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# Associations between language and literacy skills and sight word learning for native and nonnative English-speaking kindergarteners

Katharine Pace Miles<sup>1</sup> · Karen E. McFadden<sup>1</sup> · Linnea C. Ehri<sup>2</sup>

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## Abstract

This study, which was drawn from a larger published work, examined language proficiency and literacy skills predictive of learning content and function words via the commonly used practice of flashcard word reading, which tests word knowledge in isolation. The current study also investigated differences in word learning performance between students of different language backgrounds (native and nonnative English speakers), and between students at the same grade level but in different alphabetic phases of word reading development. Kindergarten students ( $n = 81$ ) practiced learning to read content and function words on flashcards. Analyses examined the extent to which students' baseline English language skills, phonemic awareness, spelling knowledge, and/or word reading predicted performance on the word learning task. Results of linear regressions demonstrated that language skills accounted for a significant amount of unique variance in reading function words in isolation, but this was not the case for reading content words in isolation. Further, results indicated that baseline alphabetic phase, and not language background, moderated the relationship between language skills and word learning, such that language skills predicted function word learning only for full alphabetic readers and not partial alphabetic readers. Results are discussed in terms of implications for the teaching of function words as dependent on children's relative phase of literacy development rather than their language backgrounds.

**Keywords** Sight word learning · Flashcard word reading · Nonnative English speakers · Word reading phase

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## Introduction

High frequency word lists that are used for flashcard learning sessions with young children are full of what are known as context-dependent or function words (see Dolch and Fry word lists; Miles & Ehri, 2017; Weber, 2006). Content words (e.g., nouns, verbs, adjectives, and some adverbs) have concrete meanings that can be experienced through the senses, whereas context-dependent words (e.g., simple past and past participles of irregular verbs) and function words (e.g., prepositions, conjunctions, auxiliary verbs, grammatical articles) are either difficult for children to experience through the senses or have little substantial meaning on their own. They primarily serve to signal the grammatical relationship between content words in a sentence (for clarity of distinction from content words, both context-dependent and function words will be referred to as function words). As research demonstrates, function words are more difficult to learn than content words (Ehri, 1975, 1976; Morris, 1992; Weber, 2006; Miles & Ehri, 2017). This is due to the fact that the meaning and use of function words are dependent upon other words in the sentence (Weber, 2006) and lack of knowledge of a word's meaning impacts the ability to successfully store a complete representation of the word in memory (Ehri, 2014). Currently, there is little evidence regarding which foundational language and literacy skills may support the learning of function words.

The difficulty in learning function words is of interest because word lists designed for beginning readers are full of high frequency function words (Miles & Ehri, 2017; Weber, 2006). Also, the instructional approach of flashcard word reading (which tests word knowledge in isolation) is a popular practice used with emergent readers, even though some of these students may not yet have the prerequisite language and literacy skills needed to benefit from this approach (Castles, Rastle, & Nation, 2018). Of even greater concern, is that teachers may strongly commit to the use of flashcard practice for the most struggling readers with the good intention of expediting the word learning process. Yet currently, research examining the relative effectiveness of this practice for early function word learning is limited, and the question remains whether students with only partially developed foundational language and literacy skills can benefit from it (Castles et al., 2018). Kindergarteners whose alphabet skills are less developed may not perform the same in flashcard tasks as their same-grade peers whose alphabet skills are more fully developed, and thus more research on this issue is needed.

Furthermore, a significant and increasing proportion of the population of young children engaging in early word learning in American classrooms comes from households where English is not the primary spoken language (U.S. Department of Education, National Center for Educational Statistics, 2017). This further complicates the context of early word learning as these nonnative English-speaking children may not have the exposure to English language necessary to benefit from this activity, particularly in the case of function word learning (Miles & Ehri, 2017; Morris, 2001). In response, the current study examined whether early

language and literacy skills predict word learning in isolation (during a flashcard activity) and whether kindergarteners' language background (native or nonnative English speakers) and/or their development of alphabet skills (alphabetic phase; Ehri, 2005, 2014, 2015) play a role in the relationship between foundational skills and flashcard word reading performance.

## How sight words are learned

### Connectionist theory: storing sight words in memory

Ehri (1992, 2005, 2014) explains that sight word reading, the most efficient form of reading, involves establishing systematic visual-phonological connections between spellings of words and their pronunciations, as well as their meanings. The connection between the spelling and pronunciation of a word is encoded through knowledge of grapheme-phoneme or letter-sound relations. The establishment of the visual-phonological pathways in memory enables a reader to automatically retrieve the spoken and written version of the word, as well as its meaning, and this is the essence of sight word reading. Related to Ehri's (1992, 2005, 2014) connectionist theory, Share (1995, 2008) explains that through the process of decoding, orthographic representations of words are learned. In addition, Jorm and Share (1983) explain that the value of analyzing grapheme-phoneme relations in order to phonologically recode words is particularly important because it enables beginning readers to read new words independently.

### Flashcard reading to store words in memory

Of interest in this paper is how the theory of storing words in memory is impacted by the practice of flashcard reading. Ehri (1998) explains that the term 'sight word reading' in research focuses on the mental processes involved in storing words for automatic retrieval, but educators use the term to describe an instructional practice of having students read words automatically. Also, teachers use lists of high frequency words often called "Sight Word Lists," which suggests these are the very words that need to be read without decoding. Of concern is the use of flashcards to facilitate storage of the orthographic representation of words in memory (Joshi, Treiman, Carreker, & Moats, 2008). This instructional approach suggests that words should be read instantly without analyzing grapheme-phoneme relations. Even more concerning is the use of flashcards by programs that claim to teach very young children to read. For example, Neuman, Kaefer, Pinkham, and Strouse (2014) investigated the effectiveness of a flashcard program called Your Baby Can Read with children ranging from 9 to 18 months old. After 7 months of daily flashcard instruction, results showed that training was ineffective in teaching these children to read words. Among other reasons, the authors suggested that the young children lacked sufficient alphabetic knowledge to store the words in memory.

