



Learning to Read Words on Flashcards: Effects of Sentence Contexts and Word Class in Native and Nonnative English-Speaking Kindergartners



Katharine Pace Miles^{a,*}, Linnea C. Ehri^b

^a Department of Early Childhood Education, Brooklyn College, Brooklyn, NY 11210, United States

^b Department of Educational Psychology, Graduate Center, City University of New York, United States

ARTICLE INFO

Keywords:

Sight word learning
Flashcard word reading
Word reading in sentences or isolation
Grammatical form class of words
Nonnative English-speakers

ABSTRACT

This study investigated three questions: 1) Does clarifying the meanings of words during flashcard reading better support word learning over not providing meanings? 2) Does grammatical word class affect word learning? 3) Do these manipulations affect word learning differently in native and nonnative speakers of English? Native ($n = 40$) and nonnative ($n = 41$) English-speaking kindergartners practiced learning to read nouns and function words on flashcards in a repeated measures, counterbalanced design with random assignment. In one condition words were taught in meaningful sentences. In the other condition words were taught in isolation. Results of ANOVAs revealed that both native and nonnative speakers of English were better able to read words when they were taught in isolation than in sentences, and native speakers were better able to spell the words as well. However, both groups showed better ability to express their meanings when words were read in semantically rich sentences than when read in isolation. Children learned to read, spell, and produce sentences for content words more easily than for function words. Results indicate that the way children practice reading words and the type of words being read influence what they learn about the words.

1. Introduction

One goal of early childhood literacy education is to establish a foundation enabling children to become fluent readers with strong comprehension skills during their years in elementary school. Essential ingredients of successful reading skill lie in readers' acquisition of decoding skill and a large sight word vocabulary so that the recognition of words becomes effortless during text reading. Questions still remain as to what teaching practices best support beginning readers in acquiring sight word vocabularies. One such practice involves having beginners read high frequency words on flashcards with the belief that these words need to be memorized, especially if the words are spelled irregularly, in order to read them automatically. The purpose of the current study was to examine factors that influence sight word learning conducted with flashcards.

1.1. Flashcards to Teach Sight Words

Two concepts of sight word learning can be distinguished (Ehri, 1998). One is a method of teaching that involves having students practice reading isolated words on flashcards. The other is a learning process in which the mind stores written words that readers have read

repeatedly. When readers come across such words in print, their spellings, pronunciations, and meanings are immediately retrieved from memory. According to Ehri, sight word reading is not limited to strangely spelled words or high frequency words. On the contrary, the goal of efficient reading is to make all words sight words so that they are activated automatically in memory. Only then is mental energy for word level processing freed up so that readers can allocate more attention to the comprehension of a text.

Flashcards are commonly used to teach children to read words by sight. Typically each word is printed in isolation on a card. Early childhood teachers report using flashcard rings, flashcard boxes, and repeated readings of high frequency words such as those on the Dolch list with the goal of enabling children to read the words quickly and automatically as whole units from memory. This method is employed without regard for the types of words on the cards, or for students' ability to recognize meanings of the words when read out of context, or for students' knowledge of letter-sound relations enabling them to store the written words in memory. One purpose of the present study was to examine the impact of these factors on flashcard word learning.

Ehri (2015) suggests that the type of written word matters in sight word learning. Some words are more heavily dependent upon sentence contexts for activating syntactic and semantic identities than other

* Corresponding author.

E-mail address: kpmiles@brooklyn.cuny.edu (K.P. Miles).

words. These words, referred to as function words or context dependent words, include conjunctions, prepositions, auxiliary verbs, and irregular past tense verb forms (e.g., *with, of, from, this, kept, gave*). They require exposure to the words in meaningful sentence contexts to activate and connect their syntactic and semantic identities to their spellings and pronunciations. This is different from content rich words such as concrete nouns whose pronunciations alone may be sufficient to activate their meanings.

Differences between form class of words has been demonstrated. Paivio (1991) explains that nouns are more concrete than other form classes. The concrete nature of nouns invokes mental images upon hearing the word more readily than when other more abstract types of words are heard. Entwisle (1966) investigated young children's progression of responses in a word association task from unrelated to syntagmatic to paradigmatic responses. Results indicated that how young children responded was dependent upon the form class of the stimulus with responses to verbs and adverbs being more slow to develop in the hierarchical progression of word associations than responses to nouns. Cronin (2002) more recently conducted a word association task in young children and also found that grammatical form class of the stimuli impacted the occurrence of paradigmatic responses, again with nouns eliciting more of these higher level paradigmatic responses than verbs or the combination group comprised of adverbs, pronouns, conjunctions and demonstratives.

This difference in word type is thought to impact the learning that results when children read words on flashcards to store them in memory. While Beck and McKeown (1991) explain the role of context for learning new words in general, it may not make any difference for nouns if they are given extra contextual supports when learned, but this may make a difference for other word types that are more reliant on the surrounding text for its semantic and syntactic identity. One purpose of the present study was to compare word learning with and without sentence contexts displayed on flashcards to examine whether function words are learned better with than without contexts whereas concrete nouns are little affected by the difference.

Of concern is that flashcards to teach sight word reading may be used with children as young as three months old. This practice is included in various programs to teach babies to read. Neuman, Kaefer, Pinkham, and Strouse (2014) put such programs to the test with an experiment. In the treatment group, babies ranging from 9 to 18 months old received 7 months of daily instruction in a popular Your Baby Can Read program sold in chain stores such as Walmart and Target. The program included single words printed on flashcards. The control group received no training. Results showed that training was ineffective in teaching babies to read words. One reason offered by Neuman et al. (2014) based on Ehri's (2005) phase theory of sight word reading, is that children lacked sufficient alphabetic knowledge to remember how to read words. In the current study, to insure that children would be able to learn to read words on flashcards, we recruited kindergartners who knew at least 16 alphabet letters but had not yet learned to read the words that we taught. According to Ehri, it is developmentally appropriate to teach children to read words on flashcards when they possess sufficient alphabetic skills to retain the spellings of words in memory (see explanation below). One purpose of the current study was to assess whether this method is effective for teaching native and nonnative English speakers to read words and under what conditions.

1.2. Theory of Sight Word Learning

Besides reading words by sight, there are other ways to read words (Ehri, 2005). These strategies are applied to read words never read before. Readers might decode them by transforming and blending letter-sound relations, or they might adapt known words to read new words by analogy (e.g., reading *fight* by analogy to *light*), or they might use context clues to predict words. However, if readers have read words before, they may be able to read them from memory by sight.

To explain sight word learning, similar connectionist theories have been offered by Ehri (1980, 1992, 2005, 2014) and others (Kilpatrick, 2015; Perfetti & Hart, 2002; Seymour & Duncan, 2001; Share, 2008). According to Ehri's word amalgamation theory, learning to read words by sight involves the reader forming connections between multiple identities of individual words in memory, including their orthographic, phonological, syntactic, and semantic identities. Connections between spellings and pronunciations are formed when readers map letters onto sounds in words. In this way, spellings of the words become bonded to their pronunciations and are retained in memory. Semantic connections are formed when contexts activate the relevant meanings of words. Connections involving the syntactic functions of words require reading the words in meaningful sentences. The first few times that readers encounter and read a new word in print, one or another strategy is applied. This activates multiple identities that become bonded together in memory for that word. Subsequently when the word is seen again, it is read from memory rather than by application of a strategy. Sight of the word activates its identities enabling it to be recognized immediately. It is important to note that according to this theory, all words become sight words when readers are able to read them from memory, not just high frequency words or irregularly spelled words. One purpose of the present study was to examine flashcard word reading conditions that facilitate learning the orthographic, syntactic and semantic identities of words.

Optimal conditions for learning the orthographic identities or spellings of words may be different from the optimal conditions for learning syntactic and semantic identities. Sentence contexts may be optimal for learning meanings of words but less so for learning spellings. According to Ehri (1980, 1992, 2005, 2014), orthographic identities are acquired when readers apply grapheme-phoneme knowledge and phonemic segmentation to connect spellings to pronunciations in memory. However, when words are read in sentences, letter-sound relations may not be fully analyzed, thus limiting the retention of spellings in memory. Sentences may enable readers to anticipate word identities before they are read and hence to slight spellings. Also, the reader's eyes may spend less time fixating on words embedded in sentences than on words written alone. This suggests that reading words in sentences on flashcards might be less effective for remembering how to read and spell the words than reading words printed in isolation on flashcards. In the current study, this possibility was tested.

