013).

Despite strong initiatives to understand and improve the instructional practices of DLLs in kindergarten through grade 3 (Goldenberg, 2013), fewer studies have investigated best practices for DLLs from birth to age 5. From the existing literature we know that emergent Latino preschool DLLs in high-poverty settings benefit more from high-quality explanations and discussions of new concepts during English and Spanish vocabulary instruction than from a focus on word meanings (Hindman & Wasik, 2015)—This is especially the case for DLLs entering school with lower English competencies. Similarly, Collins (2010) documented that rich word explanations can integrate the use of gestures and the use of vocabulary concepts in decontextualized statements. Further evidence confirms that young DLLs benefit from enriched language interactions with opportunities for individualized adult-child conversations (Espinosa, 2002) and clarifying feedback (Castro, Pérez, Dickinson, & Frede, 2011).

Collectively, existing evidence suggests that, in general, oral language skills are crucial for English vocabulary and academic knowledge acceleration for DLLs (Gutiérrez, Zepeda, & Castro, 2010; Roberts & Neal, 2004; Saunders, Foorman, & Carlson, 2006). According to national standards established by the Teachers of English to Speakers of Other Languages (TESOL; <http://www.tesol.org>), the development of academic English proficiency requires frequent listening and speaking opportunities around science, social studies, and math (Teachers of English to Speakers of Other Languages [TESOL], 2006). TESOL standards underscore that DLL children should be exposed to specialized vocabulary and complex sentence structures to support academic learning (e.g., making predictions, summarizing, analyzing; [TESOL], 2006).

Because it may take five to eight years to develop and demonstrate a level of English oral language proficiency and vocabulary knowledge that can support subject-area learning (Crawford & Krashen, 2007; Hamayan, Marier, Sánchez-López, & Damico, 2013; Wright, 2010), teachers must scaffold instruction to enable children in the early stages of learning English to talk about academic content (August, McCardle, & Shanahan, 2014; Bravo & Cervetti, 2014). English as a second language (ESL) approaches (Fathman & Crowther, 2006) as well as nonlinguistic supports (visuals, ges-

tures) can make challenging academic content comprehensible (Cuevas, Lee, Hart, & Deaktor, 2005; Lee & Buxton, 2013).

The instructional implication is that preschool children in dual language program models who are in the early stages of English language development may require multidimensional instructional programs, approaches (e.g., ESL scaffolds), and curricula that maximize instructional time via frequent opportunities that integrate explicit target word use while acquiring content knowledge (August et al., 2014; Castro et al., 2011; García et al., 2008; Gutiérrez et al., 2010). In the present study, we hypothesized closing the word and knowledge gap for preschool DLLs begins with interactive adult-child book conversations around important science and social studies themes to build content related vocabulary and knowledge. Reading books exposes children to information and vocabulary beyond their lived experiences (Pinkham, 2012); however, the efficacy of this approach is influenced by the way children are read to and the adult-child interactions that occur around and beyond the actual book reading event (Reese, Cox, Harte, & McAnally, 2003).

1.3. Content-enriched shared book reading for dual language learners

Shared book reading – the primary instructional approach to promoting young children's vocabulary acquisition (August & Shanahan, 2006; Cohen, Kramer-Vida, & Frye, 2012; Ezell & Justice, 2005; Hargrave & Sénéchal, 2000; Mol, Bus, & de Jong, 2009; National Early Literacy Panel [NELP], 2009; Wasik, Bond, & Hindman, 2006; Whitehurst & Lonigan, 1998) – encompasses a range of methods that vary in intensity and adult-child interactions (What Works Clearinghouse [WWC], 2015). Interactive shared book reading, in which specific techniques are used to extend children's oral language use (WWC, 2015), has been the most widely studied (NELP, 2009), and has been used recently in preschool settings to accelerate oral language and subject-area learning (Gonzalez et al., 2011; Pollard-Durodola et al., 2011; French, 2004; Leung, 2008; Neuman & Dwyer, 2011; Spycher, 2009).

Interactive book reading refers to the adult use of interactive behaviors while reading books to encourage the active participation of children. In this process, the teacher asks open-ended questions, expands children's oral responses, and prompts children to employ sophisticated language. This approach to reading books has been found to augment children's oral language abilities and literacy knowledge (Whitehurst & Lonigan, 1998). One significant benefit of interactive book reading is it provides a context for scaffolding children's developing language abilities (Cabell, Justice, Vukelich, Buell, & Han, 2008). During this mode of instruction, an adult can listen to oral responses during a book discussion; determine if children have sufficient background knowledge and have learned the concepts; and, in response to children's understanding, extend children's second language and academic learning in an engaging discussion with adult feedback and confirmation. Overall, interactive shared book reading approaches accelerate oral language development in children from high-poverty settings who demonstrate limited syntax structures and verbal abilities (Arnold & Whitehurst, 1994; Wasik & Bond, 2001; Wasik et al., 2006) and provide a literacy foundation that may help to prevent reading difficulties in children from diverse linguistic and socio-economic backgrounds (Silverman, 2007).

To date, five interactive shared book reading studies have been conducted with young children for the purpose of accelerating vocabulary in the context of science learning (French, 2004; Leung, 2008; Neuman & Dwyer, 2011; Silverman, 2007; Spycher, 2009). In the current investigation, we use the term content-related and content-enriched shared book reading to refer to approaches that

embed content vocabulary knowledge (e.g., science-related vocabulary) and instruction during the shared book reading experience. The majority of these studies were conducted with preschool native English speakers (French, 2004; Leung, 2008; Neuman & Dwyer, 2011) with two studies conducted with kindergarten children acquiring English as a second language (Silverman, 2007; Spycher, 2009).

In investigations with native English speakers, preschool children learned science-related words (e.g., prism, frequency) and concepts via informational books sometimes organized around themes (e.g., light, growth/change) (French, 2004; Leung, 2008). In one study (Neuman & Dwyer, 2011), low-income children benefited from instruction on word taxonomies (classifying words into categories) to facilitate retention of difficult science words (antennae, segments, camouflage). Results from these studies indicate that children significantly grew in their science knowledge and benefited from strategies that emphasized the structure of knowledge (conceptual categories). However, we have less guidance from research on how interactive content-related shared book reading approaches might benefit preschool children in a dual language program who require thoughtful linguistic scaffolding because they are in the initial stages of English language development.

Two studies (Silverman, 2007; Spycher, 2009) conducted with kindergarten English learners utilized adult-child interactions around repeated book readings to accelerate vocabulary knowledge while learning science. In these studies, intervention length ranged from 5 to (Spycher, 2009) to 14 weeks (Silverman, 2007) and was implemented in mainstream or bilingual educational settings (structured immersion, two-way immersion) with children of varied English abilities and proficiencies.

In the first intervention (Spycher, 2009), children referred to as Spanish-only, English-only, and Spanish/English bilinguals received explicit English instruction on words that varied in complexity (Tier II, high utility, and Tier III, technical words) and that were sometimes taught in semantically related categories. Linguistic (e.g., sentence frames) and nonlinguistic (visuals, realia or real objects from real life) scaffolds provided structured formats for academic talk during book discussions. Student learning was measured both quantitatively (researcher-developed expressive measure, English and Spanish standardized receptive measures) and qualitatively (e.g., teacher interviews around children's language use and science knowledge growth). Children in the explicit instructional group, regardless of their level of English proficiency, learned more target words and outperformed comparison condition children (implicit vocabulary instruction) in their receptive target vocabulary knowledge.

In the second kindergarten intervention (Silverman, 2007), children who spoke Chinese, Spanish, or Creole and were enrolled in mainstream, immersion, and two-way instructional models received explicit vocabulary instruction with scaffolds (visuals depicting word meanings; probing questions/prompts, gestures) and opportunities to recall words in the context of reading children's literature. Pre- to posttest growth, measured with raw scores from the Test of Language Development (TOLD; Newcomer & Hammill, 1997), indicated that DLLs' scores increased by 12 points compared to 6 points for comparison native English speakers. Raw scores were used to reflect small changes over time in children's general English vocabulary knowledge. A researcher-developed measure on taught words indicated that all children (native English and speakers of other languages) grew from pre- to posttest with no differences between the groups, and that children acquiring English as a second language experienced a higher vocabulary growth rate and seemed to be catching up with their native English-speaking peers.