Recently, Castles et al. (2018) addressed the debate regarding sight word instruction. In their summary of the research they determined that sight word reading instruction coupled with phonics instruction is not detrimental to beginning readers. They do however, state that not enough research has been conducted on this instructional method. In particular, information is lacking in “the minimum level of alphabetic skill that beginning readers need in order for sight-word teaching to be effective” (p. 15). Therefore, in the next section, the development of alphabetic reading and spelling skills are examined.

## Phase theory

Often, flashcard word reading is used in the early elementary grades as a way to speed up the word recognition process. This method is conducted without regard to beginning readers’ phonemic awareness, letter knowledge, orthographic mapping, or decoding/word reading skills; all of which are necessary for storing words in memory. A review of the phases that beginning readers move through as they acquire these skills seems essential as a way to thoughtfully consider when a task such as flashcard word reading would be effective.

Ehri (2005, 2014, 2015) explains four phases of sight word reading that children move through during development: *pre-alphabetic*, *partial alphabetic*, *full alphabetic*, and *consolidated alphabetic*, and each phase relies on a progression of three skills necessary to store words in memory: phonemic segmentation skills, letter knowledge, and grapheme-phoneme knowledge. In the *pre-alphabetic phase* beginning readers form connections between visual attributes of words and their pronunciations or meanings (i.e., visual cue reading). Letter-sound connections are not involved in this phase. Instead, some visual feature of the word or the word’s surrounding environment (e.g., McDonald’s arches) serve as a cue for retrieval of the pronunciation and meaning. In the *partial alphabetic phase*, beginning readers form partial connections between some of the letter-sound units in words. Often the first and last letters are remembered because they are the most salient (i.e., phonetic cue reading), thus enabling these readers to segment the initial and final sounds in words.

Ehri (2005, 2014, 2015) explains that beginning readers in the *full alphabetic phase* are able to form complete connections between the letters and sounds in words. This ability comes from beginners’ phonemic segmentation skills, their knowledge of the major grapheme-phoneme relationships, and their ability to connect graphemes to phonemes within the spellings of individual words that they read. The ability to decode unfamiliar words activates connections between spellings and pronunciations of the words. Through multiple exposures to words, students in the full alphabetic stage begin to consolidate the grapheme-phoneme connections in words into whole units, thus transitioning into the *consolidated phase* (Ehri, 2005, 2014, 2015). These units are then stored in memory and used to read words automatically. These consolidated units include whole word and multiletter units, such as morphemes, syllables, and rimes, that reduce the memory load for storing sight



words because these units can be flexibly applied thus requiring only limited grapheme-phoneme decoding of words.

The varying amount of letter knowledge, phonemic awareness skills, and grapheme-phoneme knowledge that students possess at each phase elucidates the problem of administering flashcard reading tasks with beginning readers. Full alphabetic readers may be successful with some level of flashcard word reading, while partial alphabetic readers' time may be better spent focusing on foundation skills. One focus of the present study was on the skills that native speakers and nonnative English speakers in the partial and full alphabetic phases need in order to maximally benefit from reading words in isolation.

## **Content versus function words: importance of syntactic and semantic identity**

### **Learning words in context versus in isolation**

Another important consideration is how the flashcard word reading task is administered. Castles et al. (2018) point out that more research is needed on how to most effectively teach sight words. The popular practice of using flashcards to teach sight words involves various types of words presented in isolation. However, in order to store words in memory, Ehri's (1992, 2005, 2014) connectionist theory suggests that an amalgam between the spelling, pronunciation and meaning of the word must be created. Some studies have shown that learning words in context strengthens knowledge of a word's syntactic and semantic use, whereas learning words in isolation strengthens knowledge of the word's orthographic identity and pronunciation (Ehri & Roberts, 1979; Ehri & Wilce, 1980; Johnston, 2000; Stuart, Masterson, & Dixon, 2000; Miles & Ehri, 2017). However, Nation, Angell, and Castles (2007) found no effect of context on word learning, and Wang, Castles, Nickels, and Nation (2011) found an effect of context only on learning irregular novel words. Given that function words rely on surrounding words for their meaning, it is likely that learning function words in isolation may be difficult because no information is available regarding the meaning or use of the word. However, learning content-rich words in isolation may be effective.

### **Differences between types of words**

Paivio (1991) explains that nouns tend to be more concrete than other form classes, in that hearing a noun evokes a mental image of the word's meaning more easily than other types of words. Weber (2006) explains that due to their grammatical function and position in sentences, function words often become weakly stressed when pronounced. The unstressed consonants in function words may even be dropped altogether (*'em* for *them*) when they become buried in surrounding words (*get'em* for *get them*). This makes accurate spelling of the words challenging due not only to

consonant omission but also to the unstressed schwa vowel sounds that result from the unstressed pronunciation.

Studies have been conducted to test the differences in word learning between different word types. Ehri (1975) measured students' metalinguistic capabilities and found that almost all of the prereaders missed singling out at least one word within sentences, with function words being the most problematic word to identify. Often, the prereader considered the function word as part of another word in the sentence. In a follow-up study, Ehri (1976) used a paired associate learning task to investigate word learning ability across different word types, and found that nouns were easier to learn than adjectives, verbs, and function words, regardless of whether the word was presented with or without a sentence.

Morris (1992) also observed children having difficulty distinguishing function words as separate units in written sentences. As students read sentences while using a finger point reading task, they frequently combined function words with adjacent content words. More recently, Miles & Ehri (2017) taught kindergarteners to read content and function words on flashcards. Regardless of whether the two types of words were embedded in context or seen in isolation, both native and nonnative speakers of English had a significantly harder time learning to read, spell, and properly use function words than content words.

