Print knowledge in Yucatec Maya–Spanish bilingual children: an initial inquiry

Alain Bengochea, Laura M. Justice & Maria J. Hijlkema

Published online: 29 Oct 2015.

Submit your article to this journal ⬚

Article views: 25

View related articles ⬚

View Crossmark data ⬚

Routledge
Taylor & Francis Group

Print knowledge in Yucatec Maya–Spanish bilingual children: an initial inquiry

Alain Bengochea[a] , Laura M. Justice[b] and Maria J. Hijlkema[c]

[a]Crane Center for Early Childhood Research and Policy, The Ohio State University, Columbus, OH, USA; [b]Department of Teaching and Learning & Crane Center for Early Childhood Research and Policy, The Ohio State University, Columbus, OH, USA; [c]SOLYLUNA, A.C., Mérida, México

ABSTRACT

This study serves as an initial inquiry regarding the early print knowledge of emergent bilingual preschool-age children living in an Indigenous community in Mexico. In this research, we examine various dimensions of print knowledge with Yucatec Maya–Spanish bilingual children for whom one of their languages (Yucatec Maya) is seldom seen in print forms in mainstream classrooms and curricula. A total of 84 emergent bilingual children were assessed in their Yucatec Maya and Spanish on measures of alphabet knowledge (i.e. letter names and sounds), name writing, and concepts of print. Results were analyzed and compared between languages, showing that the children demonstrated modest levels of print knowledge on all measures. Whereas the emergent bilingual children in this study performed significantly better in Spanish than Yucatec Maya on all indices of print knowledge, this investigation provides insights into how these children may concurrently develop print-related skills in interrelated ways across languages. Implications of these findings are outlined.

Introduction

A growing body of research on children's emergent literacy development has underscored the importance of skills that precede and develop into conventional literacy skills (e.g. decoding, reading comprehension, writing), which typically begin to display themselves during the years leading up to the end of preschool (see National Early Literacy Panel 2009). For instance, two-year-old children are observed producing written marks that they contend have meaning (Rowe 2008), and by four years of age many children are able to write their own name (Cabell et al. 2009). Precursor literacy skills, such as print knowledge awareness and phonological awareness, are considered critical in supporting children's transition to reading and also minimizing individual differences in later reading achievement (Lonigan, Burgess and Anthony 2000; Whitehurst and Lonigan 1998). Given that children are met with a transitional period upon attending early childhood programs and entering formal elementary school environments, improved understanding of children's emergent literacy skills could enable us to learn more about performance gaps existing in children's literacy acquisition in the classroom. Furthermore, assessing these skills could help to examine the extent to which children have acquired critical precursor literacy skills but also to evaluate the opportunities (e.g. print available in their environment, experiences with shared book readings) afforded to learners to develop this knowledge.

A considerable volume of research has shown that children's early knowledge about print is a particularly important aspect of emergent literacy development, corresponding to children's developing knowledge about the forms and functions of print (e.g. Chaney 1992; Piasta et al. 2012; Storch and Whitehurst 2002; also, see National Early Literacy Panel 2009), with much of this work involving monolingual children. Although much research has converged on the importance of early print-related knowledge to later literacy with monolingual populations (e.g. Piasta et al. 2012; Storch and Whitehurst 2002), a dearth of information is available relating to the acquisition of print knowledge among emergent bilingual children whose linguistic experiences and levels of exposure to print differ across their two languages. For instance, we have little understanding of the nature of bilingual children's print knowledge with respect to whether its dimensions develop concurrently across languages. Additionally, much less is known about the acquisition of print knowledge among emergent bilingual children who are raised in communities in which print resources are fairly scarce. To date, studies of print-knowledge development in young children, even those who are bilingual, largely concern children raised in print-rich homes and communities where there are abundant opportunities for children to develop their knowledge about print (Neuman and Celano 2011; Neuman and Roskos 1993). In this study, we contribute to the literature on emergent literacy development by examining the print knowledge of emergent bilingual (Yucatec Maya[1]/Spanish) Indigenous[2] children who live in a remote, rural community and for whom one of their languages (Maya) is seldom seen in print forms in mainstream classrooms and curricula.

Developing print knowledge

Young children's developing knowledge of print involves several preparatory skills that eventually lead to underlying understandings of how print is organized and how it functions. This includes word awareness and print awareness. The former, word awareness, refers to children's developing understanding of the written units that make up words (letters, in English and other alphabetic languages) as well as the understanding that written words map to spoken words. The latter, print awareness, refers to children's use of written language to communicate and their understanding of a variety of basic concepts about print, such as directionality of reading and writing. To assess children's development of both word and print awareness, children are typically given tasks in which they are asked to recognize and produce printed letters and familiar words (i.e. through speaking or writing) found in environmental print (Adams 1990), identify and discuss specific print concepts (e.g. pointing to the title of a book and representing the difference between words and images on a page; see Clay 1979 and Snow and Ninio 1986).

It is well understood that experiences in print-based interactions (i.e. explicit as well as without direct instruction) advance children's knowledge of written forms and support their development of metalinguistic insights relating to print, deemed necessary for conventional reading and writing behaviors (Ferreiro and Teberosky 1982; Kabuto 2011). Studies have shown that children's home literacy experiences relate to their acquisition of print knowledge, highlighting the importance of how involved parents are in their children's reading activities (Petrill et al. 2005); the frequency with which children encounter books and are read to (Sénéchal et al. 1998), and the overall quality of their shared reading experiences with their caregivers (McGinty and Justice 2009). Put differently, much of what is learned regarding print emerges prior to formal reading instruction through a learner's engagement with written language in their environment as well as the opportunities for print-related, adult-mediated interactions in order to develop knowledge of the symbolic forms and functions of written language (Storch and Whitehurst 2002; Whitehurst and Lonigan 1998). Through such incidental exposure and explicit attention to print, children at the presymbolic stage (i.e. wherein children's writing consists of unconventional written forms) gradually learn to differentiate, separate and combine letters to form words. Through this process, children gain an understanding that these units encode spoken language and carry meaning, and internalize knowledge about the ways in

which print sources are organized (Justice and Ezell 2001; Justice et al. 2009; Kabuto 2011; Neuman and Celano 2001).

Concurrent development of print knowledge in two languages

Emergent bilingual children are learners with varying degrees of proficiency in two languages due to their diverse experiences in their homes, communities, and schools and naturally use their existing bilingual resources to support learning across their languages (García, Kleifgen and Falchi 2008). In the same vein, previous literature shows how through the phenomenon of transfer emergent bilingual children's experiences with either language can promote the development of and proficiency in skills underlying both languages (Cummins 1981; Fitzgerald 1995). Research on cross-language transfer – with considerable attention focused on transfer of phonological skills – has found that certain literacy skills are based in common processes and thus can smoothly transfer across languages (Cisero and Royer 1995; Durgunoglu, Nagy, and Hancin-Bhatt 1993). Studies focusing specifically on transfer of print-related skills (Bialystok 1997; Verhoeven and Aarts 1998) suggest that bilingual children use their knowledge of speech–print relationships in one language to advance their learning in a second language across similar and different writing systems (Bialystok and Luk 2007; McBride-Chang and Treiman 2003). With this in mind, Bialystok and Luk (2007) propose that certain print-related skills (e.g. understandings of the symbolic function of print) are universal in the development of literacy and foundational for reading regardless of writing systems (i.e. alphabetic and non-alphabetic).