Results from these kindergarten content-enriched interactive shared book-reading interventions were similar to findings from

general preschool interactive shared book studies (Collins, 2010; Roberts & Neal, 2004) conducted with emergent bilinguals that did not aim to accelerate academic knowledge (e.g., science, etc.). For example, Collins (2010) reported that Portuguese-speaking children with initial low English abilities learned vocabulary concepts when explicitly taught rich word explanations with instructional supports (book illustrations depicting vocabulary, gestures, dramatic role-playing) through repeated storybook readings in small-group formats (e.g., 2–3). Roberts and Neal (2004) also documented English vocabulary learning among Spanish- and Hmong-speaking children, pointing to a significant effect for interactive shared book reading practices.

Overall, more research is needed to examine how interactive content-enriched shared book reading can be implemented most effectively (e.g., length of intervention, language of instruction) with DLLs who are still developing their English language proficiency (Gutiérrez et al., 2010; Shanahan & Beck, 2006). Although further research is warranted, these content-related investigations implemented with DLLs indicate, however, that reading books is a promising practice for vocabulary and subject-area acceleration when instructional time is maximized via the organization of book reading content, explicit vocabulary strategies, and adult/child interactions that target English word use.

1.4. Accelerating DLL learning through quality of instructional design and language interaction opportunity

For preschool DLLs who are expected to learn new academic content in a second language (e.g., English) while also acquiring expressive and receptive second language proficiency, the time needed to learn may exceed the time that is generally available in school settings. Because high-quality instruction can reduce the amount of time needed and increase the probability of in-depth learning (Carroll, 1963), we hypothesized emergent bilinguals would benefit from a careful sequence of interactive content-enriched shared book reading instruction with multiple opportunities for content-related vocabulary use during adult–child science- and social studies-related book discussions. In our preschool content-enriched intervention, it was crucial that teachers were able to create cycles of feedback and confirmation around daily lessons guided by the scientifically based instructional design principle of strategic integration (Simmons, Pollard-Durodola, Gonzalez, Davis, & Simmons, 2008).

Strategic integration intentionally combines new information with what the learner already knows to produce more generalizable, higher-order skills (Simmons et al., 2008). Integration emphasizes critical and explicit connections important for future text comprehension and academic learning. In vocabulary instruction, in particular, strategic integration implies thoughtful sequencing of tasks to accelerate vocabulary development (Baker, Simmons, & Kame'ennui, 1998). Thoughtful sequencing consists of teaching vocabulary in meaningful contexts as high-priority concepts as opposed to isolated word meanings (Hirsch, 2006; Nagy, 1988). In content knowledge instruction, strategic integration refers to intentionally sequencing tasks so that knowledge acceleration moves beyond isolated science and social studies facts so the learner makes deep connections between life experiences, content-related vocabulary, and new conceptual understandings. For emergent bilinguals in dual language preschool programs, strategic integration also includes responsive and enriched language interactions and individualized adult–child conversations to support oral language development (English) important for academic discussions (Espinosa, 2010). Overall, this method of prioritizing, organizing, and sequencing instruction may be crucial for DLLs with a second language base that may limit their participation in deep discussions and academic English discourse.

Strategic integration is supported by the knowledge hypothesis (Anderson & Freebody, 1981; Nagy, 2005), a theory that proposes children accrue vocabulary knowledge by understanding relationships between new words and their connected concepts. Knowing a word's meaning, for example, implies one understands the network of concepts or knowledge units that are connected with the word (Stahl & Nagy, 2006). Because emergent bilinguals from high-poverty settings are less likely to acquire vocabulary through incidental learning (Proctor, Carlo, August, & Snow, 2005), explicit instruction around broad content-related networks is important for priming background knowledge essential for future academic learning and comprehension of printed material.

In our interactive content-enriched shared book reading approach, critical and explicit word and world connections are facilitated through the following practices:

1. Accelerating knowledge and vocabulary via thematically and conceptually related book reading content. In a “topic immersion” approach, adults read books organized by relevant high-priority science and social studies themes over an extended period of time (Hirsch, 2006). A topic immersion approach is facilitated with repeated readings of storybooks and informational texts paired by broad universal themes about life, nature, and society. While storybooks allow children to talk about a character and main idea related to the topic, informational texts can be used to extend and build knowledge around specialized words that are essential for accelerating comprehension (Duke & Bennett-Armistead, & Roberts, 2003; Neuman & Roskos, 2007).
2. Accelerating knowledge and vocabulary via multiple opportunities to engage in instructional conversations or dialogues that provide a foundation for building complex vocabulary for higher-order cognitive tasks (e.g., making inferences) (Tharp & Gallimore, 1991). These interactive dialogues around challenging content are made possible via language strategies (*Sentence stem: Say, “I see a (vine growing around a pole).”*) teachers use to push students' conversational and conceptual thinking abilities beyond what they can accomplish on their own (August et al., 2014). Appropriate scaffolds for young DLLs in preschool dual language programs include modeling difficult tasks (Echevarria, Vogt, & Short, 2004), using visuals that depict word meanings in different contexts (Silverman, 2007), and adult–child interactions with clarifications to facilitate comprehension (*Yes, difference means that something is not the same.*) (Koskinen et al., 2000). These dialogue opportunities allow preschool DLLs to engage in social interactions during academic discussions.

1.5. Overview and study purpose

In a previous design-based experiment (Gonzalez et al., 2011; Pollard-Durodola et al., 2011), the authors extended prior shared book reading research by examining the effectiveness of the Project Words of Oral Reading and Language Development (WORLD) multi-dimensional approach that integrated (a) high-priority science and social studies background knowledge via content-related visuals, (b) complementary thematic pairings of storybooks and informational texts to provide multiple exposures to conceptually related topics, (c) brief in-context definitions around semantically related words (e.g., liquid, melt, freeze), and (d) ongoing cumulative reviews to reinforce the essential building blocks of information within a content domain (Simmons et al., 2008). This pedagogical approach originated from a three-year collaborative effort of researchers and preschool teachers in high-poverty preschool settings who implemented the intervention in two randomized control trials while providing feedback on the feasibility and usability of the shared book reading instructional components (Pollard-Durodola, Gonzalez, & Simmons, 2014). Curricular modifi-

cations were made at the end of each experiment based on teacher recommendations via focus group discussions.

These RCTs were conducted with native English-speaking preschool children who were at risk for comprehension difficulties as indicated by initial receptive vocabulary outcomes (below the 30th percentile on the Peabody Picture Vocabulary Test [PPVT]) (Gonzalez et al., 2011; Pollard-Durodola et al., 2011). Specifically, we examined the effectiveness of thematic content instruction (science and social studies) embedded in daily 20-min interactive shared book reading lessons with groups of preschool and Head Start children – predominantly African American and English-proficient Latinos – who required intensive language and knowledge extensions.

In the first experiment (12 weeks in length), treatment students scored significantly higher on researcher-developed receptive and expressive measures than students in the practice-as-usual condition (Pollard-Durodola et al., 2011). However, there were no statistically significant main effects for condition on standardized language measures. We hypothesized the larger grouping size ($n=9$ – 10 students) and short intervention period may not have been sufficient to facilitate deep conceptual understandings with opportunities for adult feedback and monitoring of student progress. In the second experiment, a new group of teachers piloted a more extensive 18-week intervention with multiple opportunities for more analytical talk and thinking with smaller student groups ($n=6$). We used smaller groups because evidence suggests smaller groupings are more beneficial for storybook learning (Morrow & Smith, 1990). Findings indicated moderate-to-strong positive effects of the interactive shared book reading approach on researcher-developed receptive and expressive measures and significant results for a standardized receptive vocabulary measure (Gonzalez et al., 2011).

In the current investigation, we were interested in the efficacy of the fully-developed 18-week WORLD interactive shared book reading approach on the English vocabulary development of preschool Spanish-speaking DLLs enrolled in a dual language bilingual program. Specifically, we hypothesized that multiple exposures to lexical networks of words and concepts would be beneficial for children acquiring English as a second language while engaging in content-related discussions. Further, we believed the opportunities for ESL-supported language interactions (e.g., gestures, visuals, sentence stems) in small groups to facilitate group and individual responses with adult feedback would facilitate vocabulary growth in English. We focused on native Spanish-speakers because the majority of U.S. emergent bilinguals are from Spanish-language backgrounds (Ballantyne, Sanderman, & Levy, 2008) and live in families with the greatest concentrations of poverty (Espinosa, 2010). We targeted preschool children because evidence suggests quality preschool instruction is more effective for reducing the achievement gap for Latino students than for any other ethnic group in the U.S. (National Clearinghouse for English Language Acquisition, 2011). We specifically wanted to know what was the effect of the WORLD preschool shared-book reading curricular intervention and pedagogical approach on proximal and distal receptive and expressive vocabulary outcomes of DLLs in the initial stages of English language development.

