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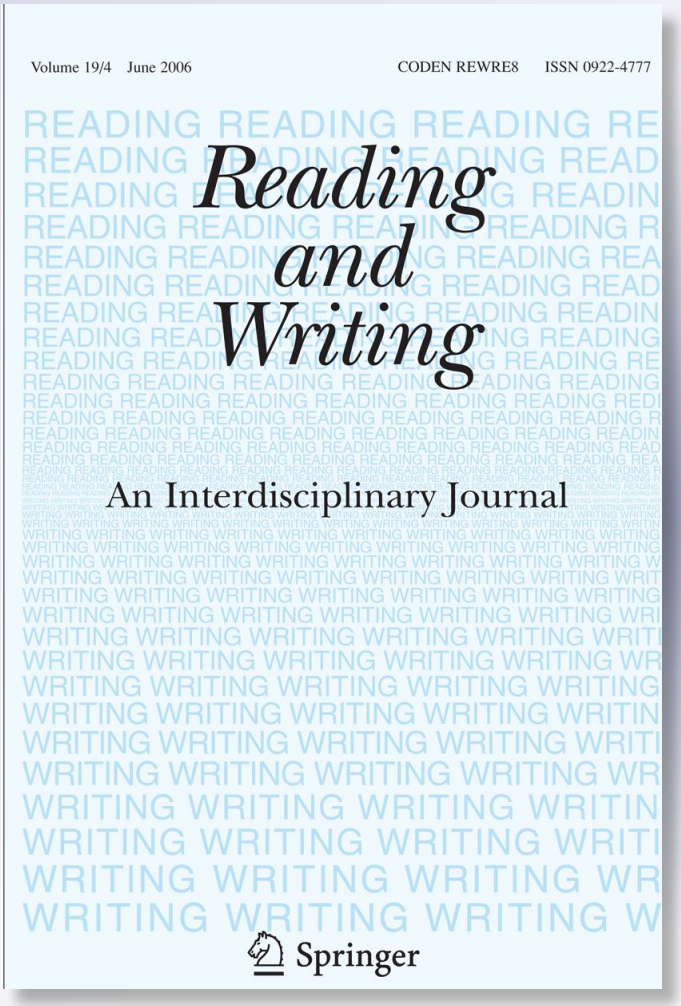
Reading and Writing
An Interdisciplinary Journal

ISSN 0922-4777

Read Writ
DOI 10.1007/s11145-012-9380-9



Springer

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Vowel representations in the invented spellings of Spanish–English bilingual kindergartners

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Abstract The study compared the invented spelling of vowels in kindergarten native Spanish speaking children with that of English monolinguals. It examined whether, after receiving phonics instruction for short vowels, the spelling of native Spanish-speaking kindergartners would contain phonological errors that were influenced by their first language. Results showed no differences between the two groups on the number of correct short vowel spellings, even though the sounds for four of the five English short vowels do not exist in Spanish. By contrast, differences were observed in the representation of long vowels with a higher rate of error among ELLs. The students had not received explicit instruction in long vowels. ELLs appeared to be trying to represent the diphthongized nature of some English long vowels by spelling long vowels with more than one vowel. The results support the authors' hypothesis that kindergarten phonics instruction had an impact on the invented spellings of new second language vowel phonemes.

Keywords Bilingual · English language instruction · Invented spelling · Spanish language

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Published online: 16 May 2012

Introduction

Reading and writing are arguably the most important skills children acquire in the early primary grades. These skills often develop at the same time, each being founded on the knowledge of letters and sounds. Instruction in spelling has been linked to improvement in reading (Ehri, 2000). "Spelling and reading build and rely on the same mental representation of a word. Knowing the spelling of a word makes the representation of it sturdy and accessible for fluent reading" (Moats, 2005/2006, p. 12).

Children who speak another language at home and attend elementary school where English is the language of instruction face many challenges. In order to learn to read and write in English, not only must young children learn the English alphabet, they must also acquire new phonemes in oral English that do not exist in their native language. Learning to read and spell requires that children map phonological representations onto printed words. Children may easily acquire L2 letter-sound correspondences for which they already have L1 phonological representations. Differences at the phonological level between a child's L1 and L2 may consequences for learning to spell in a L2 (Wang & Geva, 2003). For example, when trying to spell the word VOTE, where /v/ is a non-Spanish phoneme, native Spanish-speaking children may represent what they hear as BOT. Invented spelling is often used as an early literacy assessment tool in kindergarten and first grade, and has been shown to be an important window into the child's knowledge of phonemic awareness as well (e.g., Richgels, 2001; Gentry, 2000). Because of the differences in the way bilingual children process phonological information, the early spelling development of children learning English as their second language may differ from that of monolingual children. If teachers do not understand these differences, the "errors" in bilingual children's spelling may be misinterpreted as a weakness in letter-sound knowledge and phonemic awareness causing the literacy abilities of these children to be underestimated. While the development of spelling skill in English-speakers has been well documented, additional research in the spelling development of children acquiring English as a new language is an area needing additional research (Yeong & Rickard Liow, 2010). The purpose of this study is to compare the representation of English vowels in the invented spelling of Spanish-English bilingual kindergarteners with that of their monolingual English-speaking peers.