There are specialized language-learning mechanisms that require specialized knowledge and are resultantly language-dependent, such as learning the nature of the orthography for a particular language (Perfetti 2003). Learning to read in two languages that differ in levels of orthographic depth – the degree to which pronunciation is assembled from known sound–symbol associations – may require different processes (Ellis et al. 2004; Katz and Frost 1992). As Katz and Frost (1992) indicate, languages sharing similarly shallow orthographies, for which sound–symbol correspondence is more direct, should be easier to read using word-recognition processes as they may share similar phonological encoding processes. As such, learning Maya, which has a less consistent orthography than Spanish due to greater articulation variances, may require additional attention to these variations. Although certain letter forms found in Spanish comprise a large proportion of the Maya alphabet, articulation variances mainly lie in the number of vowels between both languages, with the Maya alphabet exceeding Spanish. For instance, the Maya alphabet distinctly uses diacritics with vowels (a', e', i', o', u') to distinguish them as glottalized sounds. It also includes two contiguous vowels (aa, ee, ii, oo, uu) without diacritics to represent long vowels with low tone; with diacritics to represent long vowels with an ascending tone (áa, ée, íi, óo, úu); or with diacritics to represent intermediate glottalized and rearticulated vowels (a'a, e'e, i'i, o'o, u'u). Additionally, in Maya, glottalized consonants, or ejectives, are represented by the addition of a diacritic (ch', k', p', t', ts'). Maya also uses the letter X with greater frequency than Spanish, often appearing in initial and final positions of words. On the other hand, certain letters are generally considered borrowings from the Spanish alphabet (d, c, ch, f, g, h, ll, ñ, q, v),[3] and the letter R is less frequently used in Maya words, as it only appears in the medial position (e.g. p'urux, turix).

There is very little understanding of how emergent bilingual children develop the various dimensions of print knowledge (i.e. letter names and sounds, name writing, and print and word awareness (PWA), particularly for those children reared in contexts in which there is little opportunity to engage in print-related activities at home and in the community in one or both of their languages. For instance, it is not clear whether children who are reared in contexts in which there are few print-related resources, deemed critical mechanisms for promoting children's knowledge about print, will develop any knowledge about print prior to formal reading instruction. Neuman and Celano (2001), who described the vast differences in print resources between two low-income communities and two high-income communities in the USA, suggested that being reared in areas with scarce print

resources could have profound implications for children's early literacy development. At the same time, it is also unclear whether emergent bilingual children develop print knowledge simultaneously across both languages, potentially due to transfer, or rather a different pattern is observed, particularly when print-related resources in one of their two languages are very scarce. The present study serves to speak directly to these issues by exploring knowledge about print in two languages for children reared in an Indigenous community with relatively low levels of print-related resources.

Language and literacy development in an indigenous community

The present work was conducted in an Indigenous community in Mexico in which both Maya and Spanish are widely spoken. Maya is the second most widely used Indigenous language in Mexico, with 759,000 speakers nationwide mostly found in the Yucatán Peninsula (Instituto Nacional de Estadística y Geografía 2010). Although the Mexican government officially recognized 68 Indigenous languages as national languages and proposes to promote bilingual and intercultural education (Ley General de Derechos Lingüísticos de los Pueblos Indígenas [General Law on Linguistic Rights of Indigenous Peoples] 2003), Indigenous children commonly attend schools in which Spanish is predominantly used during literacy-learning activities (Azuara and Reyes 2011; Despagne 2013). Accordingly, with relatively few print resources in Maya coupled with limited language and literacy-learning experiences in the classroom in their home language, Maya speakers generally depend on oral tradition and interaction outside of school to preserve their home language (Coronado Suzán 1992; Hamel 2001).

Even though there is a scarcity of print in schools where Maya is used, efforts are made by those in Maya-speaking communities to expand the functional domains of the language beyond more familiar contexts and into conventional literacy (Pellicer Ugalde 1997). To this point, it must be noted that Maya originally used a polyvalent, glyphic writing system, employing both logographic and syllabic elements. The current writing system, however, derives from a Latin-based script imposed by non-native groups after Spanish colonialism in the sixteenth century and, therefore, may not adequately represent the Maya language as it does for western European languages, from which the phonemic alphabetic writing system evolved (Brody 2004; Restall 1997). Currently, the Latin-based Maya alphabet is the only writing system that is widely in use and ongoing efforts to standardize the language have been made through recent publication of various dictionaries recording the Maya alphabet and lexical items, with several highlighting dialectal variations of Maya (e.g. Barrera Vásquez 1980; Bastarrachea Manzano and Canto Rosado 2003; Bricker, Po'ot Yah, and Dzul de Po'ot 1998). However, there are still ongoing politico-ideological debates about the acceptable written forms of the Maya language among its users (Brody 2004; Guerrettaz 2013, 2015). More recently though, the National Institute of Indigenous Languages (Instituto Nacional de Lenguas Indígenas 2014) synthesized the principles, rules and conventions through collaborative efforts between various institutions and Maya speakers in order to achieve consensus on the acceptable standards of written Maya, which will inform decisions about the use of Maya in texts for bilingual education in Yucatán state.

Although Indigenous languages are widely used in oral interaction and there are increasing efforts to standardize and make their writing systems more accessible, many contend that assimilationist educational policies continue to be principally designed and centralized in Mexico City (see Azuara and Reyes 2011; Hamel 2001). The federal agency known as La Secretaría de Educación Publica (i. e. Ministry of Education) designs curriculum as well as hires, trains, and assigns teachers to teaching positions with little attention to the cultural and linguistic needs of Indigenous children (Brambila-Rojo 2004; Faudree 2013; Fierro Evans and Rojo Pons 2012). In the same vein, the language policies implemented by the central Mexican government divert attention from the role of systemic factors that contribute to the academic challenges (e.g. lack of culturally responsive instruction and shortage of print resources in children's home languages) faced by Indigenous children (Azuara and Reyes 2011; Hamel 2001).

Typically underrepresented in second language research, Indigenous populations in Mexico and in other countries disproportionately face many of the challenges encountered by bilingual learners, such as low proficiency and academic achievement as well as a mismatch between instruction and the sociocultural, linguistic, and educational needs (Bertely Busquets and Gonzalez Apodaca 2003; Hamel 2008; Scanlon and Lezama-Morfín 1982). Assessing emergent literacy skills in the multiple languages spoken by children in Indigenous communities, as we do in this study, could more wholly depict and contribute to understandings of the extent of their exposure to and knowledge about print regardless of the predominating language of instruction. In so doing, this study aims to explore the extent to which preschoolers in a Maya community have begun to familiarize themselves with important elements of the reading process, particularly their learning about print in the preschool years prior to formal reading instruction.