The difficulty in learning function words is of interest because word lists designed for beginning readers are full of high frequency function words (Weber, 2006). Miles & Ehri (2017) explained that on popular words lists such as the Dolch word list and the Harris and Jacobson word list (1982), between 35 and 46% of the words are considered function words.

## English language learners: learning to read and spell words

As previously stated, the purpose of the current study was to investigate the effectiveness of an instructional practice commonly used with both native and nonnative English speakers—that of teaching beginners to read words in isolation on flashcards. This research is important because the disparity in academic achievement between native and nonnative English speakers is vast (Garcia & Kleifgen, 2010). Research has demonstrated that nonnative English speakers who enter Kindergarten with limited English are at increased risk for reading growth trajectories that are significantly lower than that of native English speakers and for developing reading disabilities (Kieffer, 2008, 2010). While the sources of their difficulties have yet to be fully understood (August & Shanahan, 2006, 2008), Goldenberg (2013) and Goldenberg and Quach (2010) consider the need to experimentally investigate strategies to facilitate early literacy development in this population of utmost importance.

Goldenberg (2008, 2013) identifies three important principles based on the research with English language learners (ELLs): (1) Generally effective practices are likely to be effective with ELLs, (2) ELLs require additional instructional supports, and (3) The home language can be used to promote academic development. While the third principle is outside the scope of the current study, the other two principles were motivators for the current study. In regards to Goldenberg's (2008, 2013) first



principle, the strategy of flashcard word learning was studied because this is a prevalent instructional approach used by teachers. The assumption is that the method of flashcard learning allows beginning readers to quickly and efficiently store words as sight words so that they are automatically retrieved when seen in print. Goldenberg's (2008, 2013) second principle is that ELLs require additional instructional supports. Exposure to the syntactical use of function words is obviously necessary for all beginning readers; however, while native English speakers have been exposed to colloquial English since birth, nonnative English speakers may be learning the spelling, pronunciation, syntactic and semantic meanings of words all at the same time. Providing syntactic examples of function words' use in context may be necessary to clarify the meanings of the words, just as providing clarifying definitions of content-rich words would be necessary for these students.

Evidence that ELLs need additional support with function words was gathered by Morris (2001). Fifth and sixth grade ELL students were asked to produce a short written response to a picture prompt. Analyses of misspellings revealed that ELLs spelled content words more accurately than function words. This occurred even when content words contained complicated consonant clusters, vowel combinations, and diphthongs. Unstressed function words tended to be spelled incorrectly most often. Morris reported that this pattern of spelling errors was not observed in native English speakers.

Interestingly, the function words that were spelled incorrectly were considered high frequency words, that is, words that were seen most often in print. Morris (2001) concludes that frequency of exposure to the oral and written forms of these function words was not sufficient for ELLs to acquire the orthography of these words. Rather lack of phonetic and informational salience played a larger role than simple exposure in learning the words.

## Rationale and research questions

Recently, Castles et al. (2018) discussed the commonly used practice of flashcard reading to teach irregularly-spelled high frequency words (sight words), and the authors state that more research is needed on this and other instructional methods that attempt to support this type of word learning. One issue is that beginning readers may need to have a foundational understanding of phonemic segmentation skills and letter-sound relationships before the benefits of reliable sight word learning can be realized (Ehri, 1992, 1998). In addition, prior research raises doubt about the commonly used flashcard method to teach students to read lists of isolated high frequency words that include more challenging function words. Thus, there is a critical need for research that seeks to understand factors that support children's function word reading, particularly among those who are nonnative English speakers and those who are reading at the partial alphabetic phase of development (Ehri, 1992, 1998; Morris, 2001). Therefore, the following research questions were addressed:

1. Do foundational language and literacy skills (language/vocabulary, phonemic awareness, spelling knowledge, and word reading) predict kindergarteners' learn-

ing of content words and function words when the words are taught in isolation during a flashcard activity?

2. Does language background (native vs. nonnative English speakers) and/or alphabetic phases (partial vs. full) moderate the relationship between foundational language and literacy skills and word learning during a flashcard word learning activity?

## Method

### Participants

Eighty-one kindergarten students, 40 native English speakers and 41 nonnative English speakers, were included in the study. Participants were drawn from six kindergarten classrooms in four public schools serving predominately middle and low socio-economic students in a large Northeastern metropolitan area in the United States. In three out of the four schools, one hundred percent of the students qualified for free or reduced lunch (see Table 1). In the fourth school, fifty-two percent qualified. The students participated in a larger study on flashcard word reading (see Miles & Ehri, 2017) during the last 2 months of the school year (May and June).

Parental consent and children's verbal assent was obtained for 110 children, who were told they could stop participating at any time. Only six words were included in each training set to ensure a developmentally appropriate timeframe for instruction.

Children were pretested individually to determine qualification for participation in the study. There were two criteria: (1) ability to write a minimum of 16 out of 22

**Table 1** Characteristics of native and nonnative English speaking participants

	Native			Nonnative		
	<i>M</i> or <i>N</i>	(SD)	Range	<i>M</i> or <i>N</i>	(SD)	Range
Age	6;1	(0.31)	5;5–6;6	6;1	(.36)	5;6–7;2
Gender	19F; 21 M			23F; 18 M		
Language (L1)						
English	40			–		
Spanish	–			25		
Chinese	–			14		
Russian	–			1		
Other	–			1		
School						
A (100% free/red.)	8			7		
B (52% free/red.)	13			12		
C (100% free/red.)	9			18		
D (100% free/red.)	10			4		

Free/red. = percent of students at the school that qualified for free or reduced lunch

letters (v, x, q, and z were excluded because kindergarteners are still in the process of mastering knowledge of all the letters of the alphabet, and researchers did not want lack of knowledge of these less frequently used letters (Solso & King, 1976) to disqualify students from the study), and (2) ability to read no more than two out of the 12 target words. Eight students failed to qualify because they did not meet the minimum letter writing requirement, and 21 were disqualified because they read three or more of the target words correctly.

