

When the going gets tough, context gets going: Exception word reading via self-teaching

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A Thesis

In the

Department of Education

Presented in Partial Fulfillment of the Requirements

for the Degree of Master of Arts (Child Studies) at

Concordia University

Montreal, Quebec, Canada

December, 2015

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CONCORDIA UNIVERSITY

School of Graduate Studies

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Abstract

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Many English words fail to conform to typical grapheme-to-phoneme conversion patterns and are therefore deemed exceptions; this makes decoding and spelling difficult for novice readers. This study evaluated the effects of practicing regular and exception words in context and in isolation on reading and spelling accuracy. Students in Grade 2 (N=30) participated in a within subject design. They read 66 different items from three word categories: regular/short, regular/long, and exception. Half of the words were read in context, the other half were read in isolation. No feedback was provided. Training took place over 10 trials, followed by a spelling test. Reading retention followed one week after training. Results showed that training in context boosted reading accuracy initially for short words and throughout training for exception words, but no effect of context was found for long words. Spelling outcomes showed gains in all word categories for both conditions, suggesting that reading practice supports modest levels of spelling improvement. In sum, for young learners reading in context without feedback was most beneficial for exception words.

Acknowledgements

I would like to thank the many people who have contributed to the success of this project. To the children who allowed me to learn from them by participating in my study: thank you for your trust. To my principal and the staff at The Priory who allowed me to grow as an educator: thank you for your support and flexibility. To my committee members, Dr. Diane Pesco and Dr. Gene Ouellette, who gave me feedback on my thesis: thank you for your professional insight.

To my fellow lab members, thank you for your encouragement. Stephanie Kozak, it was a pleasure working with you during the data collection. Your advice during the writing process and preparation of the presentation was very helpful and much appreciated. To my thesis advisor, Dr. Sandra Martin-Chang, your guidance was invaluable. I learned a lot from you about research, writing, and teaching. Thank you for your generosity and honesty.

Most importantly, I would like to thank my loving husband and our two amazing daughters. I could not have completed this challenge without your patience and understanding. I want you to know how much this meant to me and how much I appreciate it. Steve, thank you for believing in me and cheering me on; you were my best friend when I needed it most.

I would also like to thank my mother for teaching me to be kind and for her loving presence in my life. Finally, I would like to dedicate this work to my father for encouraging me to pursue my goals.

Table of Contents

List of Figures	vii
List of Appendices	viii
Introduction	1
The Role of Self-teaching in Early Reading	1
The Role of Context in Self-teaching.....	5
The Role of Word Difficulty in Self-teaching.....	8
Current Investigation	13
Hypotheses	14
Method	14
Participants	14
Research Design	15
Materials:.....	15
Standardized.....	15
Experimental.....	16
Procedure	19
Screening and Pretest Phase.....	20
Training Phase.....	21
Testing Phase.....	22
Results	23
Training: Reading Accuracy.....	23
Posttest: Reading Accuracy.....	25
Posttest: Spelling Accuracy.....	26

Discussion	27
Implications.....	31
Limitations and future directions	32
Conclusions	33

List of Figures

1) Percentage of words read correctly during pre-test and trials.....	24
2) Percentage of words read correctly in posttests	26
3) Percentage of words spelled correctly in posttests.....	27

List of Appendices

Appendix A	40
Counter Balance	
Appendix B	45
Target Words	
Appendix C	46
Stories	
Appendix D	48
Images for Teaching Target Words	
Appendix E	57
Target Word Definitions	
Appendix F.....	59
Spelling Pre-test Sentences	
Appendix G.....	61
Scripts	

Introduction

Sounding out words can be a slow process for beginning readers (Ehri, 2005). However, Share's (1995) self-teaching hypothesis states that laboriously decoding words, in a letter-by-letter fashion helps children build a bank of "sight words" (i.e., words that can be read automatically, without the need to sound out). In this view, decoding words in natural text eventually leads to more fluent reading. Specifically, as children independently read connected text, they encounter a rich variety of unfamiliar words that require decoding, thus creating the opportunity to form new sight words. It seems then, that independent reading of texts is time well-spent (Cunningham & Stanovich, 2001). Indeed, contextual benefits have been noted in a number of populations who struggle with reading, including novice readers, poor readers, and readers working in a second language (Nation & Snowling, 1998; Nicholson, 1991; Stanovich & Stanovich, 1995; Wong & Underwood, 1996). Even in established readers, the beneficial effects of context have been noted for words that violate the standard letter-to-sound correspondences (Wang, Castles, Nickels, & Nation, 2011). Yet, far fewer studies have examined whether the contextual benefits extend beyond irregular words (e.g., *hearse*, *shone*), to other difficult words, such as those that are regular, but multisyllabic (e.g., *crocodiles*, *floated*). The goal of the current experiment is to examine the effects of self-teaching in and out of context, using words of varying difficulty.

The Role of Self-teaching in Early Reading

Share (1995) states that children learn to read most words on their own, outside of classroom instruction, via self-teaching. He describes print-to-sound translation or phonological recoding, as a mechanism of self-teaching, which connects the reader's oral language with a printed representation of sounds. Words that are unfamiliar in their printed form will lead to

greater dependence on sounding out strategies (decoding), whereas familiar words will be more easily retrieved from memory (orthographic learning). These two components of self-teaching, decoding and orthographic learning, are defined below.

Decoding describes the sounding out process of matching graphemes to phonemes (Ehri & Soffer, 1999). This is the painstaking but necessary process beginning readers go through in the first stages of their development. It is also a secondary strategy for established readers when they encounter unfamiliar or difficult written words (Ehri, 2014). In languages with deep orthographies, such as English, many words cannot be decoded using typical letter-sound translations; these are called *irregular* or *exception* words (Strain, Patterson, & Seidenberg, 2002). While reading exception words (e.g., *dreamt*), partial decoding may occur (e.g., *dr_mt*), but may not provide the reader with sufficient information to connect the printed word to its correct spoken pronunciation (e.g., /drimt/ ; Wang et al., 2011). Readers must therefore rely on strategies in addition to decoding, such as reading by analogy or prediction, to read exception words (Ehri, 2005). Reading by analogy involves using the rime (final consonants plus the preceding vowel of a syllable) of a familiar word to help read an unknown word, such as using *mint* to read *stint*. Prediction focuses the reader's attention on context clues such as accompanying pictures or the remainder of the sentence to read an unknown word.