No research of which we are aware has been conducted to investigate the extent of print knowledge that Indigenous, emergent bilingual populations have acquired in their two languages, despite the expectedly uneven exposure to print they experience in both languages in formal classroom settings and even within the community. Regarding the former point, we noted previously that in Mexico, where this study took place, the majority of classroom instruction (in children's preschools) relies on Spanish, and the majority of instructional materials are in Spanish as well. For the latter, while children are exposed to Maya within the home and community as an oral register, there are scarce print materials available in Maya. Thus, in this study we also extend our understanding of emergent bilinguals' print knowledge when exposure to the written forms in their two languages is uneven. The research aims addressed were twofold: (1) to describe print knowledge among Yucatec Maya–Spanish bilingual children in order to determine the extent to which print knowledge appears to develop prior to reading development in this unique context, thus providing possible further evidence of its cognitive universality and (2) to describe inter-relations among children's print knowledge specific to Spanish and Maya, so as to explore whether dimensions of print knowledge may represent language-independent skills.

Method

Design

The study is a descriptive, cross-sectional study that investigated emergent bilingual children's print-knowledge skills in Maya and Spanish. We used inferential statistics to examine and make judgments about children's understandings in both languages on the various dimensions of print knowledge, which include letter-sound, letter-name, PWA, and name writing. We conducted t-tests to compare the mean scores of each measure in children's two languages. Subsequently, we conducted correlational analyses to determine the cross-language relationships between Maya and Spanish print-knowledge outcomes.

Site of research

This study was conducted in a small, rural Maya community with a relatively homogenous cultural and linguistic population living in Yucatán state in southeastern Mexico. The children in this study were enrolled in a local, collaborating government-run preschool program, serving children between the ages of three and five years, with an unstructured language policy. In Mexico, teachers with less seniority may be assigned to rural areas, traveling long distances outside their own localities. As reported by school administrators through informal conversations, all teachers, non-native to the community, were designated to the school with very limited knowledge of the Maya written system. In all, there were eight Maya–Spanish bilingual teachers. The bilingual teachers reported showing a preference for Spanish when delivering instruction, with the exception of one teacher who regularly used Maya. Through our observations and informal conversations with teachers and administrators,

we learned that most printed materials available to teachers were in Spanish, which including state-sanctioned textbooks and a small collection of trade books (approximately 25 books in Spanish only across classrooms). There were few print displays around these classrooms, and they typically included the Spanish alphabet. Children's written work primarily consisted of decontextualized activities in the form of letter-tracing tasks.

Within the community in which the study took place, there were relatively few print-related materials available outside of children's classrooms. An evaluation of community-level print resources conducted using procedures described in Neuman and Celano (2001) showed these to be scant. A walk-through the town center found no literacy-related print materials available for children to purchase or borrow, with the exception of a small collection of heavily used and weathered children's books (mostly nonfiction in Spanish) for borrow from the town library. The most prevalent print resource in the community was graffiti, which was abundant. Mostly, graffiti was in Spanish. Finally, within the children's homes, and as based on parental report obtained via questionnaire, the mean number of books available was 0 (range 0–3). Religious texts, albeit rare, were generally the only Maya print resources available at children's homes.

Study population

This investigation was part of a larger project examining children's emergent literacy skills over time as a function of their caregivers' participation in a series of collaborative workshops that promoted shared book reading, which were led by trained educators and parents from a nonprofit organization in Yucatán that provides ongoing literacy support services to preschools in surrounding Indigenous communities. Participation in the larger study was open to caregivers with children who attended the community preschool and were between the ages of 3 and 5. All data for the present study were collected before the book-reading workshops commenced. Data relating to sociodemographic characteristics and language use were obtained through survey method.

Participants were 84 Maya children (41 girls, 43 boys), with a mean age of 59.5 months (SD = 9; Range = 40–70) whose caregivers self-selected into the larger study. Many children resided in traditional Maya households with extended family, and all households were based on subsistence living. The median bi-weekly household income in the present study was less than 1000 Mexican pesos (i.e. equivalent to approximately $65 US).

Table 1 provides additional sociodemographic characteristics of participating children and their caregivers. Notably, the children varied with respect to which language they preferred to use according to caregiver reports. Most families reported using more Maya at home than Spanish (56%), though 30% of families reported using more Spanish at home than Maya. The remaining 15% reported using the same amount of Spanish and Maya at home. The data are consistent with 2010 census data (Instituto Nacional de Estadística y Geografía 2010) indicating that 97.8% of the population in this community aged 3 or more were speakers of Maya. With this in mind, we took a holistic view of bilinguals as individuals with wide repertoires of language practices that use their available languages for a variety of purposes across different contexts. As such, we consider participants in this study to be emergent bilingual children due to their overall linguistic exposure and experiences across home, school, and community contexts (García, Kleifgen and Falchi 2008).

Procedures and instruments

Children were individually administered a set of five print-knowledge measures by a trained, Maya–Spanish bilingual research assistant. The children were given letter-name, letter-sound, and PWA assessments in Maya and Spanish as well as a name-writing task. These tasks derive from the Spanish version of the Phonological Awareness Literacy Screening-PreK (PALS Español; Ford and Invernizzi 2009) subtests and were also adapted into Maya-language versions. Maya–Spanish bilingual research assistants piloted all assessments with children from the same preschool setting

Table 1. Sociodemographic characteristics of participant children (*n* = 84) and their caregivers.

Variable	*M* (SD) or %
Age (months)	59.5 (9.11)
% Male	51%
Language most used at home	
Spanish	29.5
Maya	55.7%
Both	14.8%
Number of children at home	2.3 (1.40)
Number of children attending school	1.9 (1.02)
Number of adults at home	2.7 (1.18)
Mother's highest level of education	
No schooling	15.9%
Primary school	39.8%
Middle school	42.0%
High school	2.3%
University	0%
Father's highest level of education	
No schooling	19.3%
Primary school	40.9%
Middle school	30.7%
High school	5.7%
University	3.4%

where this investigation took place in order to understand how participants might interpret instructions or questions. All assessments were administered individually with the child in two separate sessions at their preschool in order to counterbalance order effects of language. The order in which the language of a set of assessments was administered was selected at random for each child.

Letter-name and letter-sound identification

Two charts representing 29 and 42 letters of the Spanish and Maya alphabet, respectively, were prepared. The children were first shown the chart representing letters in a fixed, random order in one language and were asked to name each target letter and subsequently identify the associated letter sound. The same procedures were followed in the other language. Aware that certain letters represent more than one phoneme in Spanish (i.e. the letter C sounds like /s/ in *cerdo* or /k/ in *carro*; the letter G sounds like /x/ in *gira* or /g/ in *grande*), we accepted either letter sound as a correct response in the letter-sound task. Children's responses were scored as incorrect or correct (i.e. 0 or 1) for both measures.