The following is a survey of the research on the invented or sound-to-print spelling of Spanish–English bilingual kindergarteners. The phonological and phonetic differences between Spanish and English and the possible difficulties in early spelling that result from these differences will be reviewed in the context of positive and negative transfer of language knowledge. The role of explicit instruction as well as language of instruction on invented spelling will also be examined.

Invented spelling, the subject of this investigation, requires children to match perceived phonemes in words with letter names or letter sounds that are familiar to them. To be able to do this necessitates certain prerequisites: knowledge of the alphabetic principle, letter identification, letter-sound correspondence, and a specific

phonemic awareness ability, that is to be able to segment whole words into individual phonemes (Uhry, 1999). As children begin to spell, they often say the word to themselves as they work to segment the word into phonemes. Ehri (1984, 1993) documented the way that children stretch out the sounds of a word, and how they used auditory rehearsals of word parts during their search for letter-sound matches to the parts of the word that they heard. This puts stress on the phonological system. Goswami states, "any inadequacies in the phonological representations required for these tasks will have deleterious effects on performance" (Goswami, 2000, p. 136).

Oral language and spelling abilities are both built on the child's phonological knowledge of a language. This phonological knowledge consists of both phonological awareness and phonological representations. There is evidence to suggest that bilinguals process language through both phonological systems, even when receiving input in only one of those languages (Jared & Kroll, 2001; Kim, Relkin, Lee, & Hirsch, 1997; Marian, Spivey, & Hirsch, 2003). The processing of phonological information through both languages may affect their alphabetic representations of L2 phonemes.

During invented spelling, the interaction between the two phonological systems employed by bilingual children may influence what phonemes they perceive and therefore how they represent these phonemes with letters in sound-to-print spelling. Because the children's phonological categories have already been partially developed in the first language, the phonological representation of novel L2 phonemes may be less well developed than those in their native language (Chiappe, Glaeser, & Ferko, 2007; Raynolds, 2007), and spelling these non-native contrasts may be more difficult for bilingual children. The difficulties in perceiving the contrasts between two L2 sounds when the phonological system is under stress may lead to difficulties in knowing which letters to match onto these sounds. Further work on phonological representations in bilingual children is needed to fully understand the possible pedagogical implications of the present study.

Bialystok (2001) asserts that language-specific differences in phonemes and phonological properties affects children's phonemic sensitivity and that these differences may have implications for children learning to read (pp. 173). The type and amount of experience of early spoken language experience has been shown to have an effect on phonological awareness development (e.g. Caravolas & Bruck, 1993; Cheung, Chen, Lai, Wong, & Hills, 2001; Cossu, Shankweiler, Liberman, Katz, & Tola, 1988). ELs may segment words containing partially developed L2 phonological categories differently than their monolingual peers. They may also segment words containing these sounds into different phonemes and may choose different letters to match those sounds. In order to begin to spell in English, native Spanish-speaking children must match letters to sounds that do not exist in their native language (L1) and have not yet been fully acquired as new L2 phonological categories. For example, the diphthong /eɪ/ (the English long A sound, as in *lady*) exists as a phoneme in English but does not exist in Spanish as a single phoneme. Young Spanish-speaking bilingual children may be more likely to represent this sound in invented spelling with multiple vowels to match what they perceive, whereas English monolingual children may choose the name of the letter name A to

match what they perceive (San Francisco, Carlo, August, & Snow, 2006a). Through invented spelling young bilingual children can show us how they perceive novel L2 sounds by their choice of letters as they represent sounds in words.

In young children's invented spelling receiving only English instruction there is not an influence of the orthography of the native language, because they haven't yet learned the workings of that language's orthography. However, the phonology of the native language may affect the child's perception of the second language, and thus influence the L2 invented spelling or invented spelling. This invented spelling corresponds to the letter-name/alphabetic-spelling stage. At this sound level, the interaction between the two phonological systems employed by bilingual children influence what they hear and how they spell. In an earlier study, we compared the English spelling of stop consonants in native Spanish-speaking children receiving English-only instruction with that of monolingual native English speaking children at the end of kindergarten (Raynolds & Uhry, 2010). Stop consonants are not the same phonetically in Spanish and English; they differ in voice onset time and aspiration. We found that the bilingual kindergarteners' spelling of stop consonants differed significantly from the monolingual children's spellings. The bilingual kindergarteners had significantly fewer correct English spellings of ending stop consonants, than did the monolingual group. Even though the stop consonant phonemes exist in both languages, the phonetic differences between the sounds in Spanish and English caused first language interference when the bilingual students spelled the English stop consonants. The invented L2 spellings of these young children were extremely sensitive to small phonetic differences within phonemes between the first and second languages, even though they had not learned their L1 letter sound correspondences.