To summarize predictions based on amalgamation theory, reading words in isolation were expected to strengthen readers' acquisition of orthographic identities more than reading words in sentence contexts, as reflected in their ability to read and spell the words taught. However, reading words in sentence contexts was expected to strengthen readers' acquisition of syntactic and semantic identities of words more than reading words in isolation, as reflected in the ability to embed the words in sentences and to remember their meanings. Moreover, the benefit of contexts was expected to be greater for learning the meanings of function words than content rich nouns.

1.3. Studies of Word Learning

1.3.1. Word Type: Content vs. Function

Previous research has shown that recognizing the syntactic and semantic identities of function words spoken orally is problematic among younger children. Ehri (1975) examined word consciousness in 4–5 year olds who had not yet learned to read. In an oral sentence segmentation task, prereaders were unable to identify the separate words. Rather, they segmented by syllables or stress patterns. When given a function word in isolation, they had difficulty embedding it in a sentence. Morris (1992) also observed children having difficulty distinguishing words as separate units in written sentences as they recited the sentences in a finger point reading task. Often function words were combined with adjacent content words. These findings reveal that prereaders lack much awareness of context dependent words as

separate lexical units.

In another study, Ehri (1976) demonstrated that content rich words were easier for kindergartners and first graders to remember than context dependent words. Children were taught to associate single spoken words with distinctive visual squiggles. Half of the participants heard the words presented with sentences and the other half heard the words spoken in isolation. Associations between nouns and adjectives and their squiggles proved much easier to remember than verbs, prepositions, and function words. Learning function words was especially hard for kindergarten prereaders, presumably because they did not recognize these as units in their language. Even hearing the words in sentences did not improve learning. Applied to the current study, the above findings suggest that learning to read function words may be especially difficult for beginning readers even when the words are embedded in sentences.

1.3.2. Word Learning: Context vs. Isolation

The influence of word reading experiences on children's memory for words has also been studied. Johnston (2000) examined whether word learning by rereading predictable books could be enhanced by providing first graders with additional practice either reading words from the texts on sentence strips or reading individual words from the texts in isolation. Children learned to read more words in the latter two conditions, with the greatest learning occurring when the words were read in isolation. Also, Stuart, Masterson, and Dixon (2000) showed that learning words on flashcards in isolation best supported students' word reading skills over learning words presented in books and in a mixed condition. It should be noted that their flashcard condition also included a conversation about the word's meaning, which resulted in better word meaning recall scores for the flashcard condition over the other two conditions.

In two studies (Ehri & Roberts, 1979; Ehri & Wilce, 1980) investigated reading experiences that facilitate the learning of words in first graders. Both studies demonstrated that students who learned target words embedded in sentences learned more about the syntactic/semantic identities of the words, whereas students who practiced reading target words on lists learned more about the orthographic identities of the words. These findings indicate that what children learn about words depends on how they practice reading the words. Results support our predictions regarding the differential effects of flashcard word learning with and without sentence contexts.

The above studies by (Ehri & Roberts, 1979; Ehri & Wilce, 1980) examined either content or function word reading but did not compare the two types of words. In the current study, both types of words were compared. A question of interest was whether reading words in sentences would benefit function word learning more than content word learning compared to reading words in isolation. We expected that the syntactic and semantic identities of content words would be fully recognized and learned without sentence contexts whereas the meanings of function words would not.

1.4. Word Learning in English Language Learners

While educators acknowledge that ELLs are at increased risk for reading difficulties (Garcia & Kleifgen, 2010; Kieffer, 2008, 2010), sources of the difficulties have yet to be fully understood (August & Shanahan, 2006, 2008). Goldenberg (2013) explains that while there has been a dramatic increase in the number of professional publications regarding ELLs since 2000, there is still little empirical research on instructional approaches that improve ELLs' development in language and other content areas. One purpose of the current study was to investigate the effectiveness of flashcard word learning with nonnative English speakers.

As discussed above, content and function words may require different supports in order for beginners to store the words in memory. Activation of the syntactic role of written function words by teaching

them in context may be necessary for all beginning readers but especially for ELLs' word learning. Morris (2001) found that ELLs had weaker orthographic memory for function words in comparison to content words. Goldenberg (2013) and Goldenberg and Quach (2010) suggested that ELLs may need additional learning supports. One possible source of support involves designing the flashcard word reading task to activate the meanings of function words. The current study investigated the effect of teaching function and content words in isolation and in meaningful contexts on the word learning of nonnative English-speaking kindergartners.

Morris's (2001) findings support the difficulty of function words for ELLs. She analyzed the writing errors of fifth and sixth grade ELL students and native English speakers. Students were asked to produce a short written response to a picture prompt. ELLs were found to leave out more function words than content words in their writing. Also, ELLs spelled content words surprising well compared to function words. Even content words with more complex spellings patterns were written correctly. In contrast, function words were less frequently spelled correctly, with unstressed function words spelled incorrectly most often, despite the fact that these were high frequency words. The same pattern of errors was not observed in the spellings of native English speakers. Morris concludes that intensive exposure to oral and written forms of English were not sufficient for these ELLs to acquire orthographic knowledge of high frequency unstressed function words, even though exposure was sufficient to acquire orthographic knowledge of content words. Apparently the lack of phonetic and informational salience of words played a larger role in ELLs acquiring orthographic knowledge of the words than did frequency of exposure to the words.

The findings of Morris (2001) suggest that function words may be especially difficult for ELLs to acquire. Sheng, McGregor, and Marian (2006) found equivalent development of lexical-semantic organizations in bilinguals' two languages so it may be that function words are more difficult to acquire than content words, especially when the languages lack structural similarities (Jiang, Novokshanova, Masuda, & Wang, 2011; Jia & Fuse, 2007). Hence, ELLs may need to receive additional support to better secure function words in memory.

In conclusion, the current study was designed as an experiment to test the following hypotheses:

1. Children will learn to read and spell words more easily when the words are read in isolation without sentences than when the words are read in meaning-clarifying sentences.
2. Children will learn the meanings of written words better when the words are read in meaning-clarifying sentences than when the words are read in isolation. The advantage of sentences over no sentences in learning meanings will be greater for context dependent words than for nouns, and greater for nonnative speakers of English than for native English speakers.
3. Children will learn to read, spell, and embed words in sentences more easily when the words are nouns than when they are context dependent words. Learning context dependent words will suffer more from the absence of sentences than the learning of nouns will, and this difference will be magnified among nonnative speakers of English compared to native English speakers.

2. Method

2.1. Participants

Participants were 81 children, 40 native English speakers and 41 nonnative English speakers. Characteristics of the two groups are presented in Table 1. Children were drawn from six kindergarten classrooms in four public schools serving predominately middle or low socio-economic students in a large Northeastern metropolitan area. In three out of the four schools, one hundred percent of the students qualified for free or reduced lunch. In the fourth school fifty two

Table 1
Characteristics and Abilities of Native and Nonnative English Speaking Participants.

| | Native | Nonnative |
|-------------------------------------|--------------------|-------------------|
| Age (<i>M</i> , <i>SD</i> , Range) | 6;1 (0.31) 5;5-6;6 | 6;1 (.36) 5;6-7;2 |
| Gender (Female/Male) | 19/21 | 23/18 |
| 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 |

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

percent qualified. Independent samples *t*-tests compared children in the more affluent environment ($n = 25$) and less affluent environment ($n = 56$) on all baseline reading skills and no significant differences were found (all $ps > .05$). Students were tested in May and June of their kindergarten year.

English as a second language (ESL) instruction was available for students who qualified in all four schools. In three of the classrooms teachers provided dual language instruction (two Spanish/English classrooms, and one Chinese/English classroom). In the other three classrooms, English was the primary language of instruction, and nonnative English speakers in need of language support received ESL instruction.

The primary researcher spoke with principals to obtain permission to work with students enrolled in kindergarten classrooms. After teacher permission was obtained, consent letters were sent home both in English and the child's native language to parents explaining the study and requesting permission to have their child participate. The children whose parents signed permission forms were pretested individually to determine qualification for participation in the study. After the beginning of each pretest session, researchers explained to the children what they would be asked to do, and they were asked if they were willing to participate in the study. Children who agreed to participate were then administered the pretest measures. All children were given the option to withdraw at any time. Children's behavior was monitored during the course of the study, and if a child displayed signs of discomfort the researcher investigated the possible causes. When this occurred, the researcher obtained the child's consent to continue the procedures. No child was dismissed from the study.