## Materials and procedures

Participants were pretested individually for approximately 30 min. The following day, students were individually taught and tested on their ability to learn to read two sets of words presented on flashcards. One of the sets of words was presented in context (i.e., words were embedded in sentences) and words in the other set were presented in isolation. The flashcard session was conducted individually in two separate 15 min periods, one to teach words embedded in sentences, and one to teach words in isolation. Students were given a break of 25–30 min between the first and second periods. The previous larger study (Miles & Ehri, 2017) investigated the effect of learning to read, spell, and properly use words based on whether they were learned in isolation or embedded in context. In the current study, only students' ability to read the set of words presented in isolation was of interest. Each set of words contained three content and three function words.

## Measures

### Language/vocabulary

The Peabody Picture Vocabulary Test-4 (Dunn & Dunn, 2007), Form A or Form B was administered to assess students' receptive vocabulary. The split-half reliability coefficients of this measure on Forms A and B as reported in the manual are .94 and .95, respectively.

### Phonemic awareness

Students' ability to segment and blend phonemes was assessed using the Sound Matching subsection of the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999). The test-retest reliability coefficients of the CTOPP range from .70 to .92 as reported in the manual, and the Spearman-Brown split-half reliability of the measure for this study was .75.

### Spelling knowledge

A set of five regularly spelled nonwords was used to assess students' spelling skills (*hud, gat, kif, des, jom*). Credit was given for each phonetically correct letter written in the word. Graphotactic constraints, such as permissible letters based on position

of the of the sound in the word and/or adjacent sounds, were not considered. Therefore, the word *kif* was considered correct if it was written *cif*, *ciff*, *ckif*. Letters in phonetic spellings had to occur in the correct order, incorrect phonetic representations were not scored, and any correct phonetic representation written after the letter representing the final sound in the word was not given credit. If a phonetically acceptable letter appeared within a random string of letters that a student produced, credit was not awarded. A random string was determined to be a series of letters in which the beginning sound and subsequent letters did not match the phonetic representation in the word. The interrater reliability of scoring the spellings of the words at the letter level was .92. The Cronbach's alpha reliability coefficient for this measure was .66.

### Word reading

The Word Identification subtest of the Woodcock Reading Mastery Test-III (WRMT-III; Woodcock, 2011) was used to assess students' sight word vocabulary. The split-half reliabilities of the WRMT-III range from .86 to .99 as reported in the manual.

### Language background

Teachers decided if children should be considered native or nonnative English speakers based on their knowledge of the child's school enrollment records. Students who had learned English and another language since birth or very young (before preschool) and whom the teachers considered to be as proficient as a native English-speaker were coded as native speakers for the purpose of this study. Students who were receiving ESL supports and who the teacher considered as not being proficient in English were coded as nonnative speakers.

### Alphabetic phase

Participants were categorized as being in either Ehri's (2005, 2014, 2015) partial or full alphabetic phase of reading depending on their performance on a nonword reading pretest. A set of five nonwords was used to assess students' ability to apply their letter-sound knowledge to decode (*dut*, *sep*, *mul*, *kaf*, *nib*). The experimenter explained that the words were not real words, and so when you read the words they may sound funny. Students who did not read any of the nonwords correctly or refused to attempt to decode the words were coded partial alphabetic readers ( $N=34$ ), and students who read one or more nonwords correctly were considered to be transitioning into the full alphabetic phase of word reading and were coded as such ( $N=47$ ).

### Word learning in isolation

All students were presented with the flashcard word reading activity. All testing was conducted individually. Twelve target words commonly found on graded lists of high

frequency words were taught. The six function words included four context-dependent irregular past tense verbs or past participles (*gave, held, told, kept*), one preposition/conjunction/adverb (*since*), and an auxiliary verb (*might*), and the six content words were all nouns (*farm, soap, heat, crab, clock, fence*). Words were assigned to two sets (six words per set). Three words in each set were function words and three words were content words. All the words within each set began with different letters. Although the words were not completely regular in their spellings, most of the letters were regular. All of the content words (nouns) were second grade level except for *heat* which is a third grade level word as listed in Harris and Jacobson (1982). All of the function words were at either a first (three words) or a second (three words) grade-equivalent level, so grade equivalent levels favored better performance on the function words.

Each student practiced reading one of the two sets of words presented in isolation. At the start of the word learning task, students were instructed to learn the words so they could remember how to read them. The first trial was a study trial. Students were shown each word in isolation on a flashcard, the experimenter stated the word, and the students repeated the word. This was followed by three test trials in which students saw each word presented on a flashcard, they attempted to read it, and the experimenter provided feedback by reading the word aloud regardless of whether the student read the word correctly or not. Word reading was scored as correct or incorrect and summed across the three test trials.

## Results

We first present descriptives on all study variables and bivariate correlations among them, as well as comparisons across study variables by language background and alphabetic phase. Next, we present regression models predicting kindergarteners' reading of words in isolation. Finally, we present a series of regression models which examine whether differences exist in the prediction of children's word reading skills by language background and/or alphabetic phase.