Zutell (1988) and Fashola, Drum, Mayer, and Kang (1996) studied the spelling strategies of older Spanish-speaking children in elementary in bilingual programs. Both of these researchers correctly predicted errors based on the differences between the two languages. They found orthographic first language interferences on many of the student's spellings (i.e., writing LEIDY for *lady* where E and I represent Spanish orthography). Constructions of phonetic representations of sounds that do not occur in the native language and their orthographic representations (i.e., /sh/, which does not exist in Spanish, written as *ch*) were also seen in the spellings of some bilingual students (Fashola et al., 1996). Bear, Templeton, Helman, and Baren (2003) described spelling of bilingual children as following the same developmental sequence as monolingual children, with logical errors present when English and Spanish sounds do not match each other.

Both positive and negative transfer of language and literacy skills across languages have been shown. Phonological awareness skills and alphabetic knowledge have been shown to positively transfer across alphabetic languages (Bialystok, Majumder, & Martin, 2003; Cárdenas-Hagen, Carlson, & Pollard-Durodola, 2007, Ciscero and Royer, 1995; Dickinson, McCabe, Clark-Chairelli, & Wolf, 2004; Durgunoğlu, Nagy, & Hancin-Bhatt, 1993; Lopez & Greenfield, 2004; Verhoeven, 2007). Negative transfer was observed in L1-influenced spelling errors (Bear et al., 2003; Fashola et al., 1996; Ferroli, 1991; Raynolds & Urhy, 2010; San Francisco, Mo, Carlo, August, & Snow, 2006b; Wang & Geva, 2003; Zutell & Allen, 1988).

Read's work (1971, 1986) with young children led him to conclude that children categorize sounds differently than do adults. He observed that children vocalize speech sounds while spelling. This led him to speculate that it would not matter how a teacher pronounces words in a spelling examination; the child will spell using the recreated pronunciation. It is probable that phonological differences between one's first language and one's second-language would be reflected in the spelling of novice spellers. In this study we are examining the invented spelling of English short and long vowels. To determine which vowels are identical and may be transferred from the L1 (Spanish) to the L2 (English), and which may need to be acquired, comparison of the vowels in the two languages is necessary. Those vowel phonemes that have been developed in the first language will presumably transfer to the developing phonology of the second language.

The following is an examination of the differences in vowels in Spanish phonology as compared to English phonology. Spanish has five vowels whereas English has fourteen vowels (Yavas, 2006). Spanish has five graphemes that consistently represent its five vowels /a/, /e/, /i/, /o/, and /u/ (IPA symbols). English has fourteen vowels. In this study we will use the terms "short vowels" for the phonemes /æ/ A, /ɛ/ E, /ɪ/ I, /ɑ/ O, and /ʌ/ U; and "long vowels" for the phonemes /eɪ/ A, /i/ E, /aɪ/ I, /oʊ/ O, and /ju/ U.

Among the five English short vowels, three have no equivalent sound in Spanish. There are vowel contrasts that exist in English that do not exist in Spanish: /i/ - /ɪ/ (e.g. *greed-grid*), /u/ - /ʊ/ (e.g. *fool-full*), /ʌ/ - /ɑ/ (*buddy-body*), /ɛ/ - /æ/ (e.g. *mess-mass*) (Yavas, 2006).

Table 1 shows how Spanish may influence the pronunciation and spelling of English short vowel phonemes (Gorman & Kester, 2004). The spelling substitutions were proposed using both English and Spanish orthography because some of the children in this study received letter-sound instruction in both Spanish and English.

The English long vowel sounds can be represented in Spanish, but long *a, i, o*, and *u* are spelled with more than one vowel in Spanish, accurately showing that these sounds are really diphthongs. The English long E sound (/i/ IPA) is not a diphthong and is represented by one Spanish letter (I). Native Spanish-speaking children, using the five vowel phonemes in their first language, may spell English diphthongized vowels with two successive phonemes. For example the word *fine* would be segmented into four phonemes (/f/, /a/, /i/, /n/). Native English-speaking children may segment the word *fine* into three phonemes (/f/, /aɪ/, /n/) (San Francisco et al., 2006a). Table 2 shows how Spanish may influence the spelling of English long vowels.