Children were pretested individually to determine qualification for the study. There were two screening criteria for participation: 1) ability to write a minimum of 16 out of 22 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. Of the 110 children who were pretested, eight failed to qualify because they could not correctly write 16 out of 22 letters, and 21 because they read more than two target words correctly.

Teachers classified children as native or nonnative English speakers based on children's school enrollment records. Students who had learned both English and another language since birth or very young (before preschool) and whom the teachers considered to be proficient English speakers were included in the native speaker group in this study. Native and nonnative English speaking students were randomly assigned to the four word learning conditions.

The literacy curriculum provided within the regular kindergarten classroom revolved around meeting the Common Core Standards for kindergarten. Each of the classes had adopted a curriculum that was aligned with standards. Instruction involved read alouds with a focus on questioning, small group leveled reading, and word work sessions that included letter knowledge. Instruction also involved the use of decodable readers that were assigned based on reading ability. Teachers in three of the four schools stated that the majority of time for reading instruction focused on reading comprehension activities due to the new state mandates. One of the four schools provided differentiated small group instruction focused on letter-knowledge and decoding skills for students whose word reading skills placed them in the bottom third of the class. Another one of the schools provided this type of instruction in the mornings before school started for students whose reading performance was below grade level. All of the classrooms had a word wall with sight words posted. All of the teachers confirmed that the words included in this study had not been explicitly taught during word work sessions nor were they included on the word walls. Students participated in the study towards the end of the school year in either May or June.

2.2. Materials and Procedures

Three research assistants were hired to work on this study. The assistants were graduate and undergraduate (seniors) in psychology or speech-pathology who had previous experience using educational or psychological measures with children in a one-on-one setting. Research assistants completed a three hour training session conducted by the primary researcher. The primary researcher discussed each pre and post assessment with the research assistants. She modeled how the assessments should be administered and gave examples of potential student responses. Research assistants were given practice packets to complete with a friend, sibling, or child at home. They attended a follow-up meeting with the primary researcher to clarify and rectify any issues with the materials and/or protocols. Each research assistant conducted pre and post testing with both native and nonnative speakers who were randomly and evenly distributed to their caseloads on each day of testing. All research assistants were kept blind to the hypotheses of the study for the entire duration of testing and scoring.

On the first day of testing, there was one pretest session lasting approximately 30 min and conducted individually. On a subsequent day, students completed two rounds of word learning, one round with meaning clarifying sentences and one round without. Following each round, students' sentence production skill and memory for spellings of the target words were assessed. Each round plus posttests for that set of words lasted 15 min. Students were given a break of 25–30 min between the two rounds of word learning.

2.2.1. Literacy and Language Pretest Measures

Students' language and literacy levels were assessed with several tasks measuring phonemic awareness, letter knowledge, spelling, word reading, nonword decoding, and vocabulary.

2.2.2. Phonemic Awareness

Students' ability to segment and blend phonemes was assessed using the Sound Matching subtest of the Comprehensive Test of Phonological Processing (CTOPP; Wagner, Torgesen, & Rashotte, 1999). In the First and Last Sound tasks, the experimenter asked which of three depicted words starts or ends with the same sound as the spoken target word, and she stated the names of the three picture choices. The maximum number of trials was ten. The Spearman-Brown split-half reliability of the measure for this study was .75.

2.2.3. Letter Knowledge

Students' knowledge of 22 letter shapes and sounds (v, x, q, z were not included) was assessed using a letter writing and a letter sound task.

Students heard the name of each letter and they attempted to write the letter. Lower case and capital letters were acceptable. Then students were shown each capital letter and they pronounced the sound made by that letter. Students who wrote fewer than 16 out of 22 letters were not included in the study.

2.2.4. Spelling Nonwords

The experimenter pronounced five regularly spelled nonwords (*hud, gat, kif, des, jom*), students repeated the word, and then wrote it. Credit was given for each phonetically correct letter. Incorrect phonetic representations were not scored, and any correct phonetic representations written after the letter representing the final sound in the word was not given credit. If a phonetic component of the target word appeared within a random string of letters that a student produced, credit was not awarded. The interrater reliability (Cohen's kappa) of letter scores was .92. Cronbach's alpha reliability coefficient was .66.

2.2.5. Sight Word Reading

The Word Identification subtest of the Woodcock Reading Mastery Test-III (WRMT-III; Woodcock, 2011) assessed students' sight word vocabulary. Students read words on a list until six or more words within a set were read incorrectly. The split-half reliabilities of the WRMT-III range from .86 to .99 as reported in the manual.

2.2.6. Target Word Reading

Student's ability to read the 12 target words to be used in the word learning task was pretested. Students who read three or more of the 12 words were eliminated from the study.

2.2.7. Decoding Nonwords

Students' ability to decode five nonwords (*dut, sep, mul, kaf, nib*) was assessed. The experimenter explained that the words were not real words. Floor effects precluded determining the reliability of this measure.

2.2.8. Vocabulary

The Peabody Picture Vocabulary Test-4 (Dunn & Dunn, 2007), Form A or Form B assessed students' receptive vocabulary. Students were shown each of several pages with four pictures and pointed to the picture of the target word. The split-half reliability coefficients of this measure on Forms A and B as reported in the manual are .94 and .95, respectively.

2.2.9. English Language Proficiency Rating

A rating scale was adapted from the Language and Social Background Questionnaire (Luk & Bialystok, 2013). The questions stated, "Relative to a native English speaker's performance, rate the child's proficiency level on a scale of 0–100 for the following activities conducted in English." Four activities were provided for teachers to rate performance: reading, writing, understanding, and speaking in English. Each activity was followed by a continuum, with 0 indicating no proficiency and 100 indicating native-like proficiency. Teachers were asked to put an 'x' where they believed the students fell on the continuum. Interrater was not available because there was only one teacher per classroom.

This measure provided the researchers with informal information about nonnative speakers' English language skills beyond what was available by the classifications provided by the schools. This was important because nonnative speakers may have very little English language proficiency skills or they may be close to native-like depending on the extent of their exposure to English. This measure helped to further elucidate the extent to which the native and nonnative English speaker groups differed in their English language skills.

2.2.10. Word Learning on Flashcards

Individual students were given practice learning to read words on

flashcards. Twelve high frequency words commonly found on graded lists were selected. They were assigned to two lists, six words per list. Three words in each list were context dependent words (i.e., Set A: gave, told, since; Set B: held, kept, might), and three words were context independent nouns (i.e., Set A: farm, heat, clock; Set B: soap, crab, fence). 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. The researchers prioritized word type and having each word start with a different letter in generating these sets. This resulted in the context independent nouns being at second or third grade-equivalent levels whereas the context dependent words were at first or second grade-equivalent levels according to Harris and Jacobson (1982). Thus, grade equivalent levels favored the context-dependent words. In other words, the fact that context-dependent words were at a lower grade level than content words suggests that they should be easier to learn to read. In the current study, context-dependent words are also referred to as function words.

Within each condition, one set of words was taught with meaning clarifying sentences and the other set was taught without sentences in a repeated measures design. The order of treatment (sentences vs. no sentences taught first) and the word set (Set A vs. Set B) were counterbalanced across students. Native and nonnative English speaking students were randomly assigned to the four order x list conditions using a blocking system.

At the start of each word learning task, students were told that they should learn the words so they could remember how to read them. They were given one study trial where they were told how to read the six words, and students in the sentence condition saw and heard each word embedded in a sentence. This was followed by three test trials. In both conditions, students were shown each target word presented singly on a card and they attempted to read it. After each attempt, they saw a second card providing feedback. In the sentence condition, the card showed the target word embedded in a written sentence. As the experimenter read the sentence, she pointed to each of the words spoken. Then the student was directed to find and point to the target word. This required locating it within the sentence. The experimenter provided feedback by pointing to the word and reading it again. In the no sentence condition, the second card displayed only the isolated word. The experimenter pointed to and pronounced the word. Then the student pointed to the word while the experimenter pronounced it again. The procedures insured that students pronounced the target words the same number of times in the two conditions.