### Descriptives and comparisons across language background

Performance on the outcome measures of content and function word learning displayed full variability across native and nonnative English speakers (native content word learning:  $M=5.95$ ,  $SD=2.11$ , range 1–9; native function word learning:  $M=3.80$ ,  $SD=2.69$ , range 0–9; nonnative content word learning  $M=5.85$ ,  $SD=2.09$ , range 2–9; nonnative function word learning:  $M=3.46$ ,  $SD=2.50$ , range 0–8). Pearson product-moment correlations were calculated between several of the language and literacy pretests and the dependent variables. Results are shown in Table 2. A significant and moderately strong correlation was detected between nonword reading and nonword spelling. Because a substantial percentage of students did not read any of the nonwords correctly in the nonword reading task, this task was not used as a predictor. Rather the nonword spelling task was interpreted

**Table 2** Correlations between language variables, pretest, and posttest measures

	PPVT	CTOPP	Nonword spelling	Word reading	Nonword reading	Flashcard content words without context	Flashcard function words without context
PPVT							
CTOPP	.274*		.388**	-.103	.181	.087	.214
Nonword spelling			.267*	.299**	.213	.364**	.336**
Word reading			.224*		.541**	.210	.215
Nonword reading					.196	.380**	.471**
Flashcard content words without context						.415**	.397**
Mean	88.26	11.30	9.53	12.25	1.44	5.90	3.63
Standard deviation	11.26	4.60	3.72	10.12	1.55	2.09	2.59

PPVT = peabody picture vocabulary test IV; CTOPP = Comprehensive test of phonemic processing; Nonword Spelling = ability to spell 5 experimenter generated nonwords; Word Reading = woodcock reading mastery test; Nonword Reading = ability to read 5 experimenter generated nonwords; Flashcard Content Words Without Context = scores across trials on reading content words when presented without context

\* $p < .05$ ; \*\* $p < .01$



as assessing students' grapheme-phoneme knowledge and served as a predictor. Because a minimum score was required on the letter writing task to participate in the study, this variable and the letter sound variable were not used in the analyses due to ceiling effects. Further significant correlations were found between language/vocabulary skills (as measured by the PPVT) and phonemic awareness (as measured by the CTOPP) and nonword spelling. Phonemic awareness was also significantly correlated with word reading on the Woodcock test and with both content word learning and function word learning outcomes. As expected, word reading was also associated with both word learning outcome variables.

Additionally, native and non-native English speakers were compared on their level of language and literacy skills. Means and *F* statistics from one-way ANOVAs are reported in Table 3. Native speakers' mean scores on the PPVT were significantly higher than nonnative speakers' means, but both groups scored below national norms, with nonnative speakers on average scoring more than one standard deviation below the norm. Mean scores on the CTOPP measure of phonemic awareness (Wagner et al., 1999) were at or slightly above fifty percent correct, indicating that both groups possessed some phonemic awareness though native English speakers scored significantly higher on average. Native speakers scored significantly higher on the nonword spelling task in comparison to their nonnative English-speaking peers, but both groups showed they were able to write phonetically acceptable letters for over half of the phonemes in the CVC nonwords. Both groups of kindergarteners performed well on the WRMT-III (Woodcock, 2011) with mean scores indicating that they read words at a first grade-equivalent level. Nonnatives performed significantly better than natives on this task although variability in the scores was large (see Table 3).

## Descriptives and comparisons across alphabetic phase

Performance on the outcome measures of content and function word learning displayed full variability across students in the partial and full alphabetic phases (partial phase content word learning:  $M=5.06$ ,  $SD=1.98$ , range 1–9; partial

**Table 3** Language and literacy skills of native and nonnative English speaking participants

	Native (N=40)			Nonnative (N=41)			<i>F</i> (1,79)
	<i>M</i>	(SD)	Range	<i>M</i>	(SD)	Range	
Language/vocabulary PPVT	94.18	(11.35)	72–123	82.49	(7.67)	68–101	29.62***
Phonemic awareness CTOPP (20 max)	12.40	(4.72)	3–20	10.22	(4.26)	1–17	4.77*
Letter writing (22 max)	21.40	(1.22)	17–22	20.90	(1.64)	16–22	2.40
Spelling knowledge spelling non-words	10.45	(3.64)	0–15	8.63	(3.61)	0–14	5.08*
Word reading words (WRMT-R)	9.83	(7.80)	0–28	14.61	(11.57)	0–44	4.74*

PPVT=peabody picture vocabulary test-IV standard scores; CTOPP=comprehensive test of phonological processing; WRMT-III=woodcock reading mastery test-III

\* $p < .10$ ; \*\* $p < .05$ ; \*\*\* $p < .001$

phase function word learning:  $M=2.62$ ,  $SD=2.41$ , range 0–8; full phase content word learning:  $M=6.51$ ,  $SD=1.97$ , range 2–9; full phase function word learning:  $M=4.36$ ,  $SD=2.48$ , range 0–9). Students in the partial and full alphabetic phase were also compared on their level of language and literacy skills. Means and  $F$  statistics from one-way ANOVAs are reported in Table 4. Full phase mean scores on the PPVT were slightly higher than partial phase means, but both groups scored below national norms. Mean scores on the CTOPP measure of phonemic awareness (Wagner et al., 1999) were at or slightly above fifty percent correct, indicating that both groups possessed some phonemic awareness though students in the full alphabetic phase scored significantly higher on average. Students in the full alphabetic phase scored significantly higher on the nonword spelling task in comparison to students in the partial alphabetic phase, but again both groups showed they were able to write phonetically acceptable letters for half of the phonemes in the CVC nonwords. Both groups performed well on the WRMT-III (Woodcock, 2011) with mean scores indicating that they read words at a first grade-equivalent level. Students in the full alphabetic phase performed better than partial phase students on this task although results were not significant (see Table 4).

## Predictors of children's word learning

Ordinary least squares linear regressions were conducted with all 81 participants to investigate which variables uniquely predicted learning to read words in isolation on flashcards (see Table 5). The outcome variables being predicted were reading of content words and reading of function words. Performance on words presented in isolation was analyzed because this is typically how flashcard reading is conducted in classrooms. The question of interest was which language and reading abilities might underlie and enable beginning readers to remember how to read content and function words when no information is provided about the meanings of the words.