Print and word awareness

The PWA subtests were administered in Spanish and Maya. Children were presented with a short, narrative text following the story of *Tito, Tito Colorito* in Spanish (Ford and Invernizzi 2009) and an adapted version of the story in Maya titled *Mukuy, Mukuy*, designed and back translated with the help of a Maya–Spanish bilingual research assistant. Several tasks examining PWA were embedded throughout the storybook read aloud by the examiner. The examiner provided instructions for four items relating to print awareness (e.g. 'Follow the text with your finger from left to right'; 'Find the letter *A*.') and six items relating to word awareness (e.g. 'Point to the each word in the title'; 'Point out the word *colorito*'). The word awareness subtest assesses the following skills: (1) identifying words in a title of a story; (2) identifying words embedded the context of a story; (3) pointing word-by-word; (4) identifying two identical words; (5) differentiating long and short words; and 6) identifying a space between words. The print awareness subtest assesses the following: (1) identifying the title of a book; (2) recognizing print directionality; (3) differentiating print versus pictures; and (4) identifying letters. Each item was scored as 0 for incorrect and 1 for correct.

Name writing

The examiner requested that children draw a self-portrait and write their name on a sheet of paper on the name-writing task. Scores were given based on a continuum of 0–8, which ranges from an unconventional representation (e.g. using scribbles) that combines both their written name and self-portrait to a conventional representation in which their name is written using conventional forms with no backwards letters and a picture that appears separately.

Results

Descriptive statistics of children's raw scores for the study measures are displayed in Table 2. An inferential analysis of the data indicates that there were individual differences among the children, and that at least modest levels of print knowledge in both languages were exhibited among this sample. Our analysis revealed that children showed better performance in Spanish than Maya for indices of PWA ($t = 3.56$, $p = .001$), letter-name knowledge ($t = 4.09$, $p < .001$), and letter-sound knowledge ($t = 4.15$, $p < .001$).

Children also showed an emerging knowledge of written representations of their own names as demonstrated on the name-writing task. That is, children's name writing generally consisted of random letters and symbols. Individual scores on this task ranged from 1 to 6 ($M = 2.99$, SD = 1.15), with approximately 30% of the sample being able to correctly write some of the letters associated with their name.

On average, children identified approximately 10% of letter names of the Spanish alphabet whereas they identified 3% of letter names in Maya on the letter-naming task. Individual scores ranged from 0 to 24 ($M = 2.85$, SD = 3.69) and 0–9 ($M = 1.37$, SD = 2.08) in the Spanish- and Maya-language tasks, respectively. Similarly, children named 10% of letter sounds for Spanish and 3% of letter sounds in Maya. Their scores ranged from 0 to 25 ($M = 3.81$, SD = 3.81) and 0–10 ($M = 2.11$, SD = 2.11), respectively. Unlike their performance on the letter-name and letter-sound tasks in Maya for which they demonstrated an emerging knowledge, their performance on the Spanish letter-name and letter-sound tasks showed more variation. Notably, few children obtained a percentage correct of greater than 50% on these tasks, demonstrating high levels of skill, which was more widely seen on the Spanish measures. Most children performed with low levels of skill (i.e. percentage correct of fewer than 10%).

As a whole, children's performance on the PWA tasks appeared relatively comparable in both languages, responding correctly to 25% and 32% of total items on average during the Maya and Spanish language tasks, respectively. As noted in Table 2, their scores ranged from 0 to 7 ($M = 2.51$, SD = 1.34) in the Maya language task and 0–8 ($M = 3.18$, SD = 1.74) in the Spanish language task. In other words, their accuracy on these tasks ranged from 0% to 70% (SD = 13%) on the Maya task and 0% to 80% (SD = 17%) on the Spanish task. Even though children demonstrated a slightly better understanding on the Spanish PWA task, they tended to have similar levels of PWA in Maya, with less variation around the mean score on the Maya PWA task.

Table 3 details the children's accuracy on individual items relating to print awareness (i.e. knowledge of print concepts) and word awareness tasks administered in Maya and Spanish. Inferential

Table 2. Descriptive data for main study measures.

	Print and word awareness		Letter-name knowledge		Letter-sound knowledge		Name writing
	Spanish	Maya	Spanish	Maya	Spanish	Maya	
Points possible	10	10	29	44	29	44	7
M	3.18	2.51	2.85	1.37	2.83	1.42	2.99
SD	1.74	1.34	3.69	2.08	3.81	2.11	1.15
Range	0–8	0–7	0–24	0–9	0–25	0–10	1–6
Mode	4	2	2	0	0	0	3

Table 3. Percentage of children knowing 10 print and word concepts.

Items	Maya	Spanish
Word awareness		
1. Identify each word in title	24	48
2. Identify words in story context	28	26
3. Word-by-word pointing	20	16
4. Identify two identical words	35	35
5. Differentiate long and short words	28	39
6. Identify space between words	13	15
Print awareness		
1. Title of book	15	22
2. Print directionality	17	39
3. Print versus pictures	26	16
4. Letters	10	10

statistical analyses of children's performance suggest that a modest proportion of children showed an emerging knowledge of speech–print relationships as they identified broader linguistic units. More specifically, participants were generally able to discriminate single distinct units of meaning across both languages, with more than 25% of children locating the title, discriminating between separate words in a title, differentiating between short and long words, and finding words that looks similar. However, when asked to identify words individually as the words were read aloud in the context of the story by the examiner, there were slightly fewer correct respondents on this task. Children were less likely to respond correctly when identifying individual letters and spaces in between words, with approximately 10–15% of children answering correctly on these tasks in both languages.

Results also demonstrated that these preschoolers' accuracy on tasks relating to concepts of print varied by task and language. Generally speaking, slightly more than 20% of children were able to correctly answer to questions relating to the locations of the book title and where one begins to read in one of their two languages. Notably, nearly 40% of children knew the direction in which text is read in Spanish, whereas only 17.2% of children responded correctly to the same instructions delivered in Maya.

Correlations between Maya and Spanish skills

To address the second research question about the inter-relationships between languages, bivariate Pearson correlations among all print-knowledge measures shown in Table 4 were used. Several important observations were obtained. Maya letter-name knowledge was significantly correlated with Spanish letter-name knowledge, Spanish letter-sound knowledge, and Spanish PWA ($r = .46$, $r = .47$, $r = .30$, respectively; all $ps < 0.01$). Similarly, Maya letter-sound knowledge showed a strong, positive cross-language relationship with measures of Spanish letter-name and letter-sound knowledge ($r = .56$, $r = .57$, respectively; all $ps < 0.05$) as well as a moderate, positive relationship with PWA in Spanish ($r = .30$, $p < .01$). Additionally, PWA in Maya showed a weak, positive cross-language relationship with Spanish letter-name and letter-sound knowledge ($r = .24$, $r = .24$, respectively; all $ps < 0.05$), but there was a strong positive relationship with Spanish PWA ($r = .40$, $p < 0.01$).