2.2.11. Posttest Measures

The two posttests to assess memory for spellings and meanings of target words were individually administered immediately following the final test trial in each of the two word learning tasks.

2.2.12. Spelling Task

The experimenter said each target word, students repeated the word, and wrote it. Credit was given for each correctly recalled letter. Incorrect phonetic representations were not scored, and any correct phonetic representations written after the letter representing the final sound in the word was not given credit. If a phonetic component of the target word appeared within a random string of letters that a student produced, credit was not awarded. The maximum score was 26. The interrater reliability (Cohen's kappa) for scoring spellings at the letter level was .92.

2.2.13. Sentence Production

A sentence production task measured students' knowledge of the syntactic and semantic identities of the target words. The experimenter said each word and students embedded the word in a meaningful sentence that they spoke aloud. Three categories were used to judge the quality of the sentences produced. The categories were 'complete,' 'questionable,' and 'unacceptable.' A rubric was used for scoring student

Table 2
Scores of Native and Nonnative English Speaking Participants.

| | Native (N = 40) | | | Nonnative (N = 41) | | |
|--|-----------------|---------|--------|--------------------|---------|--------|
| | M | (SD) | Range | M | (SD) | Range |
| English Lang. Proficiency Rating (100 max) | | | | | | |
| Speaking | 90.38 | (14.74) | 50–100 | 60.85 | (19.13) | 25–100 |
| Understanding | 93.13 | (11.53) | 50–100 | 71.10 | (16.34) | 40–100 |
| Reading | 85.00 | (20.29) | 25–100 | 63.05 | (15.49) | 25–90 |
| Writing | 83.75 | (21.05) | 25–100 | 62.20 | (15.25) | 25–90 |
| PPVT Vocabulary | | | | | | |
| Standard | 94.18 | (11.35) | 72–123 | 82.49 | (7.67) | 68–101 |
| CTOPP (20 max) | 12.40 | (4.72) | 3–20 | 10.22 | (4.26) | 1–17 |
| Letter Writing (22 max) | 21.40 | (1.22) | 17–22 | 20.90 | (1.64) | 16–22 |
| Letter Sound (22 max) | 20.43 | (1.89) | 14–22 | 19.27 | (4.11) | 0–22 |
| Spelling Nonwords | | | | | | |
| Letters Correct (15 max) | 10.45 | (3.64) | 0–15 | 8.63 | (3.61) | 0–14 |
| Word Reading | | | | | | |
| WRMT-III Raw Score | 9.83 | (7.80) | 0–28 | 14.61 | (11.57) | 0–44 |
| % Zero | | | | 5% | 2.4% | |
| Target Words (12 max) | 0.43 | (.78) | 0–2 | 0.46 | (.71) | 0–2 |
| % Zero | | | | 75% | 65.9% | |
| Nonwords (5 max) | 1.65 | (1.56) | 0–5 | 1.24 | (1.53) | 0–5 |
| % Zero | | | | 35% | 48.8% | |

Note: PPVT = Peabody Picture Vocabulary Test- IV. CTOPP = Comprehensive Test of Phonological Processing. WRMT-III = Woodcock Reading Mastery Test-III.

responses based on these categories. Complete sentences were awarded two points, questionable sentences one point, and unacceptable sentences zero points. To be considered a complete sentence, the target word had to be used correctly and the sentence had to specify a context that included at least one content word. Sentences judged as questionable did not completely specify the syntactic or semantic role of the target word. These sentences were abbreviated sentences that lacked a content word, included an incomplete phrase, or included an odd sentence or an uncommon combination of words that strained the use of a word. The maximum score for this task was 12. The interrater reliability (Cohen's kappa) of this task was .98.

3. Results

3.1. Characteristics of Participants

Several pretests were used to qualify students for the study and to determine students' level of language and literacy skills. Mean scores are reported in Table 2 for native and nonnative speakers of English. It is evident that students performed close to ceiling on the measure assessing letter writing ability used to qualify them for the study. Knowledge of letter sounds was also high on average although nonnative English speakers showed much greater variability on this measure than native speakers. Students were unable to read more than two target words with the majority reading no target words, showing that screening minimized students' familiarity with the words to be taught.

Teacher mean ratings to assess students on their ability to speak, understand, read, and write English were higher and closer to 100 for native speakers compared to their ratings for nonnative English speakers whose means ranged from 62 to 71 (see Table 2). Mean standard scores on the PPVT-4 vocabulary test (Dunn & Dunn, 2007) were also higher among native than nonnative speakers but in both cases were below average, with nonnative English speakers scoring more than one standard deviation below the norm. Both groups' mean scores on the CTOPP measure of phonemic awareness (Wagner et al., 1999) were at or slightly above fifty percent of the items correct, showing that they possessed some phonemic awareness. Students' performance on the nonword spelling task showed that on average

students were able to write phonetically acceptable letters for over half of the phonemes in the CVC nonwords, with native speakers scoring somewhat higher than nonnative speakers.

Performance on the Word Identification subtest of the Woodcock Reading Mastery Test- III (Woodcock, 2011) showed that these kindergartners read words at a first grade-equivalent level. Although nonnative English speakers showed a higher mean score than native speakers, the variability in scores was great (see Table 2). A floor effect was apparent on the nonword reading task, indicating that most native and nonnative speakers were unable to decode nonwords.

These findings indicate that participants knew most letters. They could use letters to spell some phonemes in nonwords. They had moved into reading and could read real words at a first grade level, but they had very limited skill decoding unfamiliar words. Nonnative speakers differed from native speakers mainly in their vocabulary and language skills rather than in alphabetic and word reading skills.

3.2. Word Learning Performance

Students were given practice learning to read several words over trials. The words varied in syntactic form class (i.e., nouns vs. context dependent words), and in whether the words were taught in sentences to clarify meanings. Several tasks were administered to assess the effects of these manipulations on word learning: reading the target words over three test trials during learning, remembering their spellings, and embedding the words in meaningful sentences at the end of learning. ANOVAs were applied to outcome measures. The independent variables were: sentence context (presence vs. absence) and word class (nouns vs. function words). Test trial (three test points) was included as an additional independent variable in the analysis of word reading. The three variables were repeated measures. Separate ANOVAs were conducted on performance of the two language groups. Results of the ANOVAs are reported in Table 3. Mean performance on the three word learning measures is reported in Table 4 along with three types of effect sizes (Cohen's *d*), one reflecting differences between word learning with and without sentences for each language group, one reflecting differences between nouns and context dependent words for each language group, and one reflecting differences between native and nonnative English speakers.

3.2.1. Reading Words Over Trials

Students were taught to read two sets of six words on flashcards. One study trial was followed by three test trials with corrective feedback for each set. Main effects of sentence context, word class, and trials were significant in the ANOVAs of both speaker groups. Performance improved steadily across the three test trials. As evident in Table 4, both native and nonnative speakers learned to read nouns more easily than context dependent words, indicating that less meaningful words take longer to learn. Effect sizes were large ($d = .71$ for native speakers and $d = .88$ for nonnative speakers).

Also Table 4 shows that both native and nonnative speakers read significantly more words that were learned without sentences than with sentences, indicating that reading words twice in isolation made it easier to remember how to read the words than reading words once in isolation and once in a sentence context. Significant interactions were not detected between sentence context and word class (see Table 3). This challenged our expectation that sentences would boost word reading more for context dependent words than for nouns compared to reading words in isolation. Results showed that context effects on reading words were the same for nouns and function words.