The first model examined associations between language and literacy predictors and the outcome measure of content word reading taught without sentences (see Table 5). The model ( $F(4, 76)=5.31$ ,  $p<.01$ ) explained a significant amount of

**Table 4** Language and literacy skills of partial and full alphabetic phase participants

	Partial (N=34)			Full (N=47)			$F(1,79)$
	$M$	(SD)	Range	$M$	(SD)	Range	
Language/vocabulary PPVT	86.15	(9.46)	69–111	89.79	(12.27)	68–123	2.09
Phonemic awareness CTOPP (20 max)	9.79	(4.33)	1–19	12.38	(4.52)	3–20	6.70*
Letter writing (22 max)	20.76	(1.65)	16–22	21.43	(1.25)	17–22	4.21*
Spelling knowledge spelling non-words	7.18	(3.83)	0–14	11.23	(2.54)	0–15	32.92***
Word reading words (WRMT-R)	9.91	(10.52)	0–43	13.94	(9.57)	2–44	3.21

PPVT=peabody picture vocabulary test-IV standard scores; CTOPP=comprehensive test of phonological processing; WRMT-III=woodcock reading mastery test-III

\* $p<.10$ ; \*\* $p<.05$ ; \*\*\* $p<.001$

**Table 5** Multiple regression models predicting flashcard learning of content and function words when words were taught without sentences (N=81)

Predictors	Content words			Function words		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Language/vocabulary	0.004	0.022	0.020	0.052	0.025	0.227*
Phonemic awareness	0.115	0.051	0.253*	0.080	0.060	0.142
Spelling knowledge	0.039	0.065	0.070	-0.009	0.076	-0.013
Word reading	0.060	0.023	0.291*	0.116	0.027	0.455***
$R^2$	0.22			0.31		

Model for Content Words:  $F(4,76)=5.31^{**}$ ; Model for Function Words:  $F(4,76)=8.44^{***}$ ; *B*=Beta weight. *SE*=standard error.  $\beta$ =standardized beta weight. Language/vocabulary measured by the PPVT (Peabody Picture Vocabulary Test-IV); phonemic awareness by the CTOPP (Comprehensive Test of Phonological Processing); spelling knowledge by spelling of nonwords scored at the letter level; and word reading by Woodcock Reading Test

+ $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

the variance ( $R^2=.22$ ) in the reading of content words, and phonemic awareness ( $\beta=.253$ ,  $p < .05$ ) was a unique predictor over and above baseline word reading skill ( $\beta=.291$ ,  $p < .05$ ) in learning content words. This shows that, controlling for literacy skills, language proficiency as measured by vocabulary scores did not predict performance of reading content words in isolation, while literacy skills collectively were unique predictors. This may not be surprising as the content words were all highly familiar nouns. The same regression analysis was conducted this time with the reading of function words presented without sentence contexts as the outcome (see Table 5). The model ( $F(4, 76)=8.44$ ,  $p < .001$ ) explained a significant amount of the variance ( $R^2=.31$ ) in the reading of function words, and here language/vocabulary skill ( $\beta=.227$ ,  $p < .05$ ) was a unique predictor over and above baseline word reading skill ( $\beta=.455$ ,  $p < .001$ ) in learning more challenging function words. Unlike performance on reading content words, for performance on reading function words, language proficiency and literacy skills were both unique predictors of this outcome, reflecting differences among children in recognizing the semantic identities of function words heard in isolation.

### Predictors of children's word learning by language background

A series of regression analyses were conducted examining associations between language and literacy predictors and word learning outcomes within language background groups (see Table 6). The model predicting content word learning for native English-speaking kindergarteners was not significant, but the model for nonnative English speakers did predict significant variance in content word learning ( $F(4, 36)=3.44$ ,  $p < .05$ ;  $R^2=.28$ ), driven by associations between baseline word reading skills ( $\beta=.369$ ,  $p < .05$ ) and content word learning. Similarly, models predicted significant variance in function word learning for both native ( $F(4, 35)=5.28$ ,  $p < .01$ ;  $R^2=.38$ ) and nonnative English-speaking kindergarteners ( $F(4, 36)=3.27$ ,  $p < .05$ ;

**Table 6** Multiple regression models predicting flashcard learning of content and function words for native (N = 40) and nonnative English speakers (N = 41)

Predictors	Content words						Function words					
	Native English speakers			Nonnative English speakers			Native English speakers			Nonnative native English speakers		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Language/vocabulary	0.014	0.031	0.073	−0.012	0.043	−0.042	0.061	0.034	0.256+	0.005	0.051	0.015
Phonemic awareness	0.131	0.079	0.293	0.110	0.077	0.224	0.042	0.087	0.073	0.108	0.093	0.185
Spelling knowledge	0.047	0.102	0.081	0.047	0.092	0.081	−0.005	0.113	−0.006	−0.026	0.111	−0.037
Word reading	0.031	0.051	0.115	0.067	0.029	0.369*	0.158	0.057	0.456**	0.095	0.035	0.438*
<i>R</i> <sup>2</sup>	0.17			0.28			0.38			0.27		

Model for Content Words Native speakers:  $F(4,35)=1.84$ ; Model for Content Words Nonnative speakers:  $F(4,36)=3.44^*$ ; Model for Function Words Native speakers:  $F(4,35)=5.28^{**}$ ; Model for Function Words Nonnative speakers:  $F(4,36)=3.27^*$ ; *B*=Beta weight. *SE*=standard error.  $\beta$ =standardized beta weight. Language/vocabulary measured by the PPVT (Peabody Picture Vocabulary Test-IV); phonemic awareness by the CTOPP (Comprehensive Test of Phonological Processing); spelling knowledge by spelling of nonwords scored at the letter level; and word reading by Woodcock Reading Test

+ $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$

$R^2 = .27$ ), and in both cases only baseline word reading skills predicted function word learning for native ( $\beta = .456, p < .01$ ) and nonnative English speakers ( $\beta = .438, p < .05$ ).