A key consequence of self-teaching is the ability to recognize and spell words according to conventional patterns (Ouellette & Fraser, 2009; Share, 1995). This skill is referred to as orthographic learning; it signals the shift from pure decoding to more fluent reading because the child can instantly recognize a word without having to decode it (Castles & Nation, 2008). Each time a child decodes a new word he or she acquires word-specific orthographic information, which accumulates and then eventually leads to skilled word reading (Share, 1995). Contrary to

phase-based theories, self-teaching is described as item-based, which is more dependent on a child's exposure to a particular word to successfully identify it. By this account, decoding is the primary component needed to "kick start the self-teaching mechanism" (Share, 1995, p. 156) and orthography is the secondary component that enables a child to quickly and accurately process words. The relationship between these two components explains how children are able to learn word-specific spelling. If children relied on decoding alone, they would not be able to choose the appropriate spelling of a homophone, such as *see* or *sea*. Either variation of spelling would be appropriate phonetically, but orthography plays a role in deciding which spelling visually matches the intended meaning.

Share (1999) tested the self-teaching hypothesis with Israeli second-grade children who read a passage in Hebrew containing non-words. In Experiment 1, each participant read aloud a text describing a fictional place, animal, or item, followed by comprehension questions. The children were then asked to identify the target words (e.g., *yait*) in a list containing the same non-words from the stories, their homophonic pairs (e.g., *yate*), and a selection of high-frequency words. The participants also completed a spelling test of the target words. The results indicated that the children had a high degree of accuracy in (a) decoding the non-words in the text, (b) choosing the correct spelling of the targets among the foils, and (c) spelling the targets. In short, the children demonstrated self-teaching of the non-words from reading the passages. Experiments 2 and 3 focused on visual exposure to target words with a set of non-words and real words. During a brief visual exposure to the targets, children repeated a non-word, *dubba*, in an effort to reduce phonological recoding and measure its effects on orthographic learning. Results showed that hampering phonological recoding also impaired orthographic learning, suggesting

that phonologic recoding supports orthographic learning. Furthermore, as the targets were non-words, children demonstrated spontaneous orthographic learning via self-teaching.

Using a self-teaching approach, Cunningham (2006) found a strong correlation between orthographic learning and word reading among children in Grade 1. Each participant read aloud eight short stories, half of which contained real homophones, while the rest were embedded with pseudohomophones (e.g., *chooz* for *chews*). Target words were chosen based on the children's familiarity with them orally, but not in writing. Half of the stories were also altered to remove contextual support by scrambling the passages. Three days after reading, the children were asked to choose the target words they had read in the passages from four spelling variations of the words (i.e., *orthographic choice task*). In addition, the children completed a dictation of the target words (i.e., *spelling test*). The results indicated that the children had higher reading accuracy for targets when they were reading in context (83.6% compared to 67%). Furthermore, in the orthographic choice task they could reliably identify the targets that they had read accurately, but their orthographic learning did not transfer as well to the spelling task.

Cunningham explained that for young children whose spelling skills are developing, recognizing the correct spelling of a word is much less effortful than spelling a word. As this study closely replicated natural independent reading, these findings support the view that children teach themselves how to accurately decode words and also store information in memory about the words' orthography.

Together, this evidence suggests that children use their decoding skills in conjunction with orthographic learning to self-teach (Cunningham, 2006; Share, 1999). As self-teaching progresses, children store each accurately decoded word in their bank of sight words to be quickly retrieved upon subsequent exposures, therefore diminishing the need to decode (Share,

1995). While decoding is not always a successful strategy (Ehri, 2014), Share noticed that when children read the targets in context (Share, 1995; Exp. 1), they made greater gains in orthographic learning compared to reading words in isolation (Share, 1995; Exp. 3). As natural reading occurs in the context of connected text, it is important to understand the role of context in self-teaching (Share, 2004).

The Role of Context in Self-teaching

When reading becomes difficult for any variety of reasons, contextual support can help improve word reading (Martin-Chang, Levy, & O'Neil, 2007). Contextual support can take the form of a cloze sentence provided orally (Archer & Bryant, 2001), a sentence containing a target word (Frith & Snowling, 1983) or a passage containing several target words (Cunningham, 2006; Martin-Chang & Levy, 2005). The benefits of context have been noted for beginning readers, whose decoding skills are emerging, and other readers with relatively weak decoding skills (Kim & Goetz, 1994; Nicholson, 1991). Furthermore, strong readers have been shown to make gains reading in context when the text level is difficult (Nation & Snowling, 1998).

Nicholson (1991) examined the benefits of reading words in and out of context with children between the ages of six and eight. They were sorted into good, average, and poor readers. In the context condition, they were given passages of increasing difficulty to read. The children read the same words in the list condition, which was created by writing the passage from end to beginning. In Experiment 1, the participants read the same words in the passage first and then read them in a list, whereas the reverse order was used in Experiment 2. In Experiment 1, Nicholson found that poor readers (six, seven, and eight-year olds) and younger readers (six and seven-year olds) improved in reading accuracy in context. In Experiment 2, only six-year old good readers and eight-year old average readers showed higher scores in context. Despite the

fact that they were reading the same words a second time in isolation, these readers did not perform better after a subsequent exposure to the words. These results suggest that context is most useful for beginning readers and poor readers because they have less-developed decoding skills than children with stronger reading skills.

Archer and Bryant (2001) also investigated contextual facilitation among beginning readers between the ages of six and seven with average reading skills. They questioned whether a contextual facilitation effect did in fact exist and if gains made in context conditions would extend to reading the same words correctly after a delay. Participants were given a small set of words printed on flashcards to read in either isolation or with the support of a spoken cloze sentence. By carefully controlling for word exposure, the authors ensured that the potential gains clearly related to the condition, not from practice reading a word multiple times. Archer and Bryant found a highly significant contextual facilitation effect. They did not find, however, that context better predicted later word reading in isolation.