Table 4. Bivariate correlations among print knowledge measures.

Measures	1	2	3	4	5	6	7
1. Maya letter-name knowledge	–						
2. Maya letter-sound knowledge	.93**	–					
3. Maya print word awareness	.36**	.31**	–				
4. Spanish letter-name knowledge	.46**	.56**	.24*	–			
5. Spanish letter-sound knowledge	.47**	.57**	.24*	.97**	–		
6. Spanish print word awareness	.30**	0.30	.40**	.42**	.44**	–	
7. Name writing	0.20	0.17	.22*	.32**	.30**	0.30	–

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

Discussion

The research questions called for an examination of the emergent literacy skills of three- to five-year-old Indigenous, emergent bilingual children in a rural community in the state of Yucatán in Mexico. This investigation provides initial insights into how bilingual preschool-age children, particularly those who are under-served and under-researched, may respond to tasks assessing print-related skills in their two languages. This research helps to advance our understandings of emergent bilingual children's developing print knowledge across their two languages prior to encountering wider print-related experiences, adding support to the premise that aspects of print knowledge may be language-independent and cognitive universals for reading development.

Development of print knowledge among indigenous, bilingual learners

As demonstrated in this study, the emergent bilingual children exhibited individual differences across the various dimensions of print knowledge and between their two languages, revealed by their varying levels of performance on the various print-related tasks (i.e. letter name and sound knowledge; PWA) within their two languages. More specifically, the children demonstrated significantly higher levels of skill in all indices of print knowledge during the Spanish- over the Maya-language tasks at these very early stages of formal instruction. The unevenness in performance between their two languages perhaps uncovers critical aspects of their language and literacy-learning experiences. Furthermore, as noted by our observations of print in the school and the surrounding community, children's knowledge of print may also reflect the disproportionate exposure to Spanish versus Maya print resources in school and out-of-school contexts (also cited in Pfeiler 1998). Although the majority of children come from a home where Maya is predominantly used (Instituto Nacional de Estadística y Geografía 2010), participants' greater knowledge in Spanish may be indicative of the extent to which instruction was centered on supporting Spanish language development (Azuara and Reyes 2011; Despagne 2013; Hamel 2001), with less support for Maya. An additional supposition may be that although both Spanish and Maya follow the alphabetic principle and are fairly transparent languages, children may require greater phonemic sensitivity in order to differentiate between a greater number of vowels (i.e. long vowels; long vowels with ascending tone; and glottalized/rearticulated vowels) and consonants (i.e. glottalized consonants), thereby representing a less consistent orthography and more phonemes to learn in Maya (see Pollard-Durodola and Simmons 2009).

Through this initial examination in an Indigenous community, our findings offer support to the assumption that dimensions of print knowledge are cognitive universals (Bialystok and Luk 2007). A point substantiated by our results is that these children – living in a community where oral interaction is the prevailing means of communication, learning, and cultural and historical revitalization – were able to make certain metalinguistic judgments regarding the discrete nature of written language by identifying the forms in and functions of print. This was shown by the emergence of children's print knowledge, which developed well in advance of conventional reading in their two languages even when those experiences were constrained by the quantity and quality of print sources in their environment. This outcome lends further support to the notion that aspects relating to print may thus be similarly rooted in the general cognitive mechanisms found across monolingual and multilingual learners alike. As shown in this study, emergent bilingual children more readily developed certain language-independent, cognitive mechanisms that underlie both their languages. In particular, their metalinguistic insights about print as exhibited on multiple items found on the PWA measure varied across their languages. In contrast, they showed better performance on measures of alphabet knowledge (i.e. letter names and sounds) in Spanish. With this in mind, the uniform disproportion in children's alphabet knowledge may denote the language-dependent ways children acquire orthographic information. As described by Katz and Frost (1992), language learners require specialized knowledge about the orthography of a language based on how the script (i.e. the written forms) relates to the structure of that language. As such, this research adds to a growing

body of literature on how young children's emergent literacy systematically takes shape with learners of one or more languages (Bialystok, McBridge-Chang, and Luk 2005; Buckwalter and Yi-Hsuan 2002; Goswami, Porpodas, Wheelwright 1997; Leong and Joshi 1997; Wimmer and Goswami 1994), particularly broadening our knowledge of bilingual learners who are learning an Indigenous language concurrently with a majority language.

Cross-language relationships of print knowledge

Although children's performance on the print knowledge measures was significantly different in their two languages, our correlational analyses provide preliminary understandings of the cross-language relationships concerning print knowledge. The findings suggest that print-related skills in both Maya and Spanish are related for emergent bilingual learners in this community and provide an initial look into how the same (e.g. letter-name knowledge in Maya and Spanish) and construct-related skills (e.g. letter-name knowledge in Maya and print word awareness in Spanish) may concurrently develop in interrelated ways across languages. Thus, the findings in this study reveal important aspects of emergent bilingual children's acquisition of precursor literacy skills. As showcased by the emergent bilinguals in this study, their developing print knowledge, namely alphabet knowledge, concepts of print, and name writing, emerged in spite of the restricted opportunities to explore print throughout their daily lives. Given the relatively fewer print sources found in classrooms with the Indigenous, bilingual population under investigation, our results suggest that these children demonstrated early yet substantial understandings about the nature of print, possibly a result of their collected experiences with print that traverse the home, school, and community contexts. As indicated in several studies, children who encounter print from a variety of sources and contexts use those experiences to autonomously hypothesize about the functions of print (Clay 1972; Goodman 1986). The findings of this exploratory study provide initial evidence that children may engage in autonomous, incremental learning of written language while living in a community with restricted print sources.

Although this study provides a preliminary, cross-sectional view of children's print knowledge living in a rural, Indigenous community, we observed patterns in their overall development that correspond to previous research with non-Indigenous, monolingual children in urban settings (Hiebert 1981; Justice and Ezell 2001; Lomax and McGee 1987; Sulzby and Teale 1985; Weaver 1988), suggesting that their print knowledge may follow a gradual progression with certain aspects mastered in advance of others. For instance, we noted that the Indigenous, emergent bilingual children in this study demonstrated greater skill in discriminating broader features of print (e.g. locating the title, differentiating between big words) rather than discerning finer features of print (e.g. identifying letters and spaces between words), which is in alignment with existing studies conducted with monolingual children in urban settings (Badian 2000; Justice and Ezell 2001). The findings in this study showcase how even with relatively fewer opportunities to engage with print, the emergent bilingual children in this study followed a similar progression in their print-knowledge while acquiring interrelated, modest levels of knowledge in both languages.