### Predictors of children's word learning by alphabetic phase

Participants were categorized as being in either Ehri's (2005, 2014, 2015) partial or full alphabetic phase of reading depending on their performance on the nonword reading pretest, and a series of regressions examining associations between language and literacy predictors and word learning outcomes were conducted within alphabetic phase groups (see Table 7). Models predicting content word learning were not significant for either partial or full alphabetic readers, and baseline word learning predicted content word learning only for partial alphabetic readers. In contrast, while the model predicting function word learning was not significant for partial alphabetic readers, the model predicting the reading of function words *was* significant for full alphabetic readers ( $F(4, 42) = 7.51, p < .001; R^2 = .42$ ), and here language/vocabulary skill ( $\beta = .287, p < .05$ ) was a unique predictor over and above baseline word reading skill ( $\beta = .538, p < .001$ ) in learning more challenging function words.

## Discussion

### Summary of results

The purpose of this research was to examine the commonly used practice of flashcard word learning. First, this study investigated whether foundational language and literacy skills predict learning of content and function words during a flashcard word learning task. Second, the study examined whether language background and/or alphabetic phase moderated the relationship between foundational language and literacy skills and word learning in the context of a flashcard word learning task.

Analyses revealed differential prediction of learning content words versus function words in isolation. Students' phonemic awareness skills predicted learning content words, but language/vocabulary skill predicted learning function words (controlling for the literacy skill of word reading in each case). This suggests that it is important to consider word type and students' underlying skills in order to best target instruction. Learning to read function words may demand greater proficiency in English language/vocabulary than learning to read content words, and flashcard tasks may not be effective for learning function words when children's language skills are limited.

Language background did not differentiate prediction of learning either content words or function words in isolation. In general, baseline word reading predicted both content and function word learning for both native and non-native English speakers (though it was not a significant predictor of content word learning among native English-speaking children). This suggests that the identification of children's language background alone is not sufficient for the determination of which language

**Table 7** Multiple Regression models predicting flashcard learning of content and function words for partial (N=34) and full alphabetic readers (N=47)

Predictors	Content words						Function words					
	Partial phase			Full phase			Partial phase			Full phase		
	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$	<i>B</i>	<i>SE</i>	$\beta$
Language/vocabulary	0.009	0.040	0.041	0.004	0.027	0.022	0.050	0.050	0.197	0.058	0.029	0.287*
Phonemic awareness	0.090	0.084	0.196	0.117	0.072	0.269	−0.012	0.106	−0.021	0.089	0.076	0.163
Spelling knowledge	−0.049	0.100	−0.094	−0.011	0.126	−0.014	−0.080	0.127	−0.127	−0.070	0.132	−0.071
Word reading	0.074	0.033	0.393*	0.041	0.034	0.200	0.080	0.042	0.349 <sup>+</sup>	0.139	0.035	0.538***
<i>R</i> <sup>2</sup>	0.20			0.15			0.12			0.42		

Model for Content Words Partial Phase readers:  $F(4,29)=1.76$ ; Model for Content Words Full Phase readers:  $F(4,42)=1.89$ ; Model for Function Words Partial Phase readers:  $F(4,29)=1.03$ ; Model for Function Words Full Phase readers:  $F(4,42)=7.51^{***}$ ; *B*=Beta weight. *SE*=standard error.  $\beta$ =standardized beta weight. Language/vocabulary measured by the PPVT (Peabody Picture Vocabulary Test-IV); phonemic awareness by the CTOPP (Comprehensive Test of Phonological Processing); spelling knowledge by spelling of nonwords scored at the letter level; and word reading by Woodcock Reading Test

<sup>+</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$



and literacy skills support children's ability to identify and learn words in isolation. This result questions the utility of only determining whether a child is an English language learner (ELL) or not when differentiating instruction for word learning.

In contrast, comparing children based on partial or full alphabetic phase did differentiate prediction of learning function words in isolation. Language/vocabulary skills, as measured by the PPVT, predicted function word learning, but only for children in full alphabetic phase. This finding suggests that children can draw upon their language/vocabulary skills to learn function words during a flashcard word learning activity only when they have a certain level of alphabetic skill. Therefore, identification of children's relative alphabetic skill appears to be an important factor for teachers to consider when planning word learning activities.

The finding that language/vocabulary proficiency predicts young children's ability to read function words in isolation suggests that educators should consider students' English vocabulary skills, regardless of their native language status, when using word reading tasks that involve the reading of function words in isolation. As previously mentioned, often young children are given lists of preprimer and primer words to either read in a list or on flashcards. An examination of these lists showed that they are full of function words (Miles & Ehri, 2017; Weber, 2006). These words are often on these lists because they are considered basic, short words that are thought to be easier to read than longer, more complex content words. However, depending on students' language/vocabulary skills, it may be futile to have beginning readers spend time reading function words in isolation. Instead, consideration should be given to whether words on these lists should be presented within a context to clarify meaning (Ehri & Roberts, 1979; Ehri & Wilce, 1980; Johnston, 2000; Stuart et al., 2000; Wang et al., 2011), to whether emphasis should be given to the grapho-phonetic connections of the word (Arra & Aaron, 2001; Miles, Rubin, Gonzalez-Frey, 2017; Boyer & Ehri, 2011; Shahar-Yames & Share, 2008; Stuart et al., 2000; Uhry & Shepherd, 1997), and/or to whether a combination of grapho-phonetic and sight word flashcard training (McArthur et al., 2015) should be used to best secure the words in memory.

This finding also supports the results of previous studies that showed young children-both native and nonnative English speakers-had difficulty identifying, reading, and spelling function words (Ehri, 1975, 1976; Miles & Ehri, 2017; Morris, 2001, 1992). Nonnative English speakers who have had little exposure to the English language and native English speakers with low levels of language/vocabulary skills may both require additional analysis of the orthographic structure and exposure to the use of the function word in context. In other words, flashcard word reading may not be a sufficient method of instruction for students with limited language/vocabulary skills, regardless of their native language status, when learning function words. As Ehri (2014) explains, the pronunciation, spelling and meaning of words create an amalgam that supports word storage in memory. It may be that the lack of meaning available when presenting function words in isolation hinders the word learning process for these students.