To better understand the relationship between contextual facilitation and fluency, Martin-Chang and Levy (2005) studied the effects of reading a large set of words in context versus reading in isolation among good and poor readers. In Experiment 1, children in fourth grade participated in isolated word training (i.e., reading individual words from a computer screen) and a context training (i.e., reading target words in a text). Using a shared reading paradigm, the experimenter read the passage aloud, while the child read only the target words, which were typed in bold and underlined. They also answered ten comprehension questions orally. The results indicated that the context condition led to increased reading speed for all readers, increased accuracy for poor readers, but had no effect on reading comprehension. In Experiment 2, the authors tested second grade students of average reading ability, using a similar method.

The results echoed the findings of the first experiment, supporting the benefits of context training on speed and accuracy for young, average readers. Importantly, not only did children of all abilities read the target words more accurately in context than in isolation, but they also transferred this learning to reading novel stories with better accuracy and speed after the context training. The authors concluded that using a shared reading paradigm can help a wide range of readers access the benefits of contextual support.

However, not all researchers agree that context facilitates long-term word reading. Landi, Perfetti, Bolger, Dunlap, and Foorman (2006) trained young readers (ages five to eight) to read words in context or isolation. The participants were grouped according to their standardized reading score as either good or poor readers. The word sets were then individualized to each student based on pretest errors and contained an average of 33 (Exp 1) and 40 words (Exp 2) per set. In dividing the targets as “easy” or “hard” words, Landi et al. controlled for word difficulty by comparing their frequency, length, complex codas, and complex onsets. The mean length of easy words was 4.7 letters and the mean length of hard words was 6.1 letters.

In line with Martin-Chang and Levy (2005), higher accuracy rates were achieved in the context condition, however, Landi et al. found that training in isolation led to better word retention, especially among poor readers. Landi et al. hypothesized that learning a word in isolation allows the child to attend more carefully to the word’s orthography and phonology compared to reading it in context. Furthermore, they argue that although context facilitates word identification, full decoding is not necessary to recognize a word in context. However, the context condition in this experiment consisted of a missing word at the end of a series of predictable sentences, which does not reflect natural reading conditions, nor require readers to focus their attention on the print (Martin-Chang, in prep).

Martin-Chang, Levy, and O'Neill (2007) investigated the effects of reading in and out of context among average readers in second grade. Children were trained to read a large set of words individualized to each child. Half the words were trained in context, and the other half was trained in isolation. The participants' word reading was measured throughout training and after an eight-day retention period. Consistent with previous findings, children read more accurately in context than in isolation (Cunningham, 2006; Wang et al., 2011). In terms of retention, children showed equivalent maintenance of target words learned in context or isolation. Unlike Landi et al. (2006), who tested exclusively in isolation, Martin-Chang et al. used the same materials during testing as they used during training. In contrast to Landi et al., the authors concluded that, "words learned in context are no more vulnerable to being forgotten than are words learned in isolation" (p. 52).

Most of the time, especially during reading for pleasure, children read words in context (Mol & Bus, 2011; Nation, 2008); therefore, it is important to determine the impact of context on readers' fluency, comprehension, and accuracy (Archer & Bryant, 2001; Martin-Chang & Levy, 2005; Share, 1995). If another strategy, namely reading in isolation, is effective for instructional purposes, then the benefits of this approach also warrant investigation (Stanovich & Stanovich, 1995). However, most evidence tips in the favour of reading words in context over reading words in isolation for novice readers and those with reading difficulties (Nation & Snowling, 1998; Nicholson, 1991; Wong & Underwood, 1996). Furthermore, the benefit of context is clearest when children read difficult words (Wang et al., 2011).

The Role of Word Difficulty in Self-teaching

As English contains many exception words, including high frequency words such as *said*, and many homophones such as *there/their/they're*, numerous words will be challenging to

decode (Zoccolotti et al., 2004). The ability to read regular, exception, and even nonsense words rises steadily with age (Coltheart & Leahy, 1996). For young readers and especially children with dyslexia, longer words are more difficult to read, even when they follow typical grapheme to phoneme correspondences (Martens & de Jong, 2006). Therefore, when examining the role of self-teaching in context and isolation, it is important to consider the difficulty of the target words. Ideally, the word set will be large and the target words will reflect the rich variety of words typical of children's literature, thus mimicking children's self-teaching during independent reading.

Nation and Snowling (1998) examined individual differences in contextual facilitation among children between the ages of seven and ten reading two types of exception words. The authors defined *strange* words as exception words with irregular spelling patterns (e.g., *beige*), while they identified *regular inconsistent* words by the fact that they had an inconsistent neighbor (e.g., *cash* because its neighbor, *wash*, does not rhyme with *cash*, *bash*, and other *-ash* rimes). The authors measured the effects of spoken cloze sentences in relation to readers' skills in decoding and comprehension (Study 1). They also questioned how three groups of readers—dyslexics (i.e., children with good verbal comprehension skills and deficits in decoding), poor comprehenders (i.e., children with good decoding skills and deficits in comprehension), and average readers (i.e., children with average decoding skills and comprehension)—differ in their use of context (Study 2). In this within-subject design, all of the participants read the same words in both conditions and their performance was measured for response time and accuracy. In the isolation condition, the participants simply read the words as they appeared on the computer screen one at a time. In the context condition, the children listened to a cloze sentence that helped predict the meaning of the word before it was displayed (e.g., “The horse likes to kick and

stamp”). To suppress guessing at items, however, some sentences were nonsensical (e.g., “A clock tells us the *drink*”).

Participants showed greater accuracy in context than in isolation, especially for strange words. The results suggest that comprehension was a better predictor of contextual facilitation than decoding. Moreover, due to their difficulty in decoding, the dyslexic group displayed the greatest contextual facilitation, whereas the poor comprehenders showed the least facilitation when reading in context. Importantly, although poor comprehenders have good decoding skills, they showed deficits in reading exception words, indicating that context is important for the orthographic learning of exception words. The authors concluded that, “sensitivity to discourse-level context plays a crucial, albeit secondary role” to decoding in reading development (Nation & Snowling, 1998, p. 1007).

Martens and de Jong (2006) studied the effect of word length on identifying real words presented in isolation among Dutch children with dyslexia and of average reading skills. The sample included fourth-grade students with dyslexia who were matched with average readers of the same age, gender, nonverbal reasoning ability, and vocabulary skills. The third group of participants, second-grade children of average reading ability, was chosen to match the dyslexic group for reading age. Each child read 40 words and 40 non-words in isolation. The words ranged in length from three to six letters. Participants were asked to perform a lexical decision task to identify the real words in the set, similar to Cunningham’s (2006) orthographic decision task. Responses were scored for accuracy and speed. Results indicated that all participants made highly accurate lexical decisions and that dyslexic children had slower response times than their peers, especially for non-words and words with four or more letters. The dyslexic group

performed similarly to the children in Grade 2, indicating that for beginning readers and those with reading deficits, reading longer words is more difficult than reading shorter words.