Currently, there is a dearth of research on how emergent literacy advances among bilingual populations, particularly for those whose home language may differ from the predominating language used in school. However, there is an expanding literature demonstrating children's early experiences in one language can affect the course of reading development in a second language (Dickinson et al. 2004; Ziegler et al. 2010). As such, this study uniquely adds to the literature by pointing to issues of cultural and linguistic revitalization with Indigenous, bilingual populations, providing insights into how to more effectively implement bilingual education in Indigenous communities. More specifically, this research informs researchers on the ways literacy skills similarly develop in bilingual learners' languages, which may coexist but carry out different functions as a result of societal dynamics (i.e. referred to as functional diglossia; Hidalgo 2006).

Limitations and future directions

Whereas this study provides a base for future research in print knowledge with Indigenous, emergent bilingual children, there are several limitations to this study. It is important to note that the Maya community described in this research has generally relied on oral-based information literacy and are emerging as a reading culture. With this in mind, there is an expectation that the bilingual population under investigation would have fewer print-related experiences, especially for those living in a culture whose written system is relatively new and was imposed by a non-native group. This work therefore may not wholly reflect the competencies relating to literacy of children living in a community wherein oral communication is privileged above written language in out-of-school contexts.

Given the under-researched context of this investigation, the measures in this study may require further revision. Previous rules and conventions around Maya have been proposed and orthographic variations persist within Maya-speaking communities (Brody 2004). With new rules and conventions of written Maya that may potentially inform future decisions of bilingual language use in Yucatán schools (Instituto Nacional de Lenguas Indígenas 2014), it is also still uncertain whether these standards will take hold. As such, future studies should consider including older variant graphs, not used in this study, to examine children's print knowledge as they are recognized by many Maya-language users (Brody 2004). Additionally, the measures in this study were not empirically scrutinized in terms of their psychometric quality. That is, future studies should consider the predictive and concurrent validity of measures of print knowledge with other measures of emergent literacy with this population. As such, children's performance should be perceived as informal indices of their skills and viewed in the context of this very unique linguistic and cultural environment rather than comparing these results to the performance levels of non-Indigenous, monolingual populations.

An additional limitation is that our work did not investigate the role that instruction had on children's print-knowledge acquisition. Rather, the findings in this initial inquiry mainly aimed to represent the knowledge differentials and relationships between two languages in order to inform our initial understandings of children's knowledge across various dimensions of print, with the potential to depict children's uneven exposure to print. Thus, it would be helpful to further investigate the nature of instruction in these classrooms, perhaps using qualitative methods that may reveal the nuances of classroom practices supporting print-knowledge development (see Guerrettaz 2013, 2015 for ethnographic studies on Yucatec Maya language revitalization pedagogy). It is thus important to note that future research around children's acquisition of print knowledge should be represented more holistically and should account for the distributive nature of bilingual children's knowledge across their languages rather than within separate, binary entities.

To conclude, the findings in the present study have practical implications for developing print knowledge with bilingual children, particularly those reared in Indigenous communities. Typically, Indigenous children are expected to forego the use of their home language as they advance through their formal instruction, in part due to the limited resources in their Indigenous language. Notwithstanding the limited opportunities for exposure to and use of print in an Indigenous language, they may begin to exhibit comparable levels of print knowledge in both languages when their Indigenous language serves greater and differentiated written language functions. Through the provision of print resources in both languages, Indigenous, emergent bilingual children may be afforded wider opportunities to learn the different language-specific skills that may be needed even when learning to read, especially in two closely related written systems. As a result, these print-rich experiences may provide windows of opportunity to build on the shared phonological and orthographic mechanisms of children's two languages and to develop precursor skills that are universal to reading.

Notes

1. The terms *Yucatec Maya* and *Maya* are used interchangeably to describe the Indigenous language widely spoken in the state of Yucatán, Mexico. As such, the term *Maya* will be used hereafter.

2. *Indigenous* is capitalized as it refers to a people (e.g. Indians of the Americas) and legitimizes a cultural group and their minoritized languages (Greymorning 2010).

3. The digraphs (ch) and (ll), indicating the consonantal sounds as /tʃ, ʃ/ and /ʎ/, respectively, for many Spanish speakers are considered a part of the alphabet, although larger organizations promoting linguistic unity, such as the Real Academia Española, have ruled them out and instead alphabetized them under *C* and *L*.

Acknowledgements

Disclosure statement

Funding

ORCID

Alain Bengochea 🔟 http://orcid.org/0000-0002-4602-3676

References

Adams, M. J. 1990. *Beginning to Read: Thinking and Learning About Print*. Cambridge, MA: MIT Press.

Azuara, P., and I. Reyes. 2011. "Negotiating Worlds: A Young Mayan Child Developing Literacy at Home and at School in Mexico." *Compare: A Journal of Comparative and International Education* 41 (2): 181–194. doi:10.1080/03057925.2011.547283

Badian, N. A. 2000. "Do Preschool Orthographic Skills Contribute to Prevention of Reading?" In *Prediction and Prevention of Reading Failure*, edited by N. Badian, 31–56. Timonium, MD: York Press.

Barrera Vásquez, A. 1980. *Diccionario Maya Cordemex* [Maya Dictionary Cordemex]. Mérida, MX: Ediciones Cordemex.

Bastarrachea Manzano, J. R., and J. Canto Rosado. 2003. *Diccionario Maya Popular* [Popular Maya Dictionary]. Mérida, MX: Academia de la Lengua Maya.

Bertely Busquets, M., and E. Gonzalez Apodaca. 2003. "Etnicidad en la escuela" [Ethnicity in the School]. In *Educación, derechos sociales y equidad*, edited by M. Bertely Busquets, 57–83. Mexico City: Secretaría de Educación Pública.

Bialystok, E. 1997. "Effects of Bilingualism and Biliteracy on Children's Emerging Concepts of Print." *Developmental Psychology* 33 (3): 429–440. doi:10.1037//0012-1649.33.3.429

Bialystok, E., and G. Luk. 2007. "The Universality of Symbolic Representation for Reading in Asian and Alphabetic Languages." *Bilingualism: Language and Cognition* 10 (2): 121–129. doi:10.1017/s136672890700288x

Bialystok, E., C. McBridge-Chang, and G. Luk. 2005. "Bilingualism, Language Proficiency and Learning to Read in Two Writing Systems." *Journal of Educational Psychology* 97: 580–590. doi:10.1037/0022-0663.97.4.580

Brambila-Rojo, O. F. 2004. "Las actitudes sociolingüísticas y la enseñanza de lenguas indígenas; un estudio de caso" [The sociolinguistic attitudes and instruction of indigenous languages.] *Sintagma* 4: 24–37.

Bricker, V., E. Po'ot Yah, and O. Dzul de Po'ot. 1998. *A Dictionary of the Maya Language as Spoken in Hocabá, Yucatán*. Salt Lake City: University of Utah Press.

Brody, M. 2004. "The Fixed Word, the Moving Tongue: Variation in Written Yucatec Maya and the Meandering Evolution Toward Unified Norms." PhD diss., University of Texas at Austin.