One significant interaction was detected, between word class and trials in the ANOVA of native speakers (see Table 3). Fig. 1 shows children's performance reading content nouns and context dependent function words over the three test trials. It is evident that content words were easier to read than function words initially, and the nouns became increasingly easier as learning proceeded. This is additional evidence

Table 3
Analyses of Variance as a Function of Sentence Context and Word Class for Native and Nonnative Speakers.

| Dependent Variables | df | MS | F (p) | Partial Eta Squared |
|--|-------|--------|------------------|---------------------|
| Native Speakers | | | | |
| Word Reading During Learning Trials | | | | |
| Sentence Context (S) | 1 | 5.63 | 4.28* (.045) | .10 |
| Error | 39 | 1.32 | | |
| Word Class (W) | 1 | 49.41 | 51.26*** (.000) | .57 |
| Error | 39 | .96 | | |
| Trials (Tr) | 1.71 | 33.57 | 68.05*** (.000) | .64 |
| Error | 66.59 | .49 | | |
| S x W | 1 | .68 | .79 (.380) | .02 |
| Error | 39 | .85 | | |
| S x Tr | 2 | .23 | .73 (.487) | .02 |
| Error | 78 | .32 | | |
| W x Tr | 2 | 2.26 | 7.66** (.001) | .16 |
| Error | 78 | .30 | | |
| S x W x Tr | 2 | .70 | 2.09 (.130) | .051 |
| Error | 78 | .34 | | |
| Spelling | | | | |
| Sentence Context (S) | 1 | 12.10 | 8.37** (.006) | .18 |
| Error | 39 | 1.45 | | |
| Word Class (W) | 1 | 8.10 | 11.12** (.002) | .22 |
| Error | 39 | .73 | | |
| S x W | 1 | 1.23 | .86 (.358) | .02 |
| Error | 39 | 1.42 | | |
| Sentence Production | | | | |
| Sentence Context (S) | 1 | 47.31 | 28.41*** (.000) | .42 |
| Error | 39 | 1.67 | | |
| Word Class (W) | 1 | 94.56 | 33.02*** (.000) | .46 |
| Error | 39 | 2.86 | | |
| S x W | 1 | 6.01 | 3.24 (.08) | .08 |
| Error | 39 | 1.85 | | |
| Nonnative Speakers | | | | |
| Word Reading During Learning Trials | | | | |
| Sentence Context (S) | 1 | 3.42 | 5.00* (.031) | .11 |
| Error | 40 | .68 | | |
| Word Class (W) | 1 | 75.71 | 117.80*** (.000) | .75 |
| Error | 40 | .64 | | |
| Trials (Tr) | 2 | 29.64 | 84.03*** (.000) | .68 |
| Error | 80 | .35 | | |
| S x W | 1 | .02 | .03 (.865) | .00 |
| Error | 40 | .627 | | |
| S x Tr | 2 | .59 | 2.02 (.140) | .05 |
| Error | 80 | .29 | | |
| W x Tr | 1.5 | .85 | 1.56 (.220) | .04 |
| Error | 59.90 | .54 | | |
| S x W x Tr | 2 | .37 | 1.27 (.286) | .03 |
| Error | 80 | .29 | | |
| Spelling | | | | |
| Sentence Context (S) | 1 | 6.64 | 2.81 (.102) | .07 |
| Error | 40 | 2.37 | | |
| Word Class (W) | 1 | 7.47 | 6.00* (.019) | .13 |
| Error | 40 | 1.25 | | |
| S x W | 1 | .74 | .64 (.430) | .02 |
| Error | 40 | 1.16 | | |
| Sentence Production | | | | |
| Sentence Context (S) | 1 | 32.49 | 11.68** (.001) | .23 |
| Error | 40 | 2.78 | | |
| Word Class (W) | 1 | 117.81 | 53.59*** (.000) | .57 |
| Error | 40 | 2.20 | | |
| S x W | 1 | .06 | .04 (.850) | .00 |
| Error | 40 | 1.52 | | |

*p < .05. **p < .01. ***p < .000.

for the greater ease of learning words whose meanings are more salient. This interaction was not detected in the ANOVA of nonnative speakers.

Effect sizes were calculated to compare native and nonnative speakers on their word reading performance. From Table 4 it is evident that the groups differed very little, with *ds* ranging from $-.03$ to $.12$. This shows that nonnative speakers learned to read the words as well as native speakers in all the conditions.

Table 4
Performance in Word Learning Tasks for Native and Nonnative Speakers.

| | Native | | | Nonnative | | | <i>d</i> ^{NvsNon} |
|---|----------|-----------|-----------------------|-----------|-----------|-----------------------|----------------------------|
| | <i>M</i> | <i>SD</i> | <i>d</i> ^a | <i>M</i> | <i>SD</i> | <i>d</i> ^a | |
| Word Reading (3 words max) | | | | | | | |
| Sentence Context | | | | | | | |
| With Sentences | 1.41 | 0.90 | $-.23^*$ | 1.39 | 0.89 | $-.19^*$ | .02 |
| Without Sentences | 1.62 | 0.92 | | 1.56 | 0.90 | | .07 |
| Word Class | | | | | | | |
| Nouns | 1.84 | 0.87 | .71* | 1.87 | 0.85 | .88* | $-.03$ |
| Context Dependent | 1.19 | 0.96 | | 1.08 | 0.94 | | .12 |
| Spelling (13 letters max) | | | | | | | |
| Sentence Context | | | | | | | |
| With Sentences | 7.59 | 2.57 | $-.23^*$ | 7.53 | 2.68 | $-.15$ | .02 |
| Without Sentences | 8.14 | 2.26 | | 7.93 | 2.75 | | .08 |
| Word Class | | | | | | | |
| Nouns | 8.09 | 2.35 | .19* | 7.95 | 2.74 | .16* | .05 |
| Context Dependent | 7.64 | 2.48 | | 7.52 | 2.69 | | .05 |
| Sentence Production (6 points max) | | | | | | | |
| Sentence Context | | | | | | | |
| With Sentences | 4.03 | 1.89 | .51* | 3.21 | 1.88 | .48* | .44 |
| Without Sentences | 2.96 | 2.28 | | 2.32 | 1.85 | | .31 |
| Word Class | | | | | | | |
| Nouns | 4.28 | 2.09 | .75* | 3.61 | 1.90 | .91* | .34 |
| Context Dependent | 2.71 | 2.09 | | 1.91 | 1.83 | | .41 |

*See exact *p* values in Table 3. *d*^{NvsNon} = effect sizes comparing native to nonnative students on each measure. *d*^a = effect sizes comparing means with vs. without sentence contexts or means for content vs. function word class for each outcome measure in each student group.

3.2.2. Spelling

After completion of each word learning task, participants were asked to spell the target words. ANOVAs of the mean number of letters spelled correctly showed a significant main effect of sentence context for native speakers (see Table 3) but no main effect for nonnative speakers (see Table 3). As shown in Table 4, native speakers remembered spellings of words significantly better when the words were taught in isolation than when they were taught with sentences. Although the same pattern favoring learning in isolation over context was evident for nonnative speakers, the difference was not significant.

ANOVAs revealed a significant main effect of word class for both native and nonnative speakers. Children remembered how to spell nouns more easily than context dependent words (see Table 4). The interaction between sentence context and word class was not significant in either analysis (see Table 3), showing that meaning activation by sentences did not have a greater effect on memory for the spellings of function words than content words. Effect sizes comparing native and nonnative speakers in spelling performance across conditions were very small (*ds* ranging from $.02$ to $.08$) (see Table 4), showing that nonnative speakers remembered spellings as well as native speakers.

3.2.3. Sentence Production

Following the spelling task, participants were asked to use each of the target words in a sentence. ANOVAs of both native and nonnative speakers revealed significant main effects of sentence context and word class but no significant interaction (see Table 3). As shown in Table 4, mean performance producing sentences was greater when words were taught in sentences than in isolation. Effect sizes were moderate. This indicates that having children read words in sentences better connected the syntactic and semantic identities of the words to their spellings and pronunciations in memory than reading words in isolation. Also it was easier to embed nouns in meaningful sentences than context dependent words. Effect sizes were large, especially in nonnative speakers (*d* = $.91$), showing that they found it especially difficult to create sentence contexts for context dependent words (see means in Table 4). The interaction between word class and sentence context was not

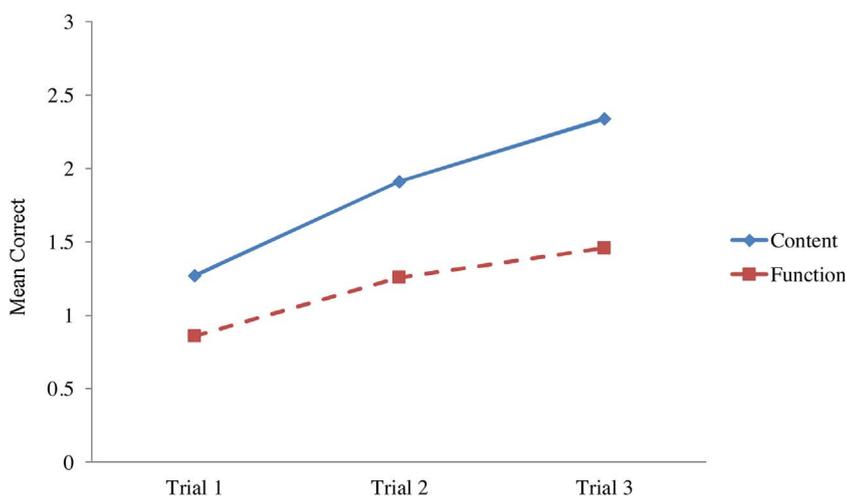


Fig. 1. Mean number of words read correctly by native speakers over trials as a function of the form class of the words, either content nouns or context dependent function words (maximum = 3 correct).

significant, indicating that reading function words in sentences did not produce greater improvement in children's ability to embed function words in sentences compared to nouns. Such a relationship was expected, given that the meaning of nouns is more transparent outside of sentences than function words and hence should be easier to embed in a sentence regardless of whether the words were practiced in sentence contexts.