With monolinguals, a reciprocal effect of reading instruction on phonological awareness skill and phonological awareness instruction on reading skill has been documented (Adrián, Alegria, & Morais, 1995; Ehri, 1984; Perfetti, Beck, Bell, & Hughes, 1988). The language of reading instruction has been found to be an important factor in first language influence on spelling. When children receive instruction in their native language, the knowledge of Spanish orthography has been shown to have an interference effect on English spelling. San Francisco et al. (2006a) found that students who received literacy instruction in Spanish did show Spanish-influenced spellings and showed less English orthographically plausible

Table 1 Influence of Spanish language pronunciation on the invented spelling of English short vowels using either English vowel sounds or Spanish vowel sounds

English phonemes	Spanish phonemes	Pronunciation	English vowel sound	Spanish vowel sound
/æ/	/ɑ/	"Hat" sounds like "hot"	A → O	A → A
/ɛ/	/e/	"Get" sounds like "gate"	E → A	E → E
/ɪ/	/i/	"Hit" sounds like "heat"	I → E	I → I
/ɑ/	/ɑ/	"Hot"—no change	O → O	O → A
/ʌ/	/ɑ/	"Hut" sounds like "hot"	U → O	U → A

spellings. In that study, bilingual first grade students receiving direct English literacy instruction did not show Spanish-influenced spellings and wrote more English orthographically plausible pseudoword spellings. Multiple studies have shown that high-quality English-language literacy instruction in kindergarten and first grade enabled English learners to match or surpass their monolingual, English-speaking peers on reading and spelling measures in second grade (Lesaux & Siegel, 2003; Wang & Geva, 2003; Caravolas & Bruck, 1993; Caravolas & Bruck, 2000; San Francisco et al., 2006a, b) These studies suggest that direct language and literacy instruction in the second language may lead to more sensitive L2 phonological category perception, and therefore, more accurate second language spelling. Spelling instruction may influence pronunciation and perhaps create more accurate L2 phonological representations of words for young children (Ehri, 1993).

There is a paucity of research regarding the spelling of bilingual children, especially those children receiving direct English instruction in reading and writing. Previous research suggests that the phonology of one's first language may continue to have an effect on the spelling of bilingual children. The present study compares kindergarten children who live in homes where Spanish is primarily spoken with monolingual English-speaking children. Children received either English instruction or Spanish–English instruction, but all children in the study received direct instruction in English in phonological awareness, letter names and sounds, and phonics. A comparison was completed of monolingual and bilingual children's phonological awareness, letter names, letter sounds, and of accuracy in spelling. It was speculated that the spelling of Spanish–English bilingual children receiving phonics instruction in English at the comparatively early age of 5 and 6 would

Table 2 Influence of Spanish language pronunciation on the invented spelling of English long vowels using either English vowel sounds or Spanish vowel sounds

Long vowel	Phoneme	English vowel sounds	Spanish vowel sounds
A	/eɪ/	A → AE	A → EI
E	/i/	E → E	E → I
I	/aɪ/	I → OE	I → AI
O	/oʊ/	O → OU	O → OU
U	/ju/	U → YU	U → IU

contain few English vowel errors that are influenced by their first language (Spanish) and would be statistically similar to that of their monolingual peers. Therefore, it was hypothesized that there would be no significant difference between Spanish–English bilingual kindergarteners and their monolingual English-speaking peers in the invented spelling of short vowels for which both groups have received direct instruction in short vowel letter-sound correspondences. It was also hypothesized that there would be a significant difference between Spanish–English bilingual kindergarteners and their monolingual peers in the invented spelling of long vowels, for which neither group received direct instruction in the long vowel letter-sound correspondences. For the purpose of this causal-comparative study, the independent variable is the language status of the participants—operationally defined as the status checked on the New York State Home Language Survey combined with teacher knowledge. For the purpose of this study, the dependent variable is the number of plausibly correct vowel spellings and is operationally defined as students' scores on a researcher-created spelling assessment.

Methodology

Setting

The study was carried out in an urban public elementary school in the northeastern United States. The school was eligible for Title 1 funding with 49.9 % of the student body living at poverty level. The school was judged to be in good standing by its district's quality review. With 100 % of its teachers licensed, 65 % with five or more years of experience, and 93 % with a master's degree, the teaching staff can be described as a strength of the school. The school followed its district's literacy curriculum, which was a combination of meaning-based instruction and word study. Wilson's *Fundations* (2002) was used for daily word study for all children, including those in dual language classrooms. Note that kindergarten-level *Fundations* teaches letter sounds directly (e.g., responding "A—apple—/a/" when presented with a card with a picture of an apple and a letter A) and it provides daily opportunities to practice phonemic segmentation using letters (e.g., tapping out phonemes and writing the word in response to dictated spellings. The kindergarten curriculum covers all consonants, some consonant digraphs, and all short vowels.

Participants

The 88 kindergarten children who participated in the study were between 5 years 4 months and 6 years 4 months at the time of data collection in May. Forty-four percent of the children were Hispanic, 30 % were African American, 24 % were White, and 2 % were other. The children were distributed across five classrooms with one class designated for gifted education ($n = 19$), one for regular education ($n = 18$), one with two teachers for inclusive education ($n = 15$), and two for dual language ($n = 21$; $n = 15$). English and Spanish were used for instruction on

alternate days in the two dual language classes and both bilingual Spanish–English students as well as monolingual English-speaking children were in the dual language classrooms. Children were identified as native Spanish-speakers through the New York State Home Language Survey, which is completed by all parents at registration. There were 45 monolingual English-speaking children and 36 native Spanish-speaking children in the study.