The other main finding of this study is that language background, as reported by teachers, is not a sufficient categorization to inform educators about the best instruction to support their learning of challenging sight words. This aligns with Keiffer's

(2008, 2010) work which demonstrates the importance of distinguishing between nonnative English speakers who enter school either with limited or with proficient English language skills. As Kieffer shows, students who enter schools with proficient English skills quickly catch up to native English speakers, while students who enter school with limited English proficiency skills lag significantly behind native English speakers. Simply put, the broad school-based categorizations that are typically used to plan word learning activities are not nuanced enough to be meaningful for instruction.

More specifically, Kieffer (2010) showed that when students categorized as English language learners were compared to native English speakers of similar socioeconomic background (SES), differences in risk for reading failure in later elementary school were substantially reduced. Kieffer states that this finding suggests SES, not native English language status, served as the best predictor of risk for literacy difficulties. Similarly, Kieffer and Vukovic (2012) showed that nonnative English-speaking students who enter school with limited English language skills have similar literacy profiles, as measured by linguistic comprehension and code-related skills, as native English speakers with similarly limited English skills in urban schools.

This study adds to this body of literature that considers the types of student categorizations that are most informative to policy makers, curriculum creators, school leaders, and educators as a means to thoughtfully target instruction to students with similar needs. This study demonstrated that attention to students' alphabetic development (partial vs. full alphabetic phase) was more predictive than native English language background status in determining students' ability to learn difficult function words on flashcards. As the findings showed, full alphabetic readers may be equipped to learn to read function words in isolation on flashcards. It may be that their grapho-phonetic skills are sufficiently developed in order to analyze and store the orthographic representation of the word in memory, along with its meaning, for later retrieval. However, students in the partial alphabetic phase may not have the necessary grapho-phonetic skills to quickly analyze and securely store the words in memory. In other words, having students in the partial alphabetic phase, regardless of whether they are native or nonnative English speakers, read function words on flashcards may be a futile task. Instead, instructional time may be better spent supporting these students' phonemic awareness, grapheme-phoneme knowledge, and blending skills. Once these skills are sufficiently in place, they may be able to benefit from reading words in isolation on flashcards.

Kindergarten classrooms are full of students at the partial and full alphabetic phase, in part due to differences in access to preschool, quality of literacy instruction within preschools, and quality of literacy support in the home environment. Kindergarten teachers need to be aware of the complexity of literacy development and how students' literacy profiles may interact with their high frequency word list instruction. This study suggests that early childhood teachers of English should consider two things: the number of function words they are assigning students to read in isolation, and the productivity of flashcard reading for students whose time may be better spent strengthening more basic grapho-phonetic skills. In the simplest terms, these findings provide strong support for differentiated literacy instruction at the word level. A one-size-fits-all approach to teaching English words commonly

included on sight word lists for early readers is not sufficient. Results indicated that flashcard word reading will not close the gap between readers in the partial and full phases in the kindergarten year in U.S. classrooms, a critical time to ensure that all readers are off to a strong start with their word recognition skills.

### Limitations, future directions, and conclusions

An important limitation of the study is the categorization of students as native and nonnative English speakers. In the present study, teachers indicated whether the students were native speakers who had learned English at birth or a very early age, or nonnative speakers. Teachers' categorizations of students were based on school records and their knowledge of the English language proficiency of each child. Students who teachers considered to be as proficient as a native English-speaker were coded as native speakers, while students who were receiving ESL supports and who the teacher considered as not being proficient in English were coded as nonnative speakers. Future studies should include multiple measures of language proficiency, including a standardized measure of children's English reading, writing, speaking, and listening proficiencies and questionnaires for primary caregivers in order to classify students according to language background status and English language proficiency. This would allow for a more nuanced categorization of nonnative speakers who are truly still acquiring English language skills in comparison to young nonnative English speakers who are quickly catching up to their English-proficient native speaking peers.

Future studies should also investigate performance of students from specific language backgrounds in greater detail. In the present study, students were from a variety of native languages. It may be that individuals from languages that are more similar to English phonetically and/or structurally may have an easier time acquiring sight words.

Another limitation was the number of target words. Six content and six function words were included in the word learning task. This limited number was necessary due to the time constraints and developmental appropriateness of the task. Future studies should include more words of both kinds, and also focus more specifically on particular types of function words or words that are more generally dependent on context for their meaning. It may be that one type of function word is more difficult to learn than others.

Also, future studies should refine the categorization of students into partial and full alphabetic phase. In this study, performance on a nonword reading task was used to establish whether students were able to use their letter-sound knowledge to read CVC nonwords. Future studies should consider a more comprehensive categorization of partial and full alphabetic phase by cross-referencing students nonword reading and nonword spelling ability, as Ehri's phase theory considers development in both (Ehri, 2005, 2014).

In summary, two important distinctions between the beginning readers were evident in this study. First, language/vocabulary skills in English predicted performance in reading function words in isolation, but it did not predict performance

of reading content words. Second, categorization of students as partial versus full alphabetic readers, but not language background in terms of native or nonnative English-speaking status, predicted performance in reading function words. These results suggest that flashcard word reading of function words may be problematic for emergent readers who have limited English-language vocabulary skills, regardless of their native language status, and for those who are functioning in the partial alphabetic phase. However, these may be the very students for whom this practice of sight word reading of function words is used most frequently in a well-intentioned effort to catch these students up to their peers. Future studies should continue to investigate this commonly used practice of flashcard word reading. Attention should be paid to the interaction of this instructional method with the types of words used and the language and literacy skills of the students being asked to learn from the task. Valuable time may be being spent on a task that is not effective or efficient for emergent and/or struggling readers.

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