Comparison of the mean performance of native and nonnative speakers revealed that native speakers were more successful in generating sentences than nonnative speakers, with effect sizes ranging from $d = .31$ to $.44$ across conditions (see Table 4). This contrasts with equivalent performance between native and nonnative speakers on the word reading and spelling tasks involving alphabetic skills. Nonnative speakers' weaker mean scores on this linguistic/semantic measure are perhaps not unexpected given their lower scores on the PPVT vocabulary test and lower English proficiency ratings (see Table 2).

A subsample of sentences was analyzed to investigate the similarity whether students were recalling sentences that they read on flashcards during the word learning trials instead of generating new sentences to demonstrate their knowledge of the syntactic and semantic identities of the target words. Twenty percent of the participants were randomly chosen for the analysis ($n = 16$). Sentences that received scores at the highest level (2 points) were examined to see if they contained non-target content words from the training sentences (i.e., four different sentences per word were read during the trials). For example, the non-target content words provided in the training sentences for *farm* (target noun) were *school, field trip, pigs, horses, chickens, Old McDonald, boy, tractor, cowboys, and Colorado*. The non-target content words provided for the word *kept* (target context dependent word) were *money, box, puzzle, elephant, circus, clown, hair, men, car, motor, candy bar, and wrapper*.

Context dependent target words were embedded in 44 acceptable sentences by the subsample of 16 children. We calculated the percentages of children's sentences that contained content words appearing in the training sentences: 9% contained two or more content words; 23% included only one non-target content word. The remainder, 68%, contained no words from the training sentences. The target nouns were embedded in 73 acceptable sentences by the subsample. The percentage of these sentences that included more than one non-target content words from training sentences was 4%; the percentage containing only one content word was 15%. The remaining sentences, 81%, contained no words from the training sentences. These results indicate that the overwhelming majority of sentences were uniquely generated by the participants and not recalled from the training sentences. This suggests that children's success embedding the target words in acceptable sentences was not a result of memorizing and recalling training sentences but rather reflected the acquisition of general knowledge about the

syntactic and semantic identities of the words.

3.2.4. Supplemental Analyses

Nonnative English speakers came from various language backgrounds. Supplemental analyses showed that there was a significant difference between the two predominant nonnative English speaking groups with native Chinese speakers performing significantly better on the word reading ($F_{1,37} = 4.17, p = .04$; Spanish $M = 1.29$, Chinese $M = 1.71$) and spelling tasks ($F_{1,37} = 4.71, p = .03$; Spanish $M = 7.02$, Chinese $M = 8.77$) than native Spanish speakers, but there was no significant differences between the two groups on the sentence production task ($F_{1,37} = 2.4, p = .12$; Spanish $M = 2.99$, Chinese $M = 2.29$). No interactions between nonnative English speaking groups and the independent variables of sentence context (presence vs. absence) and word class (nouns vs. function words) were detected. Why this difference in overall performance on reading and spelling words occurred between the Chinese and Spanish native speakers is unclear and warrants further investigation.

4. Discussion

4.1. Summary of Findings

To summarize, children's word learning on flashcards was affected by several factors: the type of words they practiced reading, either concrete nouns or context dependent function words; by their experience reading the words, either without meanings in isolation or with meanings provided by sentence contexts; by the identities of the words being learned, including their orthographic identities as indicated by reading and spelling performance, and by their syntactic/semantic identities as indicated by embedding words in sentences; and by students' background as native or nonnative speakers of English.

Children remembered how to read nouns more easily than context dependent words over trials, with native speakers showing an advantage that grew greater as learning progressed. Also both groups learned to spell and to produce sentences containing nouns better than context dependent words. This shows that despite being higher frequency words, the less meaningful context dependent words took longer to learn.

Learning to read words in isolation without meanings improved children's orthographic learning, indicated by superior reading and spelling memory whereas learning to read words in meaningful contexts benefited syntactic and semantic learning indicated by superior ability to embed words in sentences. These findings show that each type of word reading experience strengthened a different aspect of word knowledge, either orthographic or syntactic/semantic, suggesting that there are costs and benefits of each flashcard word reading condition.

Native and nonnative English speakers showed very similar performance levels in learning the orthographic identities of words across conditions. Very small effect sizes showed that the two groups did not differ in their decoding skills and ability to retain the spellings of words in memory. However, the groups differed substantially in learning the syntactic and semantic identities of words, as suggested by larger effect sizes favoring native speakers in the sentence production task. These findings are consistent with students' strengths on pretests. The English language and vocabulary mean scores of nonnative English speakers were lower than those of native speakers whereas their reading and spelling scores were equivalent.

4.2. Teaching Words in Context vs. Isolation

It was hypothesized that children would learn to read and spell both content and function words more easily when the words were taught in isolation than when the words were accompanied by meaning clarifying sentences. Also, it was hypothesized that children would be better able to embed content and function words in grammatically correct and contextually rich sentences when the words were taught with meaning-clarifying sentences than when the words were taught in isolation. Results supported both of these hypotheses.

Findings of the current study replicate and extend previous findings (Ehri & Roberts, 1979; Ehri & Wilce, 1980; Johnston, 2000; Stuart, Masterson, & Dixon, 2000) that also investigated experiences that facilitate word learning. The current study extended these findings by comparing both word types to see whether effects of meaningful contexts might be greater for function words than for content words. Our results confirmed the differential effects of context and isolation on word learning and showed that effects were the same for both word types, with isolated word reading facilitating reading and spelling, and contexts facilitating sentence production.

In the current study, the word learning task was structured a bit differently from that used in the previous studies in that children in both the isolation and context reading conditions were given practice reading the words in isolation. The difference between conditions occurred after each single word was read once. In the isolation condition, the target word was read on a second card again in isolation. In the context condition, the word was read in a sentence context on the second card, with a different sentence presented on each learning trial. Findings showed that reading words once in isolation and once in context did not strengthen word memory as much as reading words twice in isolation, either for reading or for spelling words, even though the succession of readings occurred immediately in both conditions. Perhaps students' memory for the orthographic forms of words was weakened in the context condition when, after reading each isolated word once, they saw and heard several other written words that activated competing connections between spellings and pronunciations.

These findings support Ehri's (1992) amalgamation theory and also the explanation offered by Johnston (2000), Stuart, Masterson, and Dixon (2000), and Ehri and Roberts (1979), and Ehri and Wilce (1980) for their findings. Reading words in isolation twice on each trial allowed children to spend more time and attention processing the orthographic identities of the words than reading the words only once in isolation. Mapping spellings onto pronunciations established connections between graphemes and phonemes and better secured the words in memory to support reading and spelling. However, reading words in isolation was less conducive to establishing connections between the syntactic/semantic identities of words and their spellings and pronunciations compared to reading the words in meaningful sentences. Reading the words in isolation did not spontaneously activate the full meanings of words in memory so connections formed between spellings and meanings were weaker.

4.3. Content vs. Function Words

It was hypothesized that children would learn to read content words more easily than function words as they practiced the words on flashcards. Findings supported this hypothesis and in addition showed that content words were easier to spell and embed in sentences. This occurred despite function words being at lower grade-equivalent levels than content words, which suggests that they should have been easier to learn. These findings on word learning differences based on word types adds to the body of literature demonstrating that nouns are more concrete and more securely stored in memory, as demonstrated in word association tasks, than other word form classes (Cronin, 2002; Entwisle, 1966; Paivio, 1991).