More recently, Wang et al. (2011) tested the self-teaching model's view of context effects by giving second-grade children a small set of novel words to read in a list or a passage condition. The authors created words to reflect the regular and exception spelling patterns of real words (e.g., *cleap*, pronounced regularly /clip/ or pronounced irregularly, /clep/). Children learned an invented meaning for each word by listening to a definition and viewing a related illustration. The goal of the vocabulary teaching was to ensure the participants were familiar with the targets orally. They then read aloud eight short stories each containing one novel word in the context condition or read a list of the novel words in the no-context condition. In the test phase, children completed a spelling test of the target words and an orthographic choice task (e.g., *cleap*, *cleep*, *cleak*, *cleek*). In addition, children performed an orthographic decision task in which the variations of the targets were presented one at a time and the children determined whether or not the word presented was the same as the original non-word. Wang et al. found higher levels of initial reading accuracy for exception words read in context and a moderate effect of context on orthographic learning for exception words. Importantly, the contextual support was strongest for exception words. The authors concluded that, as Share (1995) proposed, because exception words are difficult to read, children benefit from the support of context to learn words when decoding is difficult or incomplete.

Another method to support children when reading becomes difficult is to offer corrective feedback. Martin-Chang (in prep) examined reading in and out of context, with or without feedback among children in second grade. Participants learned to read a large set of words and then were asked to read them in a novel passage. After a time delay, retention rates were

measured by having children reread the words in isolation or in a passage. In the feedback conditions, students received whole word feedback on words they were unable to read accurately. The results showed that children's reading of novel material was most accurate when they read in context and received feedback. Furthermore, they displayed the best retention of words learned in the context/feedback condition. The author concluded that feedback, which enables the reader to connect whole word phonology to orthography, strengthens children's orthographic representations of words read in context, resulting in "superior learning" (Martin-Chang, in prep; p. 13). This type of outside support is beneficial when a child cannot decode a word either fully or partially.

Martin-Chang, Ouellette, and Bond (in prep) also studied reading in and out of context, with or without feedback among children in second grade. In addition to measuring reading performance, the authors included a spelling task. Using a within subject design, all children participated in each of the four conditions (i.e., context/feedback, isolation/feedback, context/no feedback, isolation/no feedback). In line with Martin-Chang (in prep), children read best in the context/feedback condition during training. In terms of spelling development, children had better accuracy for words learned in isolation than in context, regardless of feedback. The authors speculated that the different outcomes for spelling and reading accuracy are attributable to the dissimilar learning processes involved in spelling and reading. Specifically, spelling requires a more developed orthographic representation of the word than reading.

In contrast to Wang et al.'s (2011) word set, which contained only eight words of four or five letters in length, Martin-Chang et al. (in prep) and Martin-Chang (in prep) used much larger sets (Martin-Chang = 85 words; Martin-Chang et al. = 25 words). Furthermore, the sets contained many words longer than four or five letters. In one list of 25 words used in Martin-

Chang et al.'s study, for example, 17 targets contained more than five letters. These longer words and larger word sets reflect students' everyday reading better than Wang et al.'s small set of shorter words. Moreover, Wang et al.'s words may not present a challenge for students in Grade 2. However, unlike Wang et al., Martin-Chang et al. and Martin-Chang did not control for exception words in their targets.

In sum, many children have difficulty reading longer words and exception words (Martens & de Jong, 2006; Share, 1999; Zoccolotti et al., 2009). Exception word learning is more successful when children read in context (Nation & Snowling, 1998; Wang et al., 2011). Furthermore, contextual support can bridge the gap between a child's partial decoding of a difficult word and its full, accurate pronunciation (Ehri, 2014, Share, 1999; Wang et al., 2011). What remains unclear is whether context can also help young readers self-teach longer words that are regular.

Current Investigation

The objective of this study is to determine if reading a variety of words—short, long, and exception—in isolation or in context leads to differential gains in children's reading and spelling skills. To recreate a situation in which the second component of self-teaching—whole word phonology—is activated, children will be presented with a set of real words, which they know verbally, but not in writing. A large bank of real words, as opposed to a small set of words or non-words, has been selected to mimic naturalistic reading. Word sets were adapted from Strain, Patterson, and Seidenberg's (2002) list of exception words.

The types of words fall into three categories: regular/short, regular/long, and exception. Regular words follow typical spelling patterns and can be decoded more easily than the exception words. Exception words, in contrast, violate conventional spelling patterns (e.g.,

shone, deaf). Regular words were sorted into groups according to the word lengths. Examples of regular/short words include *hem* and *cove*, whereas *crocodiles* and *manicure* were classified as regular/long.

Hypotheses

As children read independently they encounter words of varying difficulty, many of which are exception words. Without the support of corrective feedback, children must rely on decoding and context to tackle difficult words. It was hypothesized that exception words would be the most difficult to read because they do not follow typical grapheme to phoneme conversion rules. Based on existing research, longer words were expected to be difficult as well, despite the regularity of their spelling. Short words were expected to be the easiest to read. It was hypothesized that context would provide the greatest benefit to the most difficult words (exception and long) and some benefit to the easiest words (short). Retention was expected to be equivalent for context and isolation conditions. With regard to spelling, it was hypothesized that exception words would be the most difficult to spell, followed by long words, and short words. It was unknown whether training in context or isolation would yield the most gains in spelling for each word category.

Method

Participants

Thirty-four children from two English elementary schools in Eastern Canada received consent forms. The first school was an independent school in an urban area and the second was a public school in a suburban area. Thirty participants returned their forms. The final sample included 17 girls and 13 boys. All students were in Grade 2 (M age = 7 years 8 months and age range: 7 years 1 month – 8 years 5 months) and were fluent in English.

To verify that all participants possessed age-appropriate reading skills, they completed a reading assessment using a subtest of the Wide Range Achievement Test – Third Edition (WRAT3; Wilkinson, 1993). Mean scores on the WRAT3 = 109.6 (*SD* 10.59) and score ranges: 85 – 130 indicated that all children were reading slightly above grade level. No children were excluded due to low screening scores or due to extensive absences.