Assessment instruments

A number of measures were administered in order to provide a description of the children's language and literacy skills. A developmentally scored invented spelling test was administered in order to analyze possible differences between vowel spellings of children with L1 Spanish and L1 English language.

Oral receptive vocabulary

The Peabody Picture Vocabulary Test (PPVT-4) (Dunn & Dunn,1981) involves pointing to the pictures that best expresses the meaning of a word said aloud by the examiner. The PPVT-4 is a norm-referenced test that provides percentile and standard scores as well as raw scores.

Lower case letter identification

All 26 lower case letters were arranged in short rows. A serif font was used to reduce look-alike letter attributes. The students were asked to touch each letter and to say its name.

Word identification

Word lists from the Woodcock Reading Mastery Test (Woodcock, 1987) were used to see if students could read any decontextualized words. The WRMT is a norm-referenced test that provides percentile and standard scores as well as raw scores.

Phonemic awareness

The Comprehensive Test of Phonological Processing (CTOPP) (Wagner, Torgesen, & Rashotte, 1999) is a norm-referenced test with subtests for several age groups. The following are both appropriate for ages 5–7 years. The Blending Words subtest involves items asking the student to listen to sounds and to blend them into words (e.g., /num/-/ber/; /t/-/oi/; /s/-/t/-/a/-/m/-/p/). The Elision subtest asks the student to say a word aloud and then to repeat it but to leave out a specified part (e.g., Say *popcorn.* Now say *popcorn* without saying *corn*; Say *bold*. Now say *bold* without saying /b/.)

The reliabilities of the CTOPP, PPVT, and WRMT are all reported above the 0.8 level (.97, .97, and .91 respectively) that was predetermined as an acceptable value for Cronbach's alpha. Validity for instruments come from the relevant literature;

additional predictive validity was established through correlations with other tests for the WRMT, PPVT, and through comparative fit indices for the CTOPP.

Invented spelling

A 26-word spelling measure was assembled by the authors (see "Appendix"). The final 12 words (15–26) are taken from Morris (1999) and have been used in previous research by the second author (Uhry, 1999; Uhry & Goodman, 2009) as a highly reliable predictor of later reading. They are used here as a check on the reliability of the new list (1–14). The lists in combination provide at least two examples of spellings of all long and short vowel sounds plus *aw* /ɔ/ and *oo* /u/.

The vowel spellings were scored using a system based on Morris (1999). No points were credited for random strings of letters, 1 point for a single letter representing the initial or final sound in a word, 2 points for initial and final sound, 3 points for representing all of the sounds in a word, 4 points for some orthographically conventional units of letters (e.g., -ING, -CK, -SS), and 5 points for an orthographically correct spelling. See Table 3 for this scoring.

Procedures

All families of the 95 children in kindergarten were invited to consent to their children's participation in the study through a letter and permission form that were sent home in both English and Spanish. Eighty-eight of the families gave consent for their children's participation. Collection of data was carried out in April and May after almost a school year of direct instruction using the *Fundations* curriculum. Assessments were administered by the second author and by three doctoral students trained in test administration. Students were taken out of their classrooms for assessment sessions to the relatively empty, quiet lunchroom between 9:00 and 10:30 in the morning. The literacy measures were administered in one session and the PPVT-4 in a second session.

Results

To ensure that there were no significant differences on skills that are prerequisites for invented spelling, *t* tests were carried out on the results of a lower case letter

Table 3 Developmental spelling scoring system based on Morris (1999)

	Semi-phonetic		Alphabetic		Conventional orthography
0 Points	1 Point	2 Points	3 Points	4 Points	5 Points
HTTO4	B	BK	BEC	BECK	BACK
MMM	J	GS	JRAS	DRASS	DRESS
X0AB	F	FD	FET	FETE	FEET

identification assessment, as well as the CTOPP Blending and Elision tests. Table 4 presents the results of these assessments.

There were no significant differences between monolingual students and bilingual students on tests of letter recognition. Neither were there any significant differences between the two groups on the CTOPP tests that measure phonological awareness. Both monolingual and bilingual student groups possessed skills necessary to match letters with sounds of words during sound-to-print spelling.

Table 5 displays the results of the two groups of participants on spelling the short vowels in the researcher-created spelling test. Independent samples *t* tests were performed to investigate possible sources of difference between monolingual and bilingual participants. The alpha level was set at .05 (Bonferroni corrected). All of the children had received direct instruction on the spelling of short vowels during kindergarten. Very few Spanish-influenced spellings of the short vowels were made, and no significant differences were found between the monolingual group and the bilingual group on the number of Spanish-influenced spellings of all of the short vowels.