A closer examination of incorrect sentences generated for function words showed that students were frequently assigning function words to the wrong word class (most often nouns) when attempting to embed them in sentences. Examples of students' attempts to use the function words as nouns are: *Gave wanted to go to the mountain but he couldn't; Why is our gave in front of the building?; Might is playing; Held was playing with his toys; Held is reading; The kept was watching TV and playing with his toys; Kept is taking a test; The toldis happy*. These findings extend previous findings by Ehri (1975, 1976) showing young children's difficulties with function words by failing to recognize their role in language.

It was also hypothesized that the presence of sentences would benefit children's learning of function words more than their learning of content words when compared to the absence of sentences. This was hypothesized because sentence contexts were thought to activate function word meanings and hence make learning easier whereas sentences were not thought to be needed to activate the meanings of concrete nouns. However, no significant interactions between word class and sentence context were found, thus failing to support this hypothesis. Rather, the presence of sentences affected children's learning of both content and function words equally, with sentences producing less impact on word reading and spelling but greater impact on sentence production compared to no sentences. This shows that teaching nouns in sentence contexts enhances awareness of their form class and meanings as much as teaching function words in sentences. When taught in isolation, noun meanings may not be fully activated even though their meanings are concrete and imaginable (Sadoski & Paivio, 2013). Alternatively, it may be that the sentence production task explains these findings. Kindergartners may require experience learning how all word types function in sentence contexts to improve their metalinguistic ability in order to actively construct their own sentences containing pre-specified words.

The present study extended previous findings on word learning to nonnative English speakers who showed the same patterns of performance as native speakers in learning to read target words and embedding them in sentences when the words were content and function words and when they were read in isolation versus in contexts. Comparison of the levels of performance of the two groups showed that they learned to read and spell words equivalently indicating comparable orthographic skill. However, nonnative speakers' ability to embed words in sentences was weaker than that of native speakers, reflecting more limited syntactic and semantic learning in English. The greater difficulty of nonnative speakers in processing the meanings of words is important in light of common methods used in schools to teach beginners to read. Word reading practice is commonly conducted with flashcards and word lists that contain many context dependent words whose meanings may not be activated when read outside of sentences, as suggested by present findings. On common preprimer and primer word lists such as the Dolch and Harris and Jacobson (1982), 35%–46% of the words fall in the category of context dependent words like those taught in the current study.

4.4. Strengths, Limitations, Future Research, and Implications for Instruction

The present study was an experiment with a counterbalanced design in which participants were randomly assigned to flashcard conditions that varied by word list and order of completion. This allowed for outcome differences to be attributed to the sentence context and word class variables that were manipulated. Forty one nonnative and 40 native English speakers participated in the study which provided sufficient power for hypothesis testing. Including both native and nonnative English speakers from low SES communities in a metropolitan area strengthened the external validity of the study. The U.S. school system is facing an ever increasing population of nonnative English speaking children and, as [Goldenberg \(2013\)](#) and [Goldenberg and Quach \(2010\)](#) point out, the need to experimentally examine and identify effective strategies to support their early literacy skills is in high demand.

Other threats to internal validity were addressed. All students were engaged in the flashcard activities for an equivalent amount of time during each session. Also, a team of four research assistants were kept blind to the hypotheses of the study in order to control for experimenter bias. They assisted the principal investigator by administering pre and posttest measures.

One possible limitation of the study was the procedure for categorizing students as native and nonnative English speakers. Teachers distinguished native speakers, those who had learned English at birth or a very early age, from nonnative speakers. Their classifications were based primarily on school enrollment records, and these classifications were supported by their knowledge of the language proficiency of each child and anecdotal knowledge of the language proficiency of the child's primary caregiver. The teacher rating scale of language proficiency was used to further investigate and analyze this information. Performance on the PPVT vocabulary test supported their categorization and ratings. However, future studies might administer standardized tests to measure children's English proficiency, design a questionnaire for primary caregivers, and/or create a more nuanced language proficiency rating scale for teachers. This would provide a finer grained picture of the extent of nonnative speakers' English language skills.

In the current study ELLs came from various language backgrounds. Interestingly, native Chinese speakers performed significantly better on word reading and spelling tasks than native Spanish speakers, but no difference was detected between the two groups on the sentence generation task. As previously stated, why the difference in reading and spelling words occurred is not clear. Future studies might examine performance of students speaking the same first language or obtain larger samples to compare across two nonnative English speaking samples. It may be that learning to read content and function words in English is influenced by the structure of students' native language. Also, proper use of the words in sentences may be influenced by the morphological congruency between English and the nonnative English language ([Jiang, Novokshanova, Masuda, & Wang, 2011](#); [Jia & Fuse, 2007](#)). Future studies should conduct a more extensive examination of the grammatical structure of the sentences produced in the sentence generation task and analyze the results based on native language use. Also, future studies should examine students' ability to read and write in their native language to determine whether and how familiarity with a writing system in the first language influences performance in orthographic tasks in English.

Additionally, future studies should further investigate whether and when children's nonnative language status influences their academic performance. In the current study, no differences were detected between native and nonnative English speaking kindergartners in their ability to learn to read and spell words. But a difference was detected in their ability to embed words in meaningful sentences. This carries implications for instruction by suggesting that nonnative English speakers

need extra instruction in the structure of English sentences and word meanings but not in English word reading and spelling. Future research should compare performance of specific groups of nonnative English speakers according to the type of language and literacy instruction they receive. [Cheung and Slavin \(2012\)](#) found a positive effect of bilingual education on nonnative English speakers' academic performance, although they acknowledge that the most comprehensive studies of instruction for nonnative English speakers did not find differences in outcomes based on type of language instruction.

In the current study, six function words and six nouns served as the target words that were taught. Although our findings replicated those in other studies using different words, there is a need for future research to consider a greater variety of words to determine the properties that make them especially difficult for beginners to store in memory, and to identify how learning might be made more effective. Perhaps some function words are easier to recognize out of context. Perhaps regular past tense verbs are easier to learn than irregular past tense verbs (e.g., *live – lived* vs. *give – gave*). Perhaps children need to be taught to generate sentence contexts for specific function words in order to learn their syntactic and semantic identities.

Findings in the present study carry important implications for instruction. Educators need to recognize that the grammatical form class of words and how children practice reading the words matter. Learning to read words is multifaceted and involves forming connections between orthographic, phonological, syntactic and semantic identities of words in memory. Different word reading experiences strengthen different types of connections. In the current study, reading single words out of context helped children learn orthographic identities for reading and spelling. Reading words in sentence contexts helped children learn the words' meanings and how they combine with other words to express syntactic relations. This study suggests that each experience brings about distinct learning of a word's identity and therefore, having both experiences may be more beneficial than having either of these two methods independent of the other.

Educators should consider student's knowledge of a word's identity. If children can read a word in isolation but are unable to use the word in a sentence, teachers should give children practice reading the word in multiple sentences and should provide guidance in generating their own sentences containing the words. Likewise, if children can embed a word in sentences but are unable to read or spell it, teachers should give the children practice reading and writing the word in isolation. Moreover, teachers should pay considerable attention to the sentence reading and writing skills of nonnative speakers who have had less exposure to the meanings and usage of words in English.

Educators should also critically examine preprimer and primer word lists before assigning word learning tasks. As mentioned previously, these lists are full of function words, and students are often given lists of these words to memorize in the primary grades. Findings of the present study indicate that function words are more difficult than content words for young native and nonnative speakers to read, spell, and use in grammatically correct sentences. This is counterintuitive when considering that preprimer and primer level function words are short, high frequency words that adults assume are easy for children to read, certainly easier than longer content words. However, findings of the current study show that function words are in fact more difficult to learn to read and spell than content words. How children are taught to read words needs to be considered in light of present findings.

With regard to planning reading instruction, results suggest that the two methods of teaching beginners to read words, either in meaningful sentences or in isolation, offer unique strengths and limitations. The method that facilitates the formation of orthographic connections in memory to support word reading and spelling may not be best for facilitating syntactic and semantic connections to support embedding words in meaningful sentences. In planning word study lessons, teachers need to consider which aspects of words are to be learned, how obvious their meanings are when presented out of context, and whether

the words can be guessed or passed over quickly when children read them in sentence contexts. The best approach appears to be that of providing both types of practice to strengthen all aspects of word learning.