Research Design

This study employed a 2 (context, isolation) x 3 (word category: regular/short, regular/long, exception) within participant design. Over four weeks, the students were exposed to two sets of words (context and isolation), comprised of an equal number of short, long, and exception words, totaling 66 items. During week one, half of the participants received training in context followed by a spelling test. Those words were read again at the end of week two. The process was repeated in isolation with a different set of words in weeks three and four. The remaining half of the participants followed the same format, but began in the opposite order. Please refer to Appendix A for the counter balance and a sample calendar.

Materials

Standardized. The WRAT3 requires reading 15 letters and a set of 42 words—of increasing difficulty—in isolation. Each child’s score is calculated based on the total number of words and letters read correctly and his or her age. The WRAT3 has an internal consistency reliability of $\alpha = .89$ and an average standardized mean of 100. The level of difficulty of this study was deemed suitable for participants falling within two standard deviations of the mean (between the 80th and 120th percentiles). The words and letters are displayed on 8.5 x 11” white paper typed in Times New Roman Font, size 12. The researcher scores responses on another paper, out of the child’s view. If a child reads five out of ten words incorrectly, testing is

terminated (i.e., 5/10 rule). Administering the WRAT takes approximately five minutes per child.

Experimental. Sixty-six words were selected and divided among three categories: regular/short, regular/long, and exception. Exception words were selected from Strain, Patterson, and Seidenberg (2002) and did not conform to general phoneme to grapheme conventions. The mean length for exception words was 4.91 ($SD = .81$) letters. Regular words were matched to the exception words for initial phoneme and number of morphemes (1 or 2). The regular words all conformed to general phoneme to grapheme conventions. The mean length for regular/short words was 4.18 letters ($SD = .80$) and the mean length for regular/long words was 6.55 letters ($SD = 1.06$).

A repeated measures ANOVA was conducted to evaluate word length significance. The assumption of sphericity was not violated for the main effect of word categories as assessed by Mauchly's test ($X^2(2) = 3.86, p = .145$), therefore sphericity was assumed. The ANOVA showed that word length was significant with a large effect size: $F(2, 42) = 42.08, MSE = .77, p < .001$, partial $\eta^2 = .67$. Pairwise comparisons confirmed that words in the long category were significantly longer than both short words and exception words (p 's $< .001$) and that there was a significant difference between short words and exception words ($p = .010$). In sum, the word list contained three distinct categories of words in terms of word length and the exception words were difficult, not due to their length, but because they violate standard grapheme to phoneme conventions.

In order to create unique word sets – one for training in isolation and the other in context – the 66 words were divided in two (Set A and Set B). Each set contained 33 words (11 words from each category). Please see Appendix B for the word sets.

Each word set formed the basis of a story and a list to be used during training. The stories, written by the researchers, ranged from 494 to 562 words in length. They were of comparable difficulty and written to appeal to children in Grade 2. *Animal Diary*, containing words from Set A, was written as a first person narrative in a diary format. The other story, *A Cold Night*, containing words from Set B, is written in the third person and described a Halloween night. Please see Appendix C for the stories.

In addition to the standardized test, participants completed pre-tests (reading and spelling) of the target words. The vocabulary test contained 30 of the target words presented in random order. It consisted of viewing images on PowerPoint, which were projected on the SMARTBoard, while the researcher said the target words. For each word, the participants viewed three images, labeled A, B, or C. One of the images was the same picture they had seen during vocabulary training (e.g., B- a picture of a small, fold-up bed for *cot*). The other two images were unrelated to the meaning of the word (e.g., A- a photo of a crow; C- a silhouette of a superhero). Participants were given a response sheet to record their selection by circling either A, B, or C on 8.5 x 11” white paper typed in Times New Roman Font, size 12. No target words were written on the slides or response sheet.

For the second part of the vocabulary test, participants listened to two sentences containing a target word and then selected the sentence which conveyed the meaning of the target word. The researcher read aloud two sentences, designated A and B, one of which correctly used the target word, while the other misused the target word (e.g., A- “When he heard the joke, he gave a *chortle*; B-When he feels sad, he gives a *chortle*”). The students circled the letter indicating the correct usage of the target word (A) on their response sheet.

Participants completed two other pre-tests: reading and spelling of the target words. For the reading test, each child read the 66 target words presented in random order. The words were printed in a list typed on 8.5 x 11" white paper, in Times New Roman Font, size 12. The researcher scored each item on a separate sheet, out of the child's view. Participants were audio-recorded for scoring purposes.

The spelling pre-test required participants to write the 66 target words. The researcher dictated the words in random order. The children wrote the target words on a lined 8.5 x 11" sheet of paper, which they had numbered one to 70. In addition to the target words, four very easy words (*can, help, his, run*), which all participants could effortlessly spell, were included in the test to boost their confidence.

The training period consisted of reading one set of words in isolation and another set in a story context. In the list condition, words appeared one at a time in random order on a PowerPoint slide. Words were typed in Arial font, size 72, in black, and centered on a white background. Every other slide displayed a fixation cross to allow students a visual break between target words. The participants read the list a second time, but in reverse order, for a total of two exposures per word.

In the context condition, target words were embedded in one of two stories. Target words appeared twice in each story. Target words were typed in red ink, bolded, and underlined, whereas the rest of the text was typed in black ink. The participants' copy of the story was typed in Times New Roman font, size 14, on white 8.5 x 11" sheets of paper.

Following trials, the participants wrote a spelling test on the target words they had trained with that week. Using the same format as the pre-spelling test, the researcher dictated the words

in random order and the participants wrote the targets on a numbered grid, typed in Times New Roman font, size 12, on a white 8.5 x 11” sheet of paper.

Retention was tested using the same PowerPoint word list or story the participant used during training. Once again, the researcher scored participants’ reading of the target words as correct or incorrect, out of the child’s view and audio recorded their responses.

Procedure

The researcher informed participants that the study involved reading and spelling a variety of words. Furthermore, participants’ results would have no bearing on their report card marks and would be kept confidential. In addition, their participation was voluntary and they had the option to cease participation at any point. Finally, to thank them for their participation, they would receive a small prize (e.g., a sticker or pencil) each time they completed an activity with the researchers; they would also choose a chapter book to take home once their participation in the study was complete.