2. Method

2.1. Participants

2.1.1. School sites

The study was conducted in two ethnically diverse school districts in a geographical region that is one off the most economically distressed counties in the nation (Mier et al., 2013). The

first school district enrolled just fewer than 28,000 students who were classified as 99.2% Hispanic, 95.9% economically disadvantaged, and 70.9% as at risk (Texas Education Agency [TEA] AEIS report, 2010). The second district enrolled 31,000 students with 98.6% Hispanic, 88.6% economically disadvantaged, and 73.7% at risk (Texas Education Agency [TEA] AEIS report, 2010). From these two districts, all elementary schools with a preschool dual language bilingual program were selected to participate ($n=23$).

Each school district implemented the Gómez and Gómez Dual Language Enrichment Model (Dual Language Training Institute, 2015) beginning in preschool where language arts, science, and social studies were taught in children's native language (Spanish) with English reserved for math instruction. This instructional approach aims at providing a “balanced” exposure to the native language (Spanish) and the second language (English) so that the total minutes spent in English instruction is approximately the same amount of time as Spanish instruction (Dual Language Training Institute, 2015). Within a 5-day week, three days were designated as Spanish-only instruction (e.g., the language of the day) and two were reserved for English-only instruction to ensure strict language separation—a common linguistic feature of dual language program models (Torres-Guzmán, 2002). Example language arts activities included DEAR (Drop-everything-and-read—Spanish texts), instruction on Spanish/English cognates, and paired or group work during center learning activities. The participating school districts implemented a one-way dual language version of the Gómez and Gómez model by serving only Spanish-speaking children who were acquiring English proficiency. In contrast, a two-way dual language program includes both language minority and language majority children.

2.1.2. Classroom teachers

From the selected elementary schools with preschool dual language bilingual models (Gómez and Gómez instructional model; Dual Language Training Institute, 2015), all preschool teachers who taught in the dual language program and provided consent participated ($n=48$). We randomly selected 24 teachers to implement the interactive content-enriched shared book reading curricular intervention and 24 for the comparison condition referred to as business-as-usual (BAU). Six teachers withdrew before the intervention began (e.g., reassignment by school administrators to classes not participating in the DLL bilingual model, school district lost one position; personal reasons) reducing our total number to 42 teacher participants (treatment, $n=23$; BAU, $n=19$). Teachers were primarily BA-degreed and did not significantly differ in gender, preschool teaching experience, total years of teaching, or fields of certification (e.g., bilingual/ESL). All teachers self-identified as Latino and were native Spanish-speakers although approximately 61.9% reported they primarily used English in daily life activities (see Table 1).

All classrooms in the study employed a bilingual (Spanish/English) paraprofessional that provided instructional support (e.g., center-based activities) to the remaining students who did not participate in the study while the intervention or comparison teacher implemented shared book reading (content-enriched intervention or BAU) with a small group ($n=6$) of student participants who met preLAS® (DeAvila & Duncan, 2000) selection criteria (limited English language abilities). All instruction (content-enriched intervention and BAU) occurred during teachers' regularly scheduled book reading time. Intervention teachers replaced their typical daily storybook reading lesson with our approach and curricular materials with a small group ($n=6$) of students who met screening criteria. Likewise, BAU teachers used their own books and typical shared book reading practices with a small group ($n=6$) of students who met screening criteria. Teachers were told to read their book of choice to the small group of six students

Table 1
Descriptive statistics for student- and teacher-level variables by treatment conditions.

Two-level variables	Treatment condition	
	Intervention	Comparison
Student-level	<i>N</i> = 138	<i>N</i> = 114
Gender		
Female	69	57
Male	69	57
Ethnicity		
Hispanic	127	108
Native-American	2	2
School district		
A	120	102
B	18	12
English learner status		
Bilingual	133	107
Non-bilingual	5	7
Age in months (at pretest)	56.88 (3.67)	56.11 (3.57)
Attendance	7.28 (6.43)	6.54 (0.99)
Lunch status		
Non-economically disadvantaged	11	9
Economically disadvantaged	127	105
Teacher-level	<i>N</i> = 23	<i>N</i> = 19
Gender		
Female	22	18
Male	1	1
Primary language used		
English	14	12
Spanish	9	7
School district		
A	20	17
B	3	2
Total years of teaching	8.09 (6.74)	8.95 (8.13)
Years of teaching Pre- Kindergarten	3.78 (3.59)	3.89 (3.00)
Highest degree completed		
Bachelors	22	18
Masters	1	1
University reading credits	4.36 (1.15)	4.42 (1.23)
Professional development hours	93.09 (47.95)	102.32 (52.77)
Certifications		
Bilingual (general/ESL/Reading)	4	2
Interdis studies/Psych/Sci/Social work	2	2
Early childhood	0	3
Bil/ESL/Read	17	12

Note. 1. All teachers are Hispanic. Teachers' years of teaching, university reading credits, and professional development hours are reported by means and standard deviations.

2. Students' ages and attendance are reported by means and standard deviations.

for approximately 20 min a day for the 18-week scheduled period. Teachers recorded the books read in a log collected by project staff.

2.1.3. Student participants

Preschool children in the present study were acquiring linguistic competence in their native language, Spanish, while acquiring a second language (English) simultaneously. English and Spanish preLAS[®] scores (DeAvila & Duncan, 2000) confirmed that children were emergent bilinguals in the initial stages of English language development. The PreLAS[®] measures the English and Spanish expressive and receptive language abilities and pre-literacy skills of learners in early childhood (DeAvila & Duncan, 2000).

We do not have data on children's initial age of English exposure; however, data from a parent demographic survey indicated home language use. Thus, of the 189 parents returning the survey, 87% or 165 parents reported speaking Spanish in the home, followed by 8% reported for English, and 5% reported speaking both languages. Family literacy practices suggested that most parents read to their children in Spanish. It is important to note 47% of the children in the study resided along the U.S.-Mexico border in "colonia" neighborhoods that lack basic living necessities and have unemployment rates eight times the national average (Mier et al., 2013). The aver-

age family income was less than \$15,000, with most parents having completed 9th through 12th grade.

A screening process was used to identify preschoolers with overall lower English language abilities. First, language placement data provided by the school district were used so that each classroom student roster was rank-ordered according to student performance on their English language proficiency as determined by the preLAS[®] (DeAvila & Duncan, 2000). Eligible students (*n* = 6 girls and *n* = 6 boys for a total of 12 per class) were those who scored at the pre-functional and beginning level in their English language proficiency. Second, for each of the 12 eligible students, parental consent forms were disseminated and returned. From those students with parental consent, we randomly selected 6 per class (also matched by gender) for small group instruction (content-enriched intervention and BAU practices). The remaining student names were held as replacements.

2.2. Measures and data collection procedures

The assessment battery included standardized, norm-referenced and researcher-developed receptive and expressive vocabulary measures. Standardized vocabulary measures were included because they provide information for comparing students' performance with national norms. However, researcher-developed measures were included because they are more sensitive to growth (Hargrave & Sénéchal, 2000) and capture vocabulary concepts taught in the intervention.

All student participants were individually administered the battery of English vocabulary assessments by trained bilingual (Spanish/English) graduate research assistants/assessors (*n* = 6) in two separate sessions during both pre- and post-testing intervals, balancing classroom interruptions and the need for multiple test sessions to minimize children's fatigue. They administered assessments two weeks before and two weeks post-intervention in quiet settings (e.g., small conference room) designated by the school administrator or teacher. Pilot administration (fatigue was evident after 20 min) resulted in an estimate that each session averaged 20 min. Although the typical administration was in two sessions, test administrators discontinued testing and further divided the administration into three sessions when necessary (less than three occurrences). The assessment administration was counterbalanced to take into account priming effects. All bilingual data collectors participated in a 2-day training with practice opportunities before pre- and post-test data collection and were required to demonstrate 100% mastery on all measures prior to each testing interval.

2.2.1. Receptive vocabulary knowledge

The Peabody Picture Vocabulary Test-4th edition (PPVT-4; Dunn & Dunn, 2007). The PPVT-4, a 228-item test of receptive vocabulary in standard English, is administered by having a child point to one of four pictures on a panel that represents an object or action that the examiner names. The PPVT-4 has a mean standard score of 100 and a standard deviation of 15. Nationally standardized on a stratified normative sample of 3500 children, the PPVT-4 yields reliable scores, with all reliability and validity coefficients in the 0.90s range.