Next, the presence of a Spanish influence on the spelling of long vowels was examined. These vowels were not explicitly taught in the kindergarten curriculum. Because these sounds exist in Spanish as true diphthongs both in pronunciation and in spelling, we defined Spanish-influenced spelling of long vowels as spellings that reflected the diphthongal nature of these sounds and were spelled with at least two letters. English-speaking primary teachers commonly teach these sounds as "letter name" sounds and children remember that the long sounds "say their own names." Long vowel spellings without a Spanish-influence contained only one, correctly represented vowel. Table 6 displays the results of the two groups of participants on spelling the long vowels in the researcher created spelling test. Independent samples *t* tests were performed to investigate possible sources of difference between monolingual and bilingual participants. The alpha level was set at .05 (Bonferroni corrected).

The results for the diphthongal long vowels *a, i, o*, and *u* differ from those of the short vowels. Bilingual children spelled these sounds with plausible diphthongs and multiple letters more often than did monolingual children. The difference was significant ($p < .05$) for the long vowels *o* and *u* and approached significance for

Table 4 Means and standard deviations, and independent samples *t* tests scores for descriptive data of bilingual and monolingual students

Comparisons	Monolingual $n = 45$			Bilingual $n = 36$		*t*	*p*	Cohen's *d*
	M	SD		*M*	SD			
Lower case letter ID	24.73	1.59	=	24.25	1.79	0.27	0.21	0.29
Word ID	23.62	19.66	=	16.89	14.70	1.76	0.08	0.56
PPVT raw	100.93	27.66	=	90.19	29.28	1.69	0.10	0.38
Invented spelling	36.04	14.63	=	36.03	11.63	0.01	0.99	0.001
Elision CTOPP	6.47	5.02	=	6.11	3.67	0.36	0.72	0.08
Blending CTOPP	9.00	5.36	=	9.89	4.40	−0.80	0.43	0.18

Table 5 Means and standard deviations, and independent samples *t* tests scores ($df = 79$) for Spanish-influenced short vowel spellings in a researcher-created spelling test

Comparisons	Monolingual $n = 45$			Bilingual $n = 36$		*t*	*p*	Cohen's *d*
	M	SD		*M*	SD			
Words with short A /æ/ (maximum 2)	0.02	0.15	=	0.00	0.00	0.89	.38	–
Words with short I /ɪ/ (maximum 3)	0.49	0.82	=	0.58	1.00	−0.47	.64	0.10
Words with short O /a/ (maximum 2)	0.16	0.42	=	0.11	0.40	0.48	.63	0.12
Words with short U /ʌ/ (maximum 3)	0.73	1.16	=	0.89	1.21	−0.59	.56	0.14
All short vowels (maximum 10)	1.40	1.91	=	1.58	1.83	−0.44	.66	0.10

long *i* ($p = .08$), and for long A ($p = .09$). When these vowels were analyzed together, the bilingual children wrote Spanish-influenced spellings significantly more times than monolingual children ($p < .01$, Bonferroni corrected). To confirm the bilingual children's phonetic sensitivity to diphthongs in their spelling, there were no differences in the spelling of the long vowel *e*, which is not a diphthong.

When comparing the results of monolingual children and bilingual children we found no differences between the monolingual children and the bilingual children in their spellings of the short vowels regardless of whether they received English or Spanish instruction. When measuring the explicitly taught short-vowel sounds, monolingual children and bilingual children appear to be learning at the same rate whether they receive English or Spanish–English instruction. Spanish-speaking children produced more diphthongized long vowel errors than did monolingual English-speaking children whether receiving English ($M = .92$ vs. .61) or bilingual

Table 6 Means and standard deviations, and independent samples *t* tests scores for Spanish-influenced diphthong spellings in a researcher-created spelling test

Comparisons	Monolingual $n = 45$			Bilingual $n = 36$		*t*	*p*	Cohen's *d*
	M	SD		*M*	SD			
Words with diphthong Long A /eɪ/ (maximum 2)	0.56	0.59	<	0.8 2	0.76	−1.73	$p = .09$*	0.39
Words with diphthong Long O /oʊ/ (maximum 2)	0.00	0.00	<	0.11	0.32	−2.09	$p < .05$**	–
Words with diphthong Long U /ju/ (maximum 1)	0.16	0.36	<	0.36	0.49	−2.10	$p < .05$**	0.46
Words with diphthong Long I /aɪ/ (maximum 2)	0.11	0.49	<	0.36	0.72	−1.78	$p = .08$*	0.41
Words with non-diphthong Long E /i/ multiple vowels (maximum 2)	0.18	0.49	=	0.28	0.62	−0.82	$p = .42$	0.18
All diphthongs not long E (maximum 7)	0.74	0.82	<	1.59	1.31	−3.29	$p < .01$**	0.78