Testing took place in a quiet room in the students’ school during language arts periods. During reading trials, they did not receive feedback or assistance from the researcher. The objective was to replicate self-teaching conditions as closely as possible. If a student struggled to read a word after a two second delay, they were instructed to omit it and move on. All trials and retention tasks were audio recorded for scoring purposes.

Screening and Pre-test Phase. Screening of reading skills was conducted using the WRAT3. The researcher instructed the child to read the letters at the top of the page and then read as many of the words as they could until the researcher told them to stop reading at about half-way through the list. The researcher explained that the words would increase in difficulty and that some of the words were challenging even for adult readers; the child could omit words

they found too difficult. The researcher scored the participant's responses on another paper, out of the child's view. The WRAT3 took an average of 5 minutes per student to complete.

The target words included items whose meanings may be unfamiliar to children in Grade 2, such as *hearse*, *poacher*, and *cot*, which could impact the participants' performance on reading and spelling tasks during training. Therefore, the researcher exposed the participants to the 66 target words prior to training. The researcher informed the children that they would be learning about many words, some of them familiar and others new. During this vocabulary teaching, the participants were not exposed to a written representation of the targets; instead, the words were represented with an image or a letter and given orally. The children were shown an image illustrating each word (e.g., a photo of a girl wearing a fancy yellow dress for *gown*) and the researcher orally provided the target word along with an example and a definition to further explain the meaning of the word. The children were allowed to ask questions or provide definitions or examples. See Appendix D for images used to illustrate target words and Appendix E for definition of target words.

One week later, the participants completed a multiple choice vocabulary review quiz to test their recall of the target words' meanings. Thirty words, identified as the most difficult or unfamiliar during the vocabulary exposure, were selected for the vocabulary test (e.g., *scarce*, *gauge*). If a participant failed ten words on the test, then they would complete a second test using an easier word set; however, all participants successfully completed the initial test. The first part of the test required participants to match a target word, provided orally, to an image. The second part required participants to select one of two sentences read aloud, which correctly used the target word. This test was administered to the whole group at once and took approximately 25

minutes. The researcher collected the response sheets and scored each item as correct or incorrect.

The spelling pre-test consisted of the researcher dictating each target word in isolation, then saying the word in a sentence that provided contextual support (e.g., *Pour* your milk carefully), and then repeating the target word in isolation, while the participants wrote the target word on a sheet of paper. This test was administered to the whole group at once in their classroom. Testing took approximately 40 minutes. The researcher collected the tests and scored them; the four very easy words (*can, help, his, run*) were not included in the final scores. See Appendix F for spelling words and sentences.

The reading pre-test consisted of asking the child to read the target words from a list printed on a sheet of paper. The researcher did not provide any feedback to participants. Responses were recorded for scoring purposes. The test took approximately 5 minutes to administer.

Training Phase. The training phase began two weeks later. Participants were trained on 66 target words, equally divided among three categories (regular/short, regular/long, and exception). Half of the students received context training first, followed by isolated-word training, while the other half received isolated-word training first, followed by context training. Each target word was viewed 10 times in either condition. Participants completed two trials on Monday, Tuesday, and Wednesday and four trials on Thursday.

A shared reading paradigm was employed in the context condition. The researcher read the story, pausing at target words (printed in red) to allow the child to read them. The researcher read from her own copy of the story and scored each target word as correct or incorrect, out of the child's view. She encouraged the children to do their best to read the words, but reminded

them that she could not give them any help. If a child hesitated over a word for more than two seconds, the researcher prompted the child to omit it and then she continued reading. Each context condition trial took approximately 10 minutes per child. See Appendix G for training scripts.

In the list condition, the participants read the targets, which were displayed one at a time on a computer screen. The researcher advanced the slides manually as soon as the participant read the word, allowing a maximum of two seconds exposure for each word. The list condition trials took approximately five minutes per child.

Testing phase. On Friday, participants wrote a spelling test on the word set they trained on that week. Therefore, each participant wrote two post-tests to measure spelling—one after each condition. Words were spelled individually (not in context) regardless of how they had been trained. Spelling tests were administered in small groups (two to six students). The researcher dictated words in random order, first in isolation, then in a sentence providing contextual support, and finally, repeated in isolation. Participants wrote the target words on a prepared response sheet. The researcher collected the response sheets and scored the words as correct or incorrect. Administering the spelling test took approximately 15 minutes.

The following week, participants did not complete any training trials. However, they completed a reading retention task on Friday, using the same materials they read the previous week (list or story). Retention tasks were administered individually in the same manner as the trials. For the list condition retention task, however, the participants read the list only one time. The researcher scored the participants' reading of the target words on a separate sheet of paper, out of the child's view.

Results

All participants were screened with the WRAT3. Mean standard scores for reading accuracy on the WRAT3 = 109.6 (*SD* 10.59), indicated that the children were reading slightly above age-appropriate levels.

Training: Reading Accuracy

Figure 1 displays the mean percentage of words read correctly throughout training. A 3 (word category: short, long, exception) x 2 (condition: context vs. isolation) x 10 (trial: 1 – 10), repeated measures ANOVA was conducted to evaluate reading accuracy over the duration of training. The assumption of sphericity was violated for the main effect of trial as assessed by Mauchly's test ($X^2(2) = 28.01, p = .000$), therefore the Greenhouse-Geisser correction was applied.

The ANOVA showed that all three main effects were significant: word category $F(1.23, 35.53) = 98.31, MSE = 19.96, p < .001, \text{partial } \eta^2 = .77$; condition ($F(1, 29) = 7.44, MSE = 7.09, p = .011, \text{partial } \eta^2 = .20$) and trial ($F(2.95, 85.42) = 28.67, MSE = 2.46, p < .001, \text{partial } \eta^2 = .50$). However, these main effects were qualified by a significant Word Category x Condition x Trial three-way interaction ($F(6.67, 193.36) = 4.10, MSE = 1.07, p < .001, \text{partial } \eta^2 = .12$). Therefore, the three-way interaction was followed up with simple two-way Condition x Trial ANOVAs. Three, separate, 2 (condition: context vs. isolation) x 10 (trial: 1- 10) ANOVAs were run on each word category separately.