Buckwalter, J. K., and G. L. Yi-Hsuan. 2002. "Emergent Literacy in Chinese and English." *Journal of Second Language Writing* 11: 269–293. doi:10.1016/s10603743(02)00088-7

Cabell, S. Q., L. M. Justice, T. A. Zucker, and A. S. McGinty. 2009. "Emergent Name- Writing Abilities of Preschool-Age Children with Language Impairment." *Language Speech & Hearing Services in Schools* 40 (1): 53–66. doi:10.1044/0161-1461(2008/07-0052)

Chaney, C. 1992. "Language Development, Metalinguistic Skills, and Print Awareness in 3-Year-Old Children." *Applied Psycholinguistics* 13: 485–514. doi:10.1017/s0142716400005774

Cisero, C. A., and J. M. Royer. 1995. "The Development and Cross-Language Transfer of Phonological Awareness." *Contemporary Educational Psychology* 20: 275–303. doi:10.5353/th_b3688930

Clay, M. M. 1972. *Reading: The Patterning of Complex Behavior*. Auckland: Heinemann Educational.

Clay, M. M. 1979. *Concepts About Print Tests: Sand and Stones*. Portsmouth, NH: Heinemann.

Coronado Suzán, G. 1992. "Educación bilingüe en México: Propósitos y realidades" [Bilingual Education in Mexico: Purposes and Realities]. *International Journal of the Sociology of Language* 96 (1): 53–70. doi:10.1515/ijsl.1992.96.53

Cummins, J. 1981. *Schooling and Language Minority Students: A Theoretical Framework*. Los Angeles, CA: Department of Evaluation, Dissemination and Assessment Center.

Despagne, C. 2013. "Indigenous Education in Mexico: Indigenous Students' Voices." *Diaspora, Indigenous, and Minority Education* 7: 114–129. doi:10.1080/15595692.2013.763789

Dickinson, D. K., A. McCabe, N. Clark-Chiarelli, and A. Wolf. 2004. "Cross-Language Transfer of Phonological Awareness in Low-Income Spanish and English Bilingual Preschool Children." *Applied Psycholinguistics* 25: 323–347. doi:10.1017/s0142716404001158

Durgunoglu, A. Y., W. E. Nagy, and B. J. Hancin–Bhatt. 1993. "Cross-Language Transfer of Phonological Awareness." *Journal of Educational Psychology* 85: 453–465. doi:10.1037//0022-0663.85.3.453

Ellis, N. C., M. Natsume, K. Stavropoulou, L. Hoxhallari, V. H. P. Van Daal, N. Polyzoe, and M. Tsipa. 2004. "The Effects of Orthographic Depth on Learning to Read Alphabetic, Syllabic, and Logographic Scripts." *Reading Research Quarterly* 9 (4): 438–468. doi:10.1598/rrq.39.4.5

Faudree, P. 2013. *Singing for the Dead: The Politics of Indigenous Revival in Mexico*. Durham, NC: Duke University Press.

Ferreiro, E., and A. Teberosky. 1982. *Literacy Before Schooling*. Portsmouth, NH: Heinemann.

Fierro Evans, M. C., and F. Rojo Pons. 2012. "An Intercultural Education for Mexico: Career and Contributions of Sylvia Schmelkes." *Curriculum Inquiry* 42 (1): 103–125. doi:10.1111/j.1467-873x.2011.00577.x

Fitzgerald, J. 1995. "English-as-a-Second-Language Learners' Cognitive Reading Processes: A Review of Research in the United States." *Review of Educational Research* 65: 145–190. doi:10.3102/00346543065002145

Ford, K., and M. Invernizzi. 2009. *Phonological Awareness Literacy Screening in Spanish (Español): Kindergarten*. Charlottesville: University of Virginia.

García, O., J. A., Kleifgen, and L. Falchi. 2008. *Equity in the Education of Emergent Bilinguals: The Case of English Language Learners*. New York: Teachers College.

Goodman, Y. M. 1986. "Children Coming to Know Literacy." In *Emergent literacy: Writing and Reading*, edited by W. H. Teale and E. Sulzby, 1–14. Norwood, NJ: Ablex.

Goswami, U., C. Porpodas, and S. Wheelwright. 1997. "Children's Orthographic Representations in English and Greek." *European Journal of Psychology of Education* 12 (3): 273–292. doi:10.1007/bf03172876

Greymorning, S. N. 2010. "New Languages of the State: Indigenous Resurgence and the Politics of Knowledge in Bolivia. Review of New Languages of the State: Indigenous Resurgence and the Politics of Knowledge in Bolivia, by Bret Gustafson." *Contemporary Sociology* 39 (4): 451–452. doi:10.1111/j.1469-8676.2010.00133_7.x

Guerrettaz, A. M. 2013. "Yucatec Maya Teacher Education and the Struggle for a Standard Language." PhD diss., Indiana University.

Guerrettaz, A. M. 2015. "Ownership of Language in Yucatec Maya Revitalization Pedagogy." *Anthropology & Education Quarterly* 46 (2): 167–185. doi:10.1111/aeq.12097

Hamel, R. E. 2001. "Políticas del lenguaje y educación indígena en México. Orientaciones culturales y estrategias pedagógicas en una época de globalización." In *Políticas lingüísticas: Norma e identidad*, edited by R. Bein and J. Born, 143–170. Buenos Aires: Universidad de Buenos Aires.

Hamel, R. E. 2008. "Indigenous Language Policy and Education in Mexico." In *Encyclopedia of Language and Education*, edited by S. May and N. Hornberger, 301–313. New York: Springer.

Hiebert, E. H. 1981. "Developmental Patterns and Interrelationships of Preschool Children's Print Awareness." *Reading Research Quarterly* 16: 236–260. doi:10.2307/747558

Hidalgo, M. 2006. *Mexican Indigenous Languages at the Dawn of the Twenty-First Century*. New York: Mouton de Gruyter.

Instituto Nacional de Estadística y Geografía. 2010. *Censo de Población y Vivienda 2010, Yucatán*. Mexico City: Instituto Nacional de Estadística y Geografía.

Instituto Nacional de Lenguas Indígenas. 2014. *Normas de escritura para la lengua maya* [Writing Norms for the Maya Language]. Mexico City: Instituto Nacional de Lenguas Indígenas.

Justice, L. M., and H. K. Ezell. 2001. "Written Language Awareness in Preschool Children from Low-Income Households: A Descriptive Analysis." *Communication Disorders Quarterly* 22: 123–134. doi:10.1177/152574010102200302

Justice, L. M., J. N. Kaderavek, X. Fan, A. Sofka, and A. Hunt. 2009. "Accelerating Preschoolers' Early Literacy Development Through Classroom-Based Teacher-Child Storybook Reading and Explicit Print Referencing." *Language, Speech, and Hearing Services in Schools* 40: 67–85. doi:10.1044/0161-1461(2008/07-0098)

Kabuto, B. 2011. *Becoming Biliterate: Identity, Ideology, and Learning to Read and Write in Two Languages*. New York: Routledge.