Acknowledgements

This research was supported in part by a grant from the Graduate Center, CUNY. A special thanks to Reba Rosen and Kathleen Tomes who served as research assistants. This research was conducted as part of a doctoral dissertation.

References

- August, D., & Shanahan, T. (Eds.), (2006). *Developing literacy in second-language learners: Report of the national literacy panel on language minority children and youth*. Mahwah, NJ: Lawrence Erlbaum.
- August, D., & Shanahan, T. (Eds.), (2008). *Developing reading and writing in second-language learners: Lessons from the report of the National Literacy Panel on Language-Minority Children and Youth*. New York, NY: Routledge.
- Beck, I., & McKeown, M. (1991). Conditions of vocabulary acquisition. In R. Barr, M. L. Kamil, P. B. Mosenthal, P. D. Pearson, R. Barr, M. L. Kamil, & P. D. Pearson (Vol. Eds.), *Handbook of reading research*. Vol. 2, (pp. 789–814). Hillsdale, NJ, US: Lawrence Erlbaum.
- Cheung, A. K., & Slavin, R. E. (2012). Effective reading programs for Spanish-dominant English language learners (ELLs) in the elementary grades: A synthesis of research. *Review of Educational Research*, 82(4), 351–395. <http://dx.doi.org/10.3102/0034654312465472>.
- Cronin, V. S. (2002). The syntagmatic-paradigmatic shift and reading development. *Journal of Child*, 29(1), 189–204. <http://dx.doi.org/10.1017/S0305000901004998>.
- Dunn, D. M., & Dunn, L. M. (2007). *Peabody picture vocabulary test: Manual*. San Antonio, TX: Pearson.
- Ehri, L. C. (1975). Word consciousness in readers and prereaders. *Journal of Educational Psychology*, 67(2), 204.
- Ehri, L. C. (1976). Word learning in beginning readers and prereaders: Effects of form class and defining contexts. *Journal of Educational Psychology*, 68(6), 832.
- Ehri, L. C., & Roberts, K. T. (1979). Do beginners learn printed words better in contexts or in isolation? *Child Development*, 675–685.
- Ehri, L. C. (1992). Reconceptualizing the development of sight word reading and its relationship to recoding. In P. Gough, L. Ehri, & R. Treiman (Eds.), *Reading acquisition* (pp. 107–143). Hillsdale, NJ: Lawrence Erlbaum.
- Ehri, L. C. (1998). Grapheme-phoneme knowledge is essential for learning to read words in English Word recognition in beginning literacy. In P. Gough, L. Ehri, & R. Treiman (Eds.), *Reading acquisition* (pp. 3–40). Hillsdale, NJ: Lawrence Erlbaum.
- Ehri, L. C. (2005). Learning to read words: theory, findings, and issues. *Scientific Studies of Reading*, 9(2), 167–188.
- Ehri, L. C. (2014). Orthographic mapping in the acquisition of sight word reading, spelling memory, and vocabulary learning. *Scientific Studies of Reading*, 18(1), 5–21.
- Ehri, L. C. (2015). How children learn to read words. In A. Pollatsek, & R. Treiman (Eds.), *The Oxford handbook of reading* (pp. 293–310). New York: Oxford University Press.
- Ehri, L., & Wilce, L. (1980). Do beginners learn to read function words better in sentences or in lists? *Reading Research Quarterly*, 15(4), 451–477.
- Entwisle, D. R. (1966). Form class and children's word associations. *Journal Of Verbal Learning & Verbal Behavior*, 5(6), 558–565. [http://dx.doi.org/10.1016/S0022-5371\(66\)80091-9](http://dx.doi.org/10.1016/S0022-5371(66)80091-9).
- Garcia, O., & Kleifgen, J. A. (2010). *Emergent bilinguals: Policies, programs, and practices for English language learners*. New York: Teachers College Press.
- Goldenberg, C., & Quach, S. R. (2010). Instructing English language learners: Assessing the state of our knowledge. *ERS Spectrum*, 28(1), 1–15.
- Goldenberg, C. (2013). Unlocking the research on English learners: what we know—and don't yet know—about effective instruction. *American Educator*, 37(2), 4.
- Harris, A. J., & Jacobson, M. D. (1982). *Basic reading vocabularies*. New York: Macmillan.
- Morris, D. (1992). Concept of word: A pivotal understanding in the learning-to-read process. In S. Templeton, & D. Bear (Eds.), *Development of orthographic knowledge and the foundations of literacy: A memorial festschrift for Edmund H. Henderson* Hillsdale, NJ: Erlbaum (pp. 53–77).
- Morris, L. (2001). Going through a bad spell: What the spelling errors of young ESL learners reveal about their grammatical knowledge. *Canadian Modern Language Review/La Revue canadienne des languesvivantes*, 58(2), 273–286.
- Jia, G., & Fuse, A. (2007). Acquisition of English grammatical morphology by native Mandarin-speaking children and adolescents: age-related differences. *Journal of Speech, Language, And Hearing Research*, 50(5), 1280–1299. [http://dx.doi.org/10.1044/1092-4388\(2007/090\)](http://dx.doi.org/10.1044/1092-4388(2007/090)).
- Jiang, N., Novokshanova, E., Masuda, K., & Wang, X. (2011). Morphological congruency and the acquisition of L2 morphemes. *Language Learning*, 61(3), 940–967. <http://dx.doi.org/10.1111/j.1467-9922.2010.00627.x>.
- Johnston, F. R. (2000). Word learning in predictable text. *Journal of Educational Psychology*, 92(2), 248.
- Kieffer, M. J. (2008). Catching up or falling behind? Initial English proficiency, concentrated poverty, and the reading growth of language minority learners in the United States. *Journal of Educational Psychology*, 100(4), 851–868. <http://dx.doi.org/10.1037/0022-0663.100.4.851>.
- Kieffer, M. J. (2010). Socioeconomic status, English proficiency, and late-emerging reading difficulties. *Educational Researcher*, 39(6), 484–486. <http://dx.doi.org/10.3102/0013189X10378400>.
- Kilpatrick, D. (2015). *Essentials of assessing, preventing, and overcoming reading difficulties*. Hoboken, NJ: Wiley.
- Luk, G., & Bialystok, E. (2013). Bilingualism is not a categorical variable: Interaction between language proficiency and usage. *Journal of Cognitive Psychology*, 25(5), 605–621.
- Neuman, S. B., Kaefer, T., Pinkham, A., & Strouse, G. (2014). Can babies learn to read? A randomized trial of baby media. *Journal of Educational Psychology*, 106(3), 815–830.
- Paivio, A. (1991). Dual coding theory: Retrospect and current status. *Canadian Journal of Psychology*, 45, 255–287.
- Perfetti, C., & Hart, L. (2002). The lexical quality hypothesis. In L. Verhoeven, C. Elbro, & P. Reitsma (Eds.), *Precursors of functional literacy* (pp. 67–86). Amsterdam: John Benjamins.
- Sadoski, M., & Paivio, A. (2013). *Imagery and text* (2nd ed.). New York: Routledge.
- Seymour, P. H. K., & Duncan, L. G. (2001). Learning to read in English psychology. *The Journal of the Hellenic Psychological Society*, 8, 281–299.
- Share, D. L. (2008). Orthographic learning, phonological recoding, and self-teaching. In R. Kail (Ed.), *Advances in child development and behavior* (pp. 31–81). New York: Elsevier.
- Sheng, L., McGregor, K. K., & Marian, V. (2006). Lexical–semantic organization in bilingual children: Evidence from a repeated word association task. *Journal of Speech, Language, and Hearing Research*, 49(3), 572–587.
- Solso, R. L., & King, J. F. (1976). Frequency and versatility of letters in the English language. *Behavior Research Methods & Instrumentation*, 8(3), 283–286.
- Stuart, M., Masterson, J., & Dixon, M. (2000). Spongelike acquisition of sight vocabulary in beginning readers? *Journal of Research in Reading*, 23(1), 12–27.
- Wagner, R. K., Torgesen, J. K., & Rashotte, C. A. (1999). *Comprehensive test of phonological processing: CTOPP*. Austin, TX: Pro-ed.
- Woodcock, R. W. (2011). *Woodcock reading mastery tests* (3rd ed.). San Antonio, TX: Pearson.