Receptive vocabulary was also assessed using the proximal Researcher-Developed Receptive Picture Vocabulary Test (RDRPVT), which measured target words taught during the shared book reading intervention. The procedure, materials format, and response requirements of the RDRPVT were similar to those of the PPVT-4. That is, tests consisted of one plate for each target vocabulary word. Each plate contained four illustrations, one depicting the target item and three distracters. The RDRPVT was discontinued if the student responded incorrectly to the first six items. Reliability for the RDRPVT was 0.86.

To construct the measure, researchers used a stratified, random sampling procedure selecting one target word from each of the 18 weekly topics taught during the intervention so that words represented concepts from both science and social studies themes. Sixty-one percent of the vocabulary tested was taught via informational texts. The remaining 39% was taught via storybooks. Further, 95% of the words tested were nouns while 5% were adjectives. Only two words were cognates. Approximately 33% of target vocabulary words were tested as a representative sample to avoid an unduly long assessment.

2.2.2. Expressive vocabulary knowledge

Expressive vocabulary was measured using the Expressive Vocabulary Test—Second Edition (EVT-2; Williams, 2007), a test of expressive vocabulary that does not require reading or writing. The test evaluates DLLs' English word knowledge. The EVT-2 was co-normed along with the PPVT-4.

Expressive vocabulary was also assessed using the Researcher-Developed Expressive Picture Vocabulary Test (RDEPVT) to measure vocabulary knowledge specifically taught in the shared book reading intervention. The procedure, materials format, and response requirements for the RDEPVT were similar to those of the EVT-2. The RDEPVT included the same words as the RDRPVT, representing approximately 33% of target vocabulary to avoid an unduly long assessment. A 0–2 scale was used to score responses: (a) 0 indicated a vague or incorrect response; (b) 1 indicated an attribute of the target word (water for the target word raindrop); and (c) 2 indicated that the target word or a synonym was provided. Picture prompts were different from those used in the intervention. Reliability for the RDEPVT was 0.88.

2.3. Instructional materials and procedures

2.3.1. Curriculum design and content organization

The shared book reading content was organized in 18 carefully constructed instructional units (one unit consisted of five lessons) organized around two science and social studies themes as the content foci. Within each theme, lessons were organized around smaller topics to prime important background knowledge and strategically integrate new concepts with previously learned material (Simmons et al., 2008). In this approach, all content learning was integrative and cumulative.

2.3.2. Thematic science content and books

Themes and topics were reflective of preschool content-related guidelines (e.g., Core Knowledge Foundation, 2000). Within the two science themes, weekly lesson units were organized around 10 smaller topics that were developed through the lesson. For Living Things (things that eat, grow, and use air), the weekly topics included plants, trees, ocean animals, birds, and animals. For Nature (things not made by people, such as water, air and sunlight), weekly topics included water, snow, storms, seasons, and light. To develop each weekly topic, teachers used one thematically paired storybook and informational book to expose children to important text genre features, ensure multiple exposures to semantically related content vocabulary and academic concepts, and provide a body of integrated conceptual knowledge.

In this topic immersion approach (Hirsch, 2006), concepts encountered in the storybook were heard again in the informational text. For example, in the Week 14 science unit on plants, students read *Planting A Rainbow* (Ehlert, 1988) on Days 1 and 2 and learned that bulbs can sprout after being planted in the ground. On Days 3 and 4 of the same unit and week, students read *Leaves* (Whitehouse, 2002), continuing to hear and learn about the concept of plants while learning new information on leaves: leaves can grow inside buds and on vines. A topic immersion approach

allowed multiple exposures to the same big idea concepts across texts (storybook + informational text) and future instructional units (e.g., children learned in a future unit that bulbs can sprout during the warm Spring season.) See Fig. 1 (online supplementary materials) for an example of the thematic content organization for an instructional unit (Theme, Earth; Topic, Land and Water).

The 22 science books (11 storybooks and informational texts) met the following criteria: (a) content and language was age-appropriate, (b) a sufficient number of vocabulary was related to the identified theme and smaller topic, (c) vocabulary concepts were visually represented, (d) content could be read and discussed in a 20-min session, and (e) the text structure allowed predicting and identifying the main idea in storybooks and learning more facts about a topic in informational texts. Researchers considered texts to be age appropriate if they were not excessively long (number of pages, amount of new information), were of interest to young children, did not include an excessive amount of new vocabulary (i.e., long lists of animal names, transportation types, etc.) and irrelevant details that could distract from taught concepts.

For informational texts, it was important that the content was accurate and organized in a way that was conducive to analytical thinking (e.g., facts and diagrams presented clearly; figures clarified abstract concepts; cycles in nature were presented chronologically, etc.). For storybooks, researchers selected texts whose story narration was sequential, easy to follow, supported by clarifying illustrations, and whose main idea was related to the content themes and smaller topics. (For more details, see Pollard-Durodola, Gonzalez, Simmons, & Simmons, 2015).

2.3.3. Thematic social studies content and books

Within the two social studies themes, weekly lesson units were organized around seven smaller topics. For Places Where We Live and Go, the weekly lesson units included cities, homes, school, and stores. For Earth, Land and Water, instruction focused on land, water (streams, ponds, etc.) and the ocean. Book selection criteria remained the same. Of the 14 social studies books selected, seven were informational texts and seven were storybooks.

2.3.4. Vocabulary selection

Word selection criteria included the following: (a) relevance to broad science and social studies themes and smaller topics, (b) not likely to be learned outside of school, (c) important for later learning and understanding of word relationships, and (d) visually represented in the book. Overall, researchers selected 59 science and 35 social studies vocabulary words to develop lexical networks of knowledge (e.g., water, liquid, frozen) to assist children in acquiring associative knowledge. Basically, words were selected from thematic texts to help explain the essential concepts related to the smaller topic. Researchers believed that providing instruction on words that were related by science and social studies themes and topics would assist children in organizing and storing new information via a cognitive framework or schema, making it easier to learn new concepts and build more expansive knowledge networks.

Before reading the story or informational text, teachers taught all new words with engaging vocabulary picture/concept cards, provided in researcher-developed materials, to prime background knowledge. Three words were explicitly taught from each text for a total of six words per week. Early lessons introduced only two vocabulary words per book to scaffold learning difficulty. Of the 94 words taught, 15% were English/Spanish cognates (solid/sólido) or words that were similar in spelling, meaning, and word origin (Montelongo, Hernández, Herter, & Cuello, 2011). Overall, words were often identical to academic science and social studies kindergarten vocabulary lists developed by state and local school districts.

(See Table S1 in the online supplementary materials for an example of thematic organization of vocabulary).

2.3.5. The instructional routine

Daily lessons included the following critical curricular design features (See Fig. 1 in the online supplementary materials for lesson features):

- A 5-day scope and sequence in which certain days were used to introduce, review, and integrate words and associated concepts across thematically paired texts.
- Instruction distributed before, during, and after reading the book with most interactive discussions occurring before and after reading the text.
- Repeated reading of texts so that each book was read twice in the 5-day routine.
- Instructional tasks that ranged from low to higher levels of cognitive difficulty.
- Instruction on three content-related words using visuals to depict the concept in two different contexts.

Essentially, Days 1 and 3 introduced a new book and three content-related vocabulary concepts. Days 2 and 4 repeated the book, reviewed word meanings and concepts, and extended knowledge through cognitively challenging discussions (e.g., Challenge Activity) that allowed students to integrate present concepts with previously learned knowledge and children's life experiences. Days 1 and 2 were used to read a storybook, whereas Days 3 and 4 focused on reading an informational text. Day 5 provided cumulative review activities with opportunities to integrate knowledge learned from the thematically paired texts and from the present week and previous lessons.

The aim of the before-reading instruction was to build and extend children's existing background knowledge related to the theme, introduce three new words using child-friendly definitions, and preview the text by pointing to book illustrations to predict what would happen in a storybook or what concepts they would learn in an informational text. An example activity includes showing an 11 × 14 inch poster of pictures related to the theme and saying, "This week we are going to read books about our Earth. Our Earth is where we live and it is made of land and water. Let's talk about the parts of our Earth that we see." In this lively discussion, the teacher modeled language use (e.g. I see land completely surrounded by water), extended children's responses (What does the diver find on the ocean floor?), and recasted responses in English if a child responded in Spanish. This was an opportunity to ask additional questions to stimulate thinking and talking and point to picture details to scaffold children's understanding of the concept.

During the book reading, teachers stopped briefly to discuss the vocabulary concept on the page on which it occurred, making connections to critical content knowledge and children's life experiences related to the week's topic. These brief in-context discussions occurred for each vocabulary concept.