Katz, L., and R. Frost. 1992. *Orthography, Phonology, Morphology, and Meaning*. Amsterdam: Elsevier North Holland Press.

Leong, C. K., and M. R. Joshi. 1997. *Cross-Language Studies of Learning to Read and Spell: Phonologic and Orthographic Processing*. Dordrecht: Kluwer Academic Publishers.

Ley General de Derechos Lingüísticos de los Pueblos Indígenas [General Law on Linguistic Rights of Indigenous Peoples]. 2003. *Nueva Ley DOF 13–03–2003. Estados Unidos Mexicanos*. Mexico City: Diario Oficial de la Federación.

Lomax, R. G., and L. M. McGee. 1987. "Young Children's Concepts About Print and Reading: Toward a Model of Word Reading Acquisition." *Reading Research Quarterly* 22: 237–256. doi:10.2307/747667

Lonigan, C. J., S. R. Burgess, and J. L. Anthony. 2000. "Development of Emergent Literacy and Early Reading Skills in Preschool Children: Evidence from a Latent-Variable Longitudinal Study." *Developmental Psychology* 36: 596–613. doi:10.1037/0012-1649.36.5.596

McBride-Chang, C., and R. Treiman. 2003. "Hong Kong Chinese Kindergartners Learn to Read English analytically." *Psychological Science* 14: 138–143. doi:10.1111/1467-9280.t01-1-01432

McGinty, A. S., and L. M. Justice. 2009. "Predictors of Print Knowledge in Children With Specific Language Impairment: Experiential and Developmental Factors." *Journal of Speech, Language, and Hearing Research* 52 (1): 81–97. doi:10.1044/1092-4388(2008/07-0279)

National Early Literacy Panel. 2009. *Developing Early Literacy: Report of the National Early Literacy Panel*. Jessup, MD: National Institute for Literacy.

Neuman, S. B., and D. Celano. 2001. "Access to Print in Low-Income and Middle-Income Communities: An Ecological Study of Four Neighborhoods." *Reading Research Quarterly* 36 (1): 8–26. doi:10.1598/rrq.36.1.1

Neuman, S. B., and K. Roskos. 1993. "Access to Print for Children of Poverty: Differential Effects of Adult Mediation and Literacy-Enriched Play Settings on Environmentaland Functional Print Tasks." *American Educational Researcher* 30 (1): 95–122. doi:10.3102/00028312030001095.

Pellicer Ugalde, A. 1997. *La construcción de la escritura por parte de niños maya hablantes*: El caso específico de la representación de las consonants glotalizadas [The Construction of Writing by Maya-speaking Children: The Specific Case of the Representation of Glottalized Consonants]. Ph.D. diss., Instituto Politécnico Nacional.

Perfetti, C. A. 2003. "The Universal Grammar of Reading." *Scientific Studies of Reading* 7 (1): 3–24. doi:10.1207/s1532799xssr0701_02.

Petrill, S. A., K. Deater-Deckard, C. Schatschneider, and C. Davis. 2005. "Measured Environmental Influences on Early Reading: Evidence from an Adoption Study." *Scientific Studies of Reading* 9 (93): 237–259. doi:10.1207/s1532799xssr0903_4

Pfeiler, B. 1998. "Yucatán: El uso de dos lenguas en contacto [The Use of Two Languages in Contact]." *Estudios de Cultura Maya* 17: 423–445.

Piasta, S. B., L. M. Justice, A. S. McGinty, and J. N. Kaderavek. 2012. "Increasing Young Children's Contact with Print During Shared Reading: Longitudinal Effects on Literacy Achievement." *Child Development* 83 (3): 810–820. doi:10.1111/j.1467-8624.2012.01754.x

Pollard-Durodola, S. D., and D. C. Simmons. 2009. "The Role of Explicit Instruction and Instructional Design in Promoting Phonemic Awareness Development and Transfer from Spanish to English." *Reading and Writing Quarterly* 25: 139–161. doi:10.1080/10573560802683531

Restall, M. 1997. *The Maya World: Yucatec Culture and Society, 1550–1850*. Stanford, CA: Stanford University Press.

Rowe, D. 2008. "Social Contracts for Writing: Negotiating Shared Understandings About Text in the Preschool Years." *Reading Research Quarterly* 43: 66–95. doi:10.1598/rrq.43.1.5

Scanlon, A. P., and J. Lezama-Morfín. 1982. *México pluricultural: De la castellanización a la educación indígena bilingüe bicultural* [Pluricultural Mexico: From the Castillianization to Biclrual Bilingual Indigenous Education]. Mexico City: Secretaría de Educación Pública.

Sénéchal, M., J. LeFevre, E. M. Thomas, and K. E. Daley. 1998. "Differential Effects of Home Literacy Experiences on the Development of Oral and Written Language." *Reading Research Quarterly* 33: 96–116. doi:10.1598/rrq.33.1.5

Snow, C. E., and A. Ninio. 1986. "The Contracts of Literacy: What Children Learn from Learning to Read Books." In *Emergent Literacy: Writing and Reading*, edited by W. H. Teale and E. Sulzby, 116–138. Norwood, NJ: Ablex Publishing Corporation.

Storch, S. A., and G. J. Whitehurst. 2002. "Oral Language and Code-Related Precursors to Reading: Evidence from a Longitudinal Structural Model." *Developmental Psychology* 38 (6): 934–947. doi:10.1037//0012-1649.38.6.934

Sulzby, E., and W. H. Teale. 1985. "Writing Development in Early Childhood." *Educational Horizons* 64: 8–12.

Verhoeven, L., and R. Aarts. 1998. "Attaining Functional Biliteracy in the Netherlands." In *Literacy Development in a Multilingual Context: Cross-Cultural Perspectives*, edited by A. Durgunoglu and L. Verhoeven, 37–50. Mahwah: Lawrence Erlbaum.

Weaver, C. 1988. *Reading Process and Practice: From Socio-Psycholinguistics to Whole Language*. Portsmouth, NH: Heinemann.

Whitehurst, G. J., and C. J. Lonigan. 1998. "Child Development and Emergent Literacy." *Child Development* 69 (3): 848–872. doi:10.2307/1132208.

Wimmer, H., and U. Goswam. 1994. "The Influence of Orthographic Consistency on Reading Development: Word Recognition in English and German Children." *Cognition* 51: 91–103. doi:10.1016/0010-0277(94)90010-8.

Ziegler, J. C., D. Bertrand, D. Toth, V. Csepe, A. Reis, L. Faisca, N. Saine, H. Lyytinen, A. Vaessen, and L. Blomert. 2010. "Orthographic Depth and its Impact on Universal Predictors of Reading: A Cross-Language Investigation." *Psychological Science* 21 (4): 551–559. doi:10.1177/0956797610363406