* Approaching significance; ** comparison is significant at $p < .01$, Bonferroni corrected

Table 7 Means and standard deviations, and independent samples *t* tests scores for long vowels represented by diphthong and Spanish influenced short vowel errors in English and Spanish–English language instruction classes by language status

Comparisons	Monolingual				Bilingual			*t*	*df*	*p*	Cohen's *d*
	n	*M*	SD		*n*	*M*	SD				
Diphthongs English instr.	31	0.61	0.67	=	12	0.92	0.90	−1.21	41	0.23	−0.40
Diphthongs Spanish instr.	11	1.09	1.14	=	22	1.95	1.36	1.76	31	0.08*	−0.83
Short vowels English instr.	33	0.91	1.49	=	14	0.93	1.33	−0.04	45	0.97	−0.01
Short vowels Spanish instr.	11	2.82	2.44	=	22	2.00	2.00	1.029	31	0.31	0.37

* Approaching significance

Table 8 Means and standard deviations, and independent samples *t* tests scores for long vowels represented by diphthongs and Spanish influenced short vowel errors for bilingual and monolingual students by English and Spanish–English language instruction classes

Comparisons	English instruction				Bilingual instruction			*t*	*df*	*p*	Cohen's *d*
	n	*M*	SD		*n*	*M*	SD				
Diphthongs English-speakers	31	0.61	0.67	=	11	1.09	1.49	−1.68	40	0.10*	−0.42
Diphthongs Spanish-speakers	12	0.92	0.90	<	22	1.95	1.36	−2.37	32	0.02**	−0.89
Short vowels English-speaker	33	0.91	1.49	<	11	2.82	2.44	−2.45	12.6	0.03**	−0.94
Short vowels Spanish-speakers	14	0.93	1.33	=	22	2.00	2.00	−1.77	34	0.09*	−0.63

* Approaching significance; ** comparison is significant at $p < .05$

instruction ($M = 1.95$ vs. 1.09) and that difference approached significance when students received bilingual instruction ($p = .08$). The students had not received direct instruction in English long vowels (Table 7).

When the number of errors was compared in English and Spanish–English language instruction classes, we found that children receiving English instruction made fewer mistakes and that this difference was statistically significant or approaching significance in both short vowel spellings and diphthongized long-vowel spellings. Spanish-speakers receiving English instruction made significantly fewer mistakes spelling diphthongized long vowels ($p = .02$) than Spanish-speakers receiving Spanish–English instruction. Spanish-speakers made fewer short vowel spelling mistakes when receiving English instruction than when receiving Spanish–English instruction, and this difference approached significance ($p = .09$). Monolingual English-speaking children also made fewer English spelling errors when receiving English instruction than when receiving Spanish–English instruction. The difference in short vowel errors was statistically significant ($p = .02$), and the difference in diphthongized long vowels approached significance ($p = .10$). All classes received the same amount of direct instruction in *Fundations*. It appears that length of exposure to the target language or possibly additional English instruction affected accurate English phoneme representation in invented spelling and that both English-speaking monolingual children and Spanish–English bilingual children benefited from increased English exposure (Table 8).

Discussion

Children's spellings provide a much-needed window through which one can observe the development of their knowledge of the phonology and alphabetic principle of their language. When the phonology of the first and second-language differ however, students are faced the challenge of first perceiving the unique English sounds. They then have to try to match the English sounds they perceive with the phonological categories of sounds in their native language phonology. As they recognize the inadequacy of these categories, they need to construct new phonological categories for the English sounds. To finally be able to "sound out" words in English they need to match these sounds in the newly created categories with the corresponding English letters (Fashola et al., 1996).

Invented spelling requires a specific phonemic awareness task, that of being able to segment whole words into individual phonemes and this task may be influenced by language-specific differences in phonemes and phonological properties (Bialystok, 2001). The type and amount of language experience has been shown to have an effect on phonological awareness development (e.g. Caravolas & Bruck, 1993; Cheung et al., 2001; Cossu et al., 1988). In this study, both English- and Spanish-speaking children receiving bilingual instruction had more English phonetic spelling errors than did children receiving only English instruction. It is not clear whether this difference was due to increased English oral language exposure or to increased instruction. Because both English-speaking children and Spanish-speaking children had more errors when receiving bilingual instruction it can be surmised that at least part of the difference was due to an assumed increase in instructional time.

As children attempt invented spelling, weaknesses in the representations of phonemes, especially new second language phonemes will become evident in their spellings (Goswami, 2000). The students in this investigation received explicit instruction in English short vowels, but did not received explicit instruction in English long vowels. Our hypothesis was that the explicit vowel instruction would positively affect the representation of the new L2 categories, shown in their invented spelling. The results of this investigation show that our hypothesis was correct. There was no difference in the English spelling of short vowels between the English learners and the native English-speakers. All of the children had received explicit instruction in the short vowel sounds during kindergarten. The children did not receive explicit instruction in the long vowels, and a statistically significant difference was found in the spelling of these vowels. The native Spanish-speaking children spelled the English long vowels, A, I O, and U with multiple vowels more often than their native English speaking counterparts, reflecting the actual diphthongized nature of long A, I, O and U. However, English learners did not spell long E differently than monolingual students, as this vowel is not a diphthong.