After reading the book, activities included the following: (a) a brief cumulative review of taught concepts by identifying the picture/concept cards (Reading, Set, Go!-Let's practice saying each word we have learned.); (b) a discussion that encouraged children to relate the concepts to their own lived experiences (e.g., What are some things you might hear in a meadow?); and (c) comprehension questions that focused on children applying their new vocabulary and knowledge to talk about the characters and the big thing that happened in a storybook or review knowledge that they learned in an informational text. The bigger goal, however, was to frame these discussions within the broader context of the science or social studies topic and theme (Yes, our earth has animals that live in meadows or along the shore of ponds where they can find food.). Lastly, the

teacher encouraged the children to use their new vocabulary at home. (See online supplementary materials for more details on the distributed instructional sequence).

On the second reading of the book on the following day, a similar distributed sequence was implemented with questions to generate critical thinking about associations between concepts. An example activity included Challenge Questions. In this activity, the teacher pointed to a new vocabulary picture/concept card for each target word and challenged students to think about and discuss conceptual differences (What is the difference between an island and a meadow?) and to integrate knowledge learned across texts and previous lessons (e.g., Are there apartment buildings on Earth? Why or why not?). These higher-level analytical discussions were dependent on the teacher's ability to extend oral responses, scaffold instruction (ESL strategies), and model extensive vocabulary usage (Dickinson, 2011).

Building on Dickinson and Smith (1994) research, the intervention, therefore, integrated activities along a continuum from lower (labeling, recalling information) to higher cognitive thinking (inferring, associating, relating). Most lower-cognitive skills were sequenced at the beginning of lessons (e.g., previewing vocabulary) and primarily during the first reading of a text. Most analytical skills (e.g., Challenge Questions) were sequenced in post-reading discussions and took place after the second reading of a text. The rationale for this approach was that beginning with lower cognitive demand tasks sets an important foundation for later engaging in more cognitively complex dialogues when children are still developing their language abilities.

To provide consistency in the teaching of vocabulary and conceptual knowledge across classroom settings, teachers used highly specified lessons. This ensured that the same instructional sequence and strategy was used for each given vocabulary concept. Teaching from a highly specified lesson, however, did not result in a robot delivery of instruction because teachers were encouraged to breathe life into the lessons with their own style so that they were able to constantly respond to the nuances in student's performance (Simmons et al., 2008).

2.3.6. Professional development and feedback

One week prior to implementation, the 23 teachers in the experimental condition participated in a full-day (8 h) professional development (PD) session led by project researchers-developers of the shared book reading curriculum. In this session, researchers introduced the study rationale, materials, intervention procedures, and the importance of not discussing the intervention curriculum with non-treatment teachers (some campuses included an intervention and business-as-usual teacher). Teachers were introduced to the architecture of the intervention (state preschool guidelines, science and social studies themes and topics, etc.) and several ESL scaffolding strategies to facilitate book discussions during challenging tasks. The session included opportunities for modeling instruction, discussing an exemplary videotaped lesson (How does this teacher generate a back-and-forth interactive discussion?), and participating in paired-activity sequences with feedback. Researchers emphasized that scaffolding of students' native-language responses should be aligned with their school's philosophy (e.g., recasting the student's response in English). Participating teachers received all books, the daily thematic lessons, four 11 × 14 inch thematic posters, and two 8 × 10 inch picture concept cards for each content-related vocabulary concept.

In addition to the pre-intervention PD session, teachers met with the researchers three times during implementation to review progress and identify and resolve implementation obstacles identified by teachers or during fidelity observations. Monthly classroom visits by project personnel provided further support and imple-

mentation feedback. Individual coaching was provided on a few occasions when needed.

Beginning in November, teachers replaced their regularly scheduled small-group shared book reading session with the daily 20-min English intervention for the six participating students in their classroom. An instructional aide was present during the intervention time to provide support (e.g., center-based activities) to the remaining children in the class not participating in the intervention.

2.3.7. Treatment fidelity

To measure treatment fidelity, project personnel developed a measure of critical intervention dimensions that corresponded to the weekly five-day instructional sequence. Intervention fidelity was rated for each before (e.g., Talk about Magic Words), during (e.g., Read Together with Brief-in-Context Definitions), and after reading (e.g., Challenge Questions) components of the intervention with Likert-type anchors ranging from a score of 4 = Very High to 1 = Task not Implemented. Example dimensions included: Provides designated opportunities for children to talk about words or concepts. Furnishes feedback and confirmation of student responses.

Intervention fidelity observations occurred at the beginning, middle, and towards the end of the 18-week period. Across observations, fidelity of implementation scores ranged from 1.85 to 3.44 (mean = 2.83). Lower ratings were in the category of pacing (e.g., sometimes teachers moved too quickly through after-reading comprehension tasks or allocated too much time for the picture walk before reading the book) and confirming student responses with higher ratings for providing opportunities for students to talk about the words and concepts. Inter-observer agreement (IOA) was calculated for 20% of the fidelity ratings. Mean percent agreement ($A/[A+D]$) for the IOA was 88.7 % (SD = 30.7%). Feedback sessions were scheduled after each observation interval to discuss overall implementation strengths and recommendations for improvement. Observations indicated that average book reading sessions lasted 21.7 min.

2.3.8. Business-as-usual (comparison) condition

Comparison teachers were asked to engage in “business-as-usual” shared book-reading activities for approximately 20 min with a small group of children who were selected because they met screening criteria. Teachers used their own books, materials, and reading strategies during their regularly scheduled shared book reading time. Professional development was not provided because researchers did not want to alter teachers’ typical shared book reading practices. Classroom sessions were videotaped by bilingual graduate research assistants at the beginning, middle, and towards the end of the 18-week study to document the length of book reading sessions, materials, and general procedures of the typical book reading practices. The three researchers individually reviewed videotaped observations, took field notes, and then collectively discussed teacher practices after each observation interval. Observations indicated instruction was driven by school district curricula (e.g., use of big books, realia or real life objects), and often organized by district-level curricular themes (e.g., clothing, holidays, etc.). Additionally, observations indicated that 48% of these teachers did not provide explicit vocabulary instruction (e.g., attention to meanings or explanations of target words from the book, talk about connected life experiences using vocabulary related to book content, etc.) during the shared book-reading experience. All teachers introduced the book title, illustrator, and author while some teachers introduced a goal (e.g., Today we will read a book about ____). Most teachers pointed to illustrations (e.g., the character, characters’ actions) while reading the text and fewer followed with after-reading comprehension questions. Researchers noted limited interactive discussions in which there was a cycle of adult/child talk with strategies to provide feedback and extend chil-

dren’s limited responses. Typical book reading sessions averaged 16.16 min (SD = 48.37) with most instructional time spent reading the book with or without extra-textual talk (average = 9.81 min). Teacher self-reports documented that 94% of the books read were storybooks. Only one text (*Planting a Rainbow*) overlapped with an intervention book title. In general, observed BAU pedagogy differed from intervention practices in the frequency of opportunities for language interaction, critical thinking, and distributed instruction and discussion (before, during, and after reading the text).

3. Results

3.1. Analytic strategy

When data are characterized by dependency among observations due to the nested or hierarchical data structure (e.g., in our data, 252 students nested within 42 classrooms), multilevel modeling is the appropriate analytic method (Hox, 2010; Raudenbush & Bryk, 2002). Using traditional ordinary least squares (OLS) regression analysis for the nested data might result in biased estimates and, therefore, erroneous inferences because it assumes independent observations. The multilevel modeling approach takes the dependency into account by adjusting for the standard errors of the parameter estimates and thus results in unbiased statistical conclusions (Hox, 2010). In this study, we used the two-level hierarchical linear models to account for the multilevel data structure with students nested within teachers (i.e., classroom).

All analyses were conducted by using the SPSS MIXED routine (SPSS V20.0) with the restricted maximum likelihood estimation (REML) method. REML is the default estimation method used in many statistical packages (i.e., SAS proc mixed, SPSS mixed, and Stataxt mixed) when conducting multilevel analysis.

3.2. Analysis of pre-intervention assessments

Complete data on all demographic variables were available for 252 preschoolers. Thus, all child data were included in analyses. As mentioned, the children were randomly divided into two groups according to intervention assignment (i.e., content-enriched intervention and BAU comparison group). Table 1 presents the descriptive statistics for the children demographic variables (also called student-level variables) broken down by group assignment.

To examine any potential differences between the two groups on the demographic variables (e.g., gender, ethnicity, school district, ELL status, and age), we conducted a series of chi-square analyses and *t* tests. No statistically significant differences emerged between the two groups on any children demographic variables.