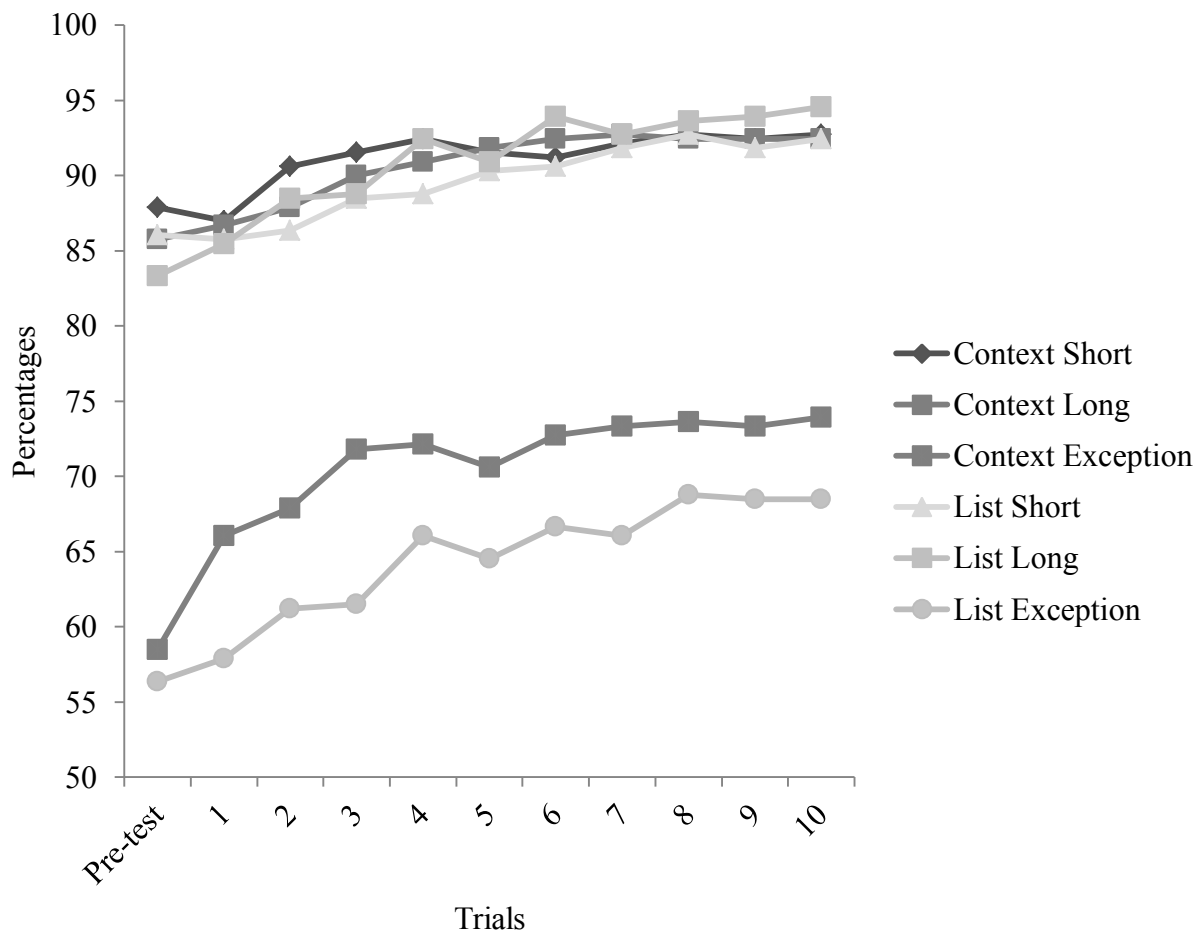


Figure 1. Percentage of words read correctly as a function of training condition and word categories from pre-test to trial 10.

When considering only the short regular words, the assumption of sphericity was violated for the main effect of trial as assessed by Mauchly's test ($X^2(44) = 213.06, p = .000$), therefore the Greenhouse-Geisser correction was applied. The main effect of condition was not significant ($F(1, 29) = 3.05, MSE = 6.38, p = .09, \text{partial } \eta^2 = .10$). However, the main effect for trial was ($F(2.79, 80.90) = 25.93, MSE = 1.81, p < .001, \text{partial } \eta^2 = .47$). The Condition x Trial two-way interaction ($F(2.97, 86.03) = 11.86, MSE = 1.49, p < .001, \text{partial } \eta^2 = .290$) was also significant. To follow up this significant two-way interaction, three paired T-tests were performed at the beginning (trial 1), middle (trial 5) and end of training (trial 10). This analysis revealed that reading in context was significantly more accurate for short words at the beginning of training

($t(29) = 7.75, p < .001$), but had no effect by trial 5 ($t(29) = .459, p = .65$) or at the end of training ($t(29) = 1.072, p = .29$).

For the long words, the assumption of sphericity was violated for the main effect of trial as assessed by Mauchly's test ($X^2(44) = 240.45, p < .001$), therefore the Greenhouse-Geisser correction was applied. There was no significant main effect of condition ($F(1, 29) = .092, MSE = 5.22, p = .76, \text{partial } \eta^2 = .00$), but the main effect of trial was significant ($F(2.24, 64.85) = 8.33, MSE = 2.25, p < .001, \text{partial } \eta^2 = .22$). The Condition x Trial two-way interaction ($F(4.30, 124.80) = .89, MSE = .68, p = .48, \text{partial } \eta^2 = .03$) was not significant.

Finally, for the exception words, the assumption of sphericity was violated for the main effect of trial as assessed by Mauchly's test ($X^2(44) = 92.46, p = .000$), therefore the Greenhouse-Geisser correction was applied. There were significant main effects of condition ($F(1, 29) = 8.81, MSE = 8.91, p = .006, \text{partial } \eta^2 = .233$) and trial ($F(5.28, 153.18) = 9.98, MSE = 1.18, p < .001, \text{partial } \eta^2 = .256$). As with the long words, the Condition x Trial two-way interaction was not significant ($F(5.18, 150.20) = 1.19, MSE = .73, p = .31, \text{partial } \eta^2 = .04$).

Posttest: Reading Accuracy

To evaluate reading performance following training, a 3 (word category) x 2 (context vs. isolation) repeated measures ANOVA was conducted next. Figure 2 displays the mean percentage of words read correctly a week after training. The assumption of sphericity was violated for the main effect of word categories as assessed by Mauchly's test ($X^2(2) = 6.20, p = .05$), therefore the Greenhouse-Geisser correction was applied.