Our results corroborate the work of San Francisco et al. (2006a), demonstrating the sensitivity of the long vowel diphthongs that native Spanish-speaking children show before exposure to English long vowel instruction. The practical implications of this study apply to the assessment of bilingual children. Research is especially needed in this area, as the accurate assessment of English learning children is particularly difficult. Invented spelling has long been acknowledged as an important

assessment tool of early literacy ability and has been found to contribute unique variance in predicting phonemic awareness, word and nonword decoding (e.g., McBride-Chang, 1998; Richgels, 2001; Gentry, 2000). Teachers may misinterpret the errors that English learning children make by not recognizing the influence that the first language may exert on early spelling. Teachers may not have the background information to understand that children segmenting diphthongized long vowels into two phonemes are showing phonetic sensitivity to these sounds. Teacher knowledge of the subtle differences between Spanish and English phonology and phonetics is essential for the appropriate use of invented spelling as a valid assessment for native Spanish-speakers. These confusions may result in depressed assessment scores. Conversely, the accurate identification of English learners who may have an additional risk for reading difficulties has proved particularly difficult. The lexical restructuring model suggests that children with unusually slowly developing phonological representations may be at risk for reading difficulties (Metsala & Walley, 1998). This may also apply to unusually slowly developing second-language phonological representations, as compared to typical second-language phonological acquisition. This may especially be true when the children receive early English phonics instruction, as learning to read in English may help develop new and accurate second language phonological representations (Ehri, 1993; Meschyan & Hernandez, 2004). When the typical rate and order of L2 phoneme acquisition are more completely documented, bilingual children at risk for reading difficulties may be more easily identified and provided with early remediation in order to prevent later reading failures. More research is clearly needed to provide teachers with a more complete understanding of typical second language phonological and literacy development.

The results support our hypothesis that early (i.e., kindergarten) phonics instruction has an impact on the creation of precise second language phonological categories. Early instruction in a second language may have benefits, especially when learning new phonemes. "Learning changes the nature of the brain, eliminates some connections and tunes others to values that are difficult to change. Eventually the system may reach a point of no return, a reduction in plasticity that mimics critical period effects without any change in the architecture other than the changes that result from normal processes of learning and development". (Bates, 2005, p. 237) According to this view, it is young children's cognitive immaturity, rather than maturity, which is advantageous for language learning. The younger children begin learning a new language, the better. The native Spanish-speaking students in our study provided evidence that they have formed new L2 phonemic categories in their invented spelling of non-native short vowel sounds. The number of correct short vowel spellings was statistically similar to that of their monolingual peers. In studies with older children, short vowels were problematic and subject to first language interference (Zutell, 1988; Bear et al., 2003). This study provides evidence to support the effect of age of acquisition on acquiring the phonology of a second language (i.e., Perani et al., 2003).

In studies with bilingual kindergarteners not receiving direct instruction in phonemic awareness and phonics, Spanish-influenced spellings were present (Raynolds & Uhry, 2010). The results of this investigation add evidence to the

effect of reading instruction on phonological awareness skill that has been already been well-documented in monolinguals (Adrián et al., 1995; Ehri, 1984; Perfetti et al., 1988) and extend it to support the impact of L2 literacy not only on phonological awareness, but also on the formation of accurate phonological representations of second language vocabulary.

This study was a preliminary investigation. Limitations of this study include the lack of a control group similar in attributes, but not receiving direct literacy instruction. Longitudinally collected data would allow a closer inspection of the development of L2 phoneme categories. The sample itself may not be representative of Spanish–English bilingual children, since all of the data collection took place in New York City.

Children entering American schools as learners of English need to learn at a much faster rate than their monolingual peers if they are to reach parity with them. It is imperative that all people responsible for their education search for the most efficient and successful methods of instruction. The results of this investigation may add information to the instruction and assessment of young bilingual children. Discussions need to continue as to the timing of English instruction to native speakers of other languages, as well as to the type of instruction that is the most beneficial for these children. Early explicit instruction in English sounds and corresponding letters may be an important factor in the academic success of English learning children.

Appendix: Spelling measure

1. Thick	15. Back
2. Cute	16. Feet
3. Shine	17. Step
4. Ball	18. Junk
5. Then	19. Picking
6. Rushed	20. Mail
7. Took	21. Side
8. Shopping	22. Chin
9. Saw	23. Dress
10. Tooth	24. Peeked
11. Brave	25. Lamp
12. Bug	26. Road
13. Vote	
14. Job	

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