Potential differences between teachers in the assigned intervention and comparison classrooms were examined. Descriptive statistics for the teacher-level variables (e.g., teacher’s gender, primary language, and total years of teaching) are also presented in Table 1. Based on *t* tests and chi-square analyses, no evidence was found on differential attributes between the intervention and comparison teachers in gender, primary language, school districts, teachers’ total years of teaching, years of teaching in pre-kindergarten, highest degree completed, university reading credits, professional development hours, and certifications.

Table 2 presents the means and standard deviations for the pretest and posttest measures, including the standardized measures (i.e., PPVT-4, EVT-2) and the researcher-developed measures (i.e., RDRPVT and RDEPVT). Due to missing data, we further examined any potential differences between completers (i.e., 249 children on PPVT-4; 238 children on EVT-2) and non-completers (i.e., 3 children on PPVT-4; 14 children on EVT-2) on the demo-

Table 2
Pretest and posttest measures for intervention and comparison groups.

Measure	Pretest				Posttest				Effect size (Cohen's d)
	Total	Intervention	Comparison	<i>t</i>	Total	Intervention	Comparison	<i>t</i>	
PPVT-4									
N	249	136	113	0.05, <i>p</i> = 0.957	234	129	105	0.53, <i>p</i> = 0.599	0.07
M	63.81	63.86	63.75		72.70	73.16	72.13		
SD	15.42	14.76	16.24		14.63	14.12	15.29		
EVT-2									
N	238	132	106	0.17, <i>p</i> = 0.864	232	127	105	−0.30, <i>p</i> = 0.762	−0.04
M	55.63	55.87	55.33		64.08	63.65	64.60		
SD	24.01	23.59	24.64		24.01	25.09	22.75		
RDRPVT									
N	252	138	114	−0.68, <i>p</i> = 0.499	234	129	105	10.20, <i>p</i> < 0.001	1.34
M	6.28	6.14	6.46		11.83	14.43	8.64		
SD	3.67	3.45	3.92		5.18	4.25	4.38		
%of max	20.39%	34.11%	35.89%		28.78%	80.17%	48.00%		
RDEPVT									
N	252	138	114	0.28, <i>p</i> = 0.781	234	129	105	6.76, <i>p</i> < 0.001	0.88
M	6.24	6.34	6.11		14.98	18.32	10.88		
SD	6.45	6.56	6.35		9.37	9.59	7.25		
%of max	17.92%	17.61%	16.97%		26.03%	50.89%	30.22%		

Note. PPVT-4 = Peabody Picture Vocabulary Test (4th ed.); EVT-2 = Expressive Vocabulary Test (2nd ed.); RDRPVT = Researcher-Developed Receptive Picture Vocabulary Test; RDEPVT = Researcher-Developed Expressive Picture Vocabulary Test.

graphic variables. No statistically significant differences were found between the completers and non-completers on any of the demographic characteristics. Hence, we used the list wise deletion (i.e., only including the completers in the later analyses) to handle the missing data. Within the completers, we then examined differences between the intervention and comparison group on the four vocabulary pretest measures. The results of *t* tests (see Table 2) indicated that no significant differences existed between the two groups on all measures before intervention.

3.3. Analysis of the intervention effects

We first examined the unconditional model, which included no predictors, to partition the variance in posttest measures into two levels: children and classroom. Of the total variance in the PPVT-4 posttest measure, 22.38% (intra-class correlation coefficient [ICC] = 0.2238) was attributed to classroom effects. Further, the ICCs for the EVT-2, RDRPVT, and the RDEPVT, were 27.57%, 51.60%, and 40.97%, respectively, indicating that multilevel modeling was suitable for our data given that it modeled with precision effects at both the classroom/teacher level (Level 2) and individual level (Level 1).

We then estimated four two-level models, one for each posttest outcome measure (i.e., PPVT-4 standard scores, EVT-2 standard scores, RDRPVT, and RDEPVT raw scores). Except for the different pretest measure (corresponding to the posttest outcome variable) as the covariate, all four models contained the same set of predictors, including gender, age, bilingual status (bilingual coded as 1, non-bilingual coded as 2), ethnicity, attendance (days attending school), preLAS® English scores, and preLAS® Spanish scores at Level 1, or the student level, while the intervention effect, school district, teachers' total years of teaching, teachers' total years of teaching in prekindergarten, teacher's primary language (English coded 0 as the reference category; Spanish coded 1), teachers' university reading credits, and teachers' hours of professional development at Level 2, or the classroom/teacher level.

We adopted a two-level random intercept model, which only contained one random effect at the classroom/teacher level; the variance of this random effect captured the between-classroom variation. Our primary interest was the intervention effect (i.e., the potential difference between the intervention classrooms and the

control classrooms on the six posttest outcome measures) while controlling for all Level 1 and Level 2 covariates.

Research question 1. The first research question examined the effects of the shared book reading intervention on standardized measures, with analyses based on Models 1 and 2 (see Table 3). These models tested the effect of the shared book reading intervention on the standardized posttest measures, including PPVT-4 and EVT-2, controlling for child-level variables (e.g., gender and English learner status) and classroom-level variables (e.g., teachers' primary language and total years of teaching). As shown in Table 3, there was no statistically significant intervention effect on these standardized posttest measures: PPVT-4 ($\gamma_{01.intervention} = 2.19$, *p* = 0.200), and EVT-2 ($\gamma_{01.intervention} = -0.58$, *p* = 0.980).

On the posttest of receptive vocabulary measure (PPVT-4), the corresponding pretest measure was a significant predictor ($\gamma_{10.pretest} = 0.60$, *p* < 0.001), indicating that higher pretest scores were associated with higher posttest scores. The same significant results were also found for EVT-2 (EVT-2 pretest measure: $\gamma_{10.pretest} = 0.73$, *p* < 0.001).

Similarly, the preLAS® English score was a significant predictor for all the outcome measures (PPVT-4: $\gamma_{70.preLAS.English} = 0.16$, *p* < 0.001; EVT-2: $\gamma_{70.preLAS.English} = 0.13$, *p* < 0.01). In turn, the preLAS® Spanish score was a significant predictor for PPVT-4 (PPVT-4: $\gamma_{80.preLAS.Spanish} = 0.10$, *p* < 0.005). In general, the higher the preLAS® score, the better the performance on the posttest measure.

Research question 2. The second research question examined the effect of the content-related shared book reading program on the researcher-developed receptive and expressive vocabulary measures: the RDRPVT and the RDEPVT. As shown in Table 4, we found statistically significant main effects for the shared book reading intervention on RDRPVT ($\gamma_{01.intervention} = 6.43$, *p* < 0.001) and RDEPVT ($\gamma_{01.intervention} = 7.99$, *p* < 0.001), after controlling for all the covariates (i.e., pretest score, student demographic variables, student's oral language ability, school characteristic variables and teachers' associated characteristics). The findings indicated that, for these two researcher-developed posttest measures, children in the intervention group scored on average 6.43 and 7.99 points higher than children in the comparison group (total scores are 18 for both measures). See Table 4 for completed results.

Table 3
Hierarchical linear model of standardized measures.

Parameter estimates for multilevel models predictors	Dependent variable	
	PPVT-IV	EVT-2
Fixed effects		
Intercept	13.08	8.26
(SE)	(8.62)	(11.99)
Level- 1 Pretest (γ_{10})	0.60	0.73*
(SE)	(0.05)	(0.05)
Level- 1 Gender ^a (γ_{20})	1.71	1.18
(SE)	(1.24)	(1.76)
Level- 1 Bilingual (γ_{40})	4.70	4.23
(SE)	(3.77)	(5.68)
Level- 1 Ethnicity ^b (γ_{50})	1.43	0.68
(SE)	(1.76)	(2.99)
Level- 1 Attendance (γ_{60})	−0.08	−0.01
(SE)	(0.10)	(0.15)
Level- 1 preLAS [®] English (γ_{70})	0.16*	0.13*
(SE)	(0.04)	(0.06)
Level- 1 preLAS [®] Spanish (γ_{80})	0.10*	0.01
(SE)	(0.04)	(0.05)
Level- 2 Intervention (γ_{01})	2.19	−0.58
(SE)	(1.73)	(2.38)
Level- 2 School district (γ_{02})	−1.54	−0.35
(SE)	(5.17)	(7.21)
Level- 2 Years teaching (γ_{03})	0.21	−0.23
(SE)	(0.19)	(0.27)
Level- 2 Years teaching in prekindergarten (γ_{04})	0.14	0.96
(SE)	(0.37)	(0.51)
Level- 2 Teachers' primary language ^c (γ_{05})	−0.84	−4.82
(SE)	(1.90)	(2.60)
Level- 2 University reading credits (γ_{06})	−0.06	1.50
(SE)	(1.23)	(1.73)
Level- 2 Hours of professional development (γ_{07})	0.002	−0.01
(SE)	(0.03)	(0.04)
Random Effects		
Level- 1 Residual Variance (σ^2)	71.76*	137.56*
(SE)	(7.96)	(16.11)
Level- 2 Residual Variance (τ_{00})	13.22	23.45
(SE)	(7.29)	(14.87)

Note. PPVT-4 = Peabody Picture Vocabulary Test (4th ed.); EVT-2 = Expressive Vocabulary Test (2nd ed.).