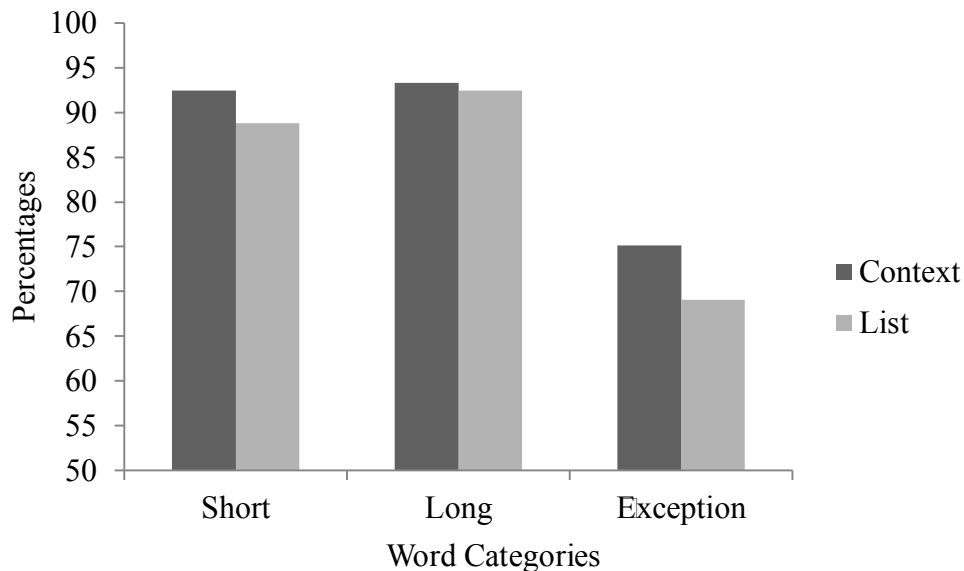


Figure 2. Percentage of words read correctly in post-test as a function of training condition and word categories.

As expected, the ANOVA confirmed that the main effect of word category was significant: $F(2, 58) = 21.50$, $MSE = 1.51$, $p < .001$, partial $\eta^2 = .43$. The main effect of condition was not significant ($F(1, 29) = 2.94$, $MSE = 1.59$, $p = .097$, partial $\eta^2 = .09$), however, this was qualified by a significant Word Category x Condition interaction ($F(2, 58) = 46.06$, $MSE = 1.39$, $p < .001$, partial $\eta^2 = .61$). To follow up this significant two-way interaction, three paired T-tests were performed for each word category with adjusted p values to account for multiple comparisons ($p = .017$). This analysis revealed a significant trend in favor of context for exception words ($t(29) = 2.07$, $p = .048$), that was not apparent for short regular words ($M = .400$, $SD = t(29) = 1.07$, $p = .293$) or longer regular words ($t(29) = .487$, $p = .63$).

Posttest: Spelling Accuracy

Lastly, to evaluate spelling performance following training a 3 (word category) x 2 (context vs. isolation) ANOVA was conducted on the spelling scores. Figure 3 displays the mean percentage of words spelled correctly during post-tests. The assumption of sphericity was not

violated for the main effect of word categories as assessed by Mauchly's test ($X^2(2) = 2.75, p = .253$), therefore sphericity was assumed.

The ANOVA showed that the main effect of word category was significant, with a large effect size: $F(2,58) = 43.61, MSE = 3.16, p < .001, \text{partial } \eta^2 = .60$. The main effect of condition was not significant ($F(1,29) = .37, MSE = 2.21, p = .12, \text{partial } \eta^2 = .08$). Likewise, the Word Category x Condition interaction was not significant ($F(2, 58) = 46.06, MSE = 1.39, p = .693, \text{partial } \eta^2 = .01$). Pairwise comparisons confirmed that differences between all word categories were significant (p 's $< .001$) at post-test.

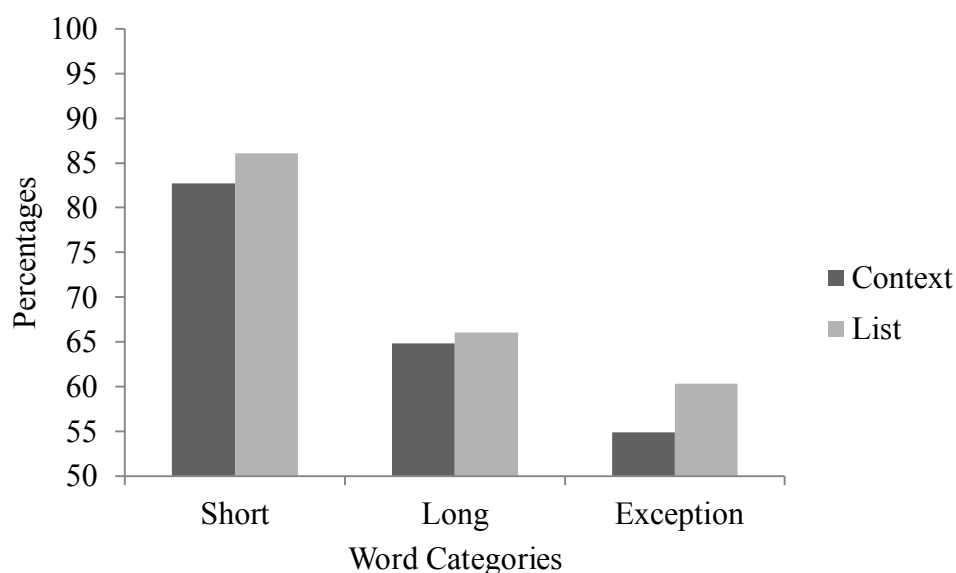


Figure 3. Percentage of words spelled correctly in post-test as a function of training condition and word categories.

Discussion

Exception words are more difficult for children to read (Coltheart & Leahy, 1996) and English contains many exception words (Ehri, 2014). Therefore, many practical implications exist for determining whether context facilitates exception word learning. Indeed, the contextual advantages noted previously (e.g., Martin-Chang, Levy, & O'Neill, 2007; Nicholson, 1991; Share, 1999; Stanovich