* The significance level is set at $p < 0.05$ (two-tailed).

^a The reference group for gender is female (coded 0).

^b The reference group for ethnicity is Native American (coded 0).

^c The reference group for teachers' primary language is English (coded 0).

Similar to the standardized measures, the pretest measures significantly predicted the corresponding outcomes (RDRPVT: $\gamma_{10, \text{pretest}} = 0.25$, $p = 0.001$; and RDEPVT: $\gamma_{10, \text{pretest}} = 0.58$, $p < 0.001$) for both researcher-developed measures. Moreover, preLAS[®] English was significant for both researcher-developed measures (RDRPVT: $\gamma_{70, \text{preLAS.English}} = 0.07$, $p = 0.037$; RDEPVT: $\gamma_{70, \text{preLAS.English}} = 0.08$, $p = 0.002$) whereas the preLAS[®] Spanish was significant for RDRPVT ($\gamma_{80, \text{preLAS.Spanish}} = 0.03$, $p = 0.039$). In general, children who had higher scores on these measures at pretest reported higher scores on both researcher-developed measures at posttest.

With regard to the effect of the shared book reading intervention on actual growth of children's vocabulary building, as shown in Table 2, we found significant differences between the intervention and BAU comparison group on the researcher-developed receptive ($p < 0.001$) and expressive vocabulary posttest measures ($p < 0.001$). To facilitate the comparison of the mean differences between the intervention and BAU comparison groups on these researcher-developed measures, we converted the original scores of the researcher-developed measures to the percentage of the maximum possible scores for these two measures. Note that (see Table 2) at pretest children's mean scores on the proximal RDRVT were about 34% for the intervention group and 36% for BAU comparison group. At posttest, the intervention group mean increased

Table 4
Hierarchical linear model of researcher-developed measures.

Parameter estimates for multilevel models predictors	Dependent variable	
	RDRPVT	RDEPVT
Fixed effects		
Intercept	−1.45	−2.63
(SE)	(4.62)	(8.38)
Level- 1 Pretest (γ_{10})	0.25	0.58*
(SE)	(0.08)	(0.09)
Level- 1 Gender ^a (γ_{20})	0.55	0.59
(SE)	(0.46)	(0.78)
Level- 1 Age in months (γ_{30})	0.04	0.12
(SE)	(0.07)	(0.12)
Level- 1 Bilingual (γ_{40})	1.84	0.75
(SE)	(1.43)	(2.51)
Level- 1 Ethnicity ^b (γ_{50})	0.02	0.64
(SE)	(0.67)	(1.16)
Level- 1 Attendance (γ_{60})	0.002	−0.06
(SE)	(0.04)	(0.07)
Level- 1 preLAS [®] English (γ_{70})	0.07*	0.08*
(SE)	(0.01)	(0.03)
Level- 1 preLAS [®] Spanish (γ_{80})	0.03	0.03
(SE)	(0.01)	(0.02)
Level- 2 Intervention (γ_{01})	6.43*	7.99*
(SE)	(0.76)	(1.56)
Level- 2 School district (γ_{02})	−3.48	−4.60
(SE)	(2.23)	(4.58)
Level- 2 Years teaching (γ_{03})	0.16	0.24
(SE)	(0.08)	(0.17)
Level- 2 Years teaching in prekindergarten (γ_{04})	0.007	0.24
(SE)	(0.16)	(1.68)
Level- 2 Teachers' primary language ^c (γ_{05})	−0.26	−0.14
(SE)	(0.83)	(1.68)
Level- 2 University reading credits (γ_{06})	−0.52	−1.77
(SE)	(0.53)	(1.09)
Level- 2 Hours of professional development (γ_{07})	0.02	0.02
(SE)	(0.02)	(0.03)
Random Effects		
Level- 1 Residual Variance (σ^2)	9.87*	28.83*
(SE)	(1.08)	(3.17)
Level- 2 Residual Variance (τ_{00})	3.23*	16.07*
(SE)	(1.32)	(5.59)

Note. RDRPVT = Researcher Developed Receptive Vocabulary Test; RDEPVT = Researcher Developed Expressive Vocabulary Test.

* The significance level is set at $p < 0.05$ (two-tailed).

^a The reference group for gender is female (coded 0).

^b The reference group for ethnicity is Native American (coded 0).

^c The reference group for teachers' primary language is English (coded 0).

to 80%, whereas the BAU comparison group mean was 48%. In other words, the intervention group improved substantially (i.e., a 135% increment at posttest or almost four times the improvement of the BAU comparison group). Similarly, on the RDEPVT, the intervention group mean increased considerably, from 18% at pretest to 51% at posttest, while the comparison group increased from 17% at pretest to 30% at posttest.

Effect sizes were calculated for the effects of intervention using Cohen's d . As shown in Table 2, Cohen's d equaled 0.07 and −0.04, respectively, for the outcomes of PPVT-4 and EVT-2. For the researcher-developed measures, large effect sizes were observed for RDRPVT ($d = 1.34$) and RDEPVT ($d = 0.88$). While an effect size of 0.0 indicated that the mean of the intervention group was at the 50th percentile of the comparison group, an effect size of 1.34 quantified a substantial difference between the intervention and BAU comparison group.

3.4. Fidelity

Finally, we considered whether the interactive content-enriched shared book reading intervention had differential effects on children's vocabulary development due to the plausible varia-

tions in the intervention delivery. We entered treatment teachers' fidelity scores in the previously estimated multilevel models separately as a Level-2 predictor. We conducted these analyses with the inclusion of the 138 intervention group children. Across all models, none of the fidelity effects were statistically significant on either the standardized or the researcher-developed measures, indicating that intervention fidelity did not have much variation across classrooms and did not predict vocabulary outcomes.

4. Discussion

This study examined the effects of the fully developed WORLD 18-week content-enriched interactive shared book reading intervention and pedagogical approach on the English vocabulary outcomes of Latino preschool DLLs in the initial stages of English language acquisition. Enrolled in a one-way dual language program model, children received an average of 20 min of daily carefully sequenced shared book reading vocabulary instruction organized around high priority science and social studies themes and topics. Using the instructional design principle of strategic integration (Simmons et al., 2008) as a curriculum framework, the goal was to assist DLL children in understanding complex relationships between words and concepts to build English content vocabulary knowledge important for academic learning.

4.1. Effects of shared book reading on distal English measures

Results from the PPVT- 4 and EVT-2 showed no differences between the receptive and expressive vocabulary development of the children in the content-enriched intervention and comparison condition after controlling for pretest scores, student demographics (e.g., gender, age) and classroom-level variables. This finding may be partially explained by the possibility that standardized measures are often insensitive to subtle changes in vocabulary growth (Elleman, Lindo, Morphy, & Compton, 2009; Neuman & Wright, 2013) especially for children who enter school with more limited language abilities. Silverman (2007) reported pre- to posttest TOLD raw scores to document small changes in kindergarten English learners' vocabulary growth. Other interactive book reading studies (Collins, 2010; Spycher, 2009) conducted with children acquiring English as a second language, included researcher-developed and/or qualitative measures to document subtle vocabulary knowledge growth.

Although previous preschool studies conducted with native English speakers have documented mixed effects on standardized language measures (see WWC, 2015), Wasik and colleagues (Wasik & Bond, 2001; Wasik et al., 2006) attributed low-SES preschool children's significant language outcomes to a comprehensive interactive book reading approach, opportunities for vocabulary extensions throughout the preschool day, and extensive PD with systematic and frequent individualized coaching for preschool teachers to become acclimated to novel instructional and conversational practices. Further evidence suggests that targeted within-classroom coaching with more intensive feedback loops (e.g., weekly) during the implementation of a comprehensive preschool language development curriculum may be essential for DLL's global language growth (Weiland & Yoshikawa, 2013; Wilson, Dickinson, & Rowe, 2013). In the current study, the PD model was more limited in scope (e.g., did not include weekly individualized coaching) and may not have been sufficient to support individual teachers' scaffolding abilities to extend DLL's vocabulary learning. Additionally, intervention length (18 weeks) may not have been sufficient to bolster the language development of emergent bilinguals who may require several years to develop the

academic English language knowledge that is typically measured by standardized English assessments.

4.2. Effects of shared book reading on proximal measures in English

In regards to DLLs' growth on science and social studies vocabulary, preschool children who engaged in daily interactive content-enriched shared book reading practices benefited from the multidimensional approach to vocabulary and knowledge acceleration. In contrast to their performance on standardized global vocabulary measures, children in the content-enriched shared book reading intervention scored significantly higher on receptive and expressive vocabulary outcomes than children in the BAU comparison condition. These outcomes extend previous findings (Silverman, 2007; Spycher, 2009), indicating that DLLs who are not fluent in English can learn science and social studies content when embedded in literacy experiences with explicit enriched target word instruction and rich adult/child interactions. Silverman (2007), specifically reported that kindergarten DLLs (e.g., speakers of Spanish, Chinese, or Creole) learned taught words as fast or faster than their monolingual English-speaking peers via a multidimensional instructional approach. These findings were similar to those reported in a previous study in which 5th grade Latino second language learners and native English speakers did not differ in the extent in which they learned vocabulary concepts via an explicit multi-dimensional vocabulary approach (e.g., cognates, morphology, contextual information) (Carlo et al., 2004). While our outcomes suggest that DLLs from high-poverty settings and are acquiring English proficiency may benefit from instructional explicitness and multiple exposures to concepts embedded in broader knowledge networks to learn taught information, these exposures did not seem to generalize to global outcomes after 18 weeks of daily science or social studies instruction.

4.3. L1 and L2 oral language proficiency

In our study, DLLs' preLAS® English scores were a significant predictor of both standardized and researcher-developed receptive and expressive English vocabulary outcomes. Interestingly, preLAS® Spanish scores were a significant predictor of proximal and distal receptive vocabulary outcomes in English. These findings are important and extend previous research in two ways. First, they extend findings from previous interactive shared book reading DLL studies that have also reported a relationship between English oral language abilities and English word learning (Collins, 2010; Roberts & Neal, 2004). Collins specifically reported that children's English receptive vocabulary knowledge (PPVT-III) at the beginning of the year was significantly related to English target word learning. Next, our findings confirm that preschool language competence and vocabulary exposure in Spanish may predict English learning (Ordóñez, Carlo, Snow, & McLaughlin, 2002; Winsler, Kim, & Richard, 2014). Ordóñez et al. (2002) studied whether bilingual children's ability to define and talk about words (nouns) in Spanish was predictive of the equivalent ability in English. Specifically, they found that depth of bilingual children's knowledge for high-frequency Spanish nouns related to their depth of knowledge for similar English nouns—that bilingual children were able to draw from rich Spanish vocabularies to leverage English learning (Ordóñez et al., 2002). These findings have implications for preschool instruction, which we address further below.

4.4. Limitations and future research

Our findings should be considered in the context of the following limitations that have implications for future intervention research.

Although we assessed DLL children's pre-intervention receptive and expressive English knowledge of intervention content-related concepts, we did not assess this knowledge in their native language—Spanish. Because prior knowledge related to science (e.g., *Liquids can freeze when it is cold.*) and social studies (e.g., *The earth is made of land and water.*) may transfer from the primary to a second language (Cummins, 1981), pre-intervention assessments in the native language might have revealed previously known concepts (August & Shanahan, 2006). Again, as previously noted, identifying and building on prior knowledge in Spanish might have maximized valuable instructional time and second language learning (Cummins, 1981; Yoshida, 2008).

A second limitation is that we did not code the BAU videotaped shared book reading lessons for fidelity to intervention practices. Although 52% of observed BAU comparison book-reading practices did include some instruction on target words (e.g., attention to meanings or explanations of target words from the book) within the context of primarily reading storybooks, documenting fidelity to intervention practices would have allowed researchers to describe in greater specificity similarities and difference between the BAU comparison and content-enriched intervention practices.

A third limitation is related to the assessment battery and the absence of a measure to assess DLLs' ability to understand conceptually related ideas or concepts—one goal of our pedagogical approach which was based on the design principle of strategic integration. Although global, standardized measures provide an evaluation of the generalizability of intervention effects and researcher-developed measures provide an evaluation of target words learned, neither assessment measures children's ability to deeply process word and world connections.

One approach to evaluate this skill is to ask children to manipulate word sets or networks in which vocabulary share semantic or similar attributes (Beck, McKeown, & Kucan, 2013). In this evaluation technique, children can respond orally to statements that use more than one vocabulary word in a sentence with the goal of analyzing conceptual similarities and differences (Stahl & Nagy, 2006). In a previous study with non-DLL children, researchers noted that the more time preschool teachers spent on analytical word association tasks (e.g., What is the difference between frozen water and liquid? Can you drink something that is frozen? Why or why not?), the greater were children's standardized receptive vocabulary gains (Gonzalez et al., 2013). Further, in the World of Words (WOW) content-related intervention with multi-media supports and interactive shared book reading discussions, researchers also employed similar analytical question tasks to evaluate children's conceptual understandings in science (e.g., Is a butterfly an insect? Why or why not?) (Neuman & Dwyer, 2009; Neuman & Wright, 2013). Overall, including a researcher-developed measure to assess children's pre- and posttest ability to integrate content-related words and knowledge would have provided important information about DLLs' conceptual understandings. More research is needed to further explore assessment techniques that measure children's ability to integrate words and concepts.

Another potential future research agenda is to examine the potential intervention effects for DLL children with different entry-level native and second language abilities. Dividing child participants into different subgroups based on their entry-level language proficiency scores (low English/Spanish; low English and higher Spanish) and then testing the corresponding subgroups by intervention condition interaction effect can accomplish this.

4.5. Practical implications for dual-language learning

From these studies, there are several practical implications for designing curricular interventions that provide instructional extensiveness for Latino preschool children whose native and English

language abilities are still developing and who are being educated in a dual language bilingual model. First, leveraging the native language—Spanish—as a linguistic and cognitive resource may provide a conceptual knowledge base for English vocabulary and knowledge acceleration when specific strategies (e.g., bilingual, language acquisition) are employed (Cummins, 2007).

This process is known as *Teaching to Transfer* (Cummins, 2008) and is supported by the theory that bilingualism is developed via the interaction between the child and an “educational treatment” or instruction (Cummins, 1978 pg. 226). We propose that teaching to transfer in a preschool dual language bilingual model includes explicitly developing deep content vocabulary knowledge networks in the native language prior to providing instruction to promote English knowledge acquisition and vocabulary depth. This means strengthening native language proficiency so that children can engage in an explicit sequence of content-enriched interactive activities, analytical discussions, and deep-processing of academic concepts in Spanish shared book reading experiences prior to reviewing and extending science and social studies vocabulary and knowledge during English interactive book reading sessions. This pedagogical approach has been referred to as “bootstrapping on first-language knowledge and skills” (Graves, August, Mancilla-Martinez, 2013; pg. 31) and can include pre-teaching vocabulary and previewing storybook reading in the student's native tongue (Perozzi, 1985; Roberts, 2008; Ulanoff & Pucci, 1999). Because dual language education is committed to an additive approach to language acceleration (e.g., building native language proficiency while developing a second language) (Rodríguez et al., 2014), it provides an ideal environment for teaching to transfer to occur. Future research should, therefore, explore the value added of developing knowledge networks within and across DLL's first and second language to construct a framework that supports native and English vocabulary learning. This research endeavor, however, must also consider the importance of a PD structure that integrates frequent opportunities for teachers to internalize deeper understandings of how to extend children's oral language abilities across languages.

5. Conclusion

The preschool years represent an optimal window for oral vocabulary acceleration and knowledge expansion with opportunities to stimulate young children's oral language abilities (Farkas & Beron, 2004; Winsler et al., 1999). Emergent bilinguals, however, may benefit from additional help, which may include instructional supports (Goldenberg, 2013), organization of shared book reading content (thematic), vocabulary selection and instruction that facilitate deep processing (lexical sets of words) and instructional extensiveness. Results from this study suggest that emergent bilinguals in the initial stages of English language development in preschool benefit from explicit instruction on content-related vocabulary concepts around science and social studies; however, they may also profit from native language supports to facilitate second language learning.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.ecresq.2015.12.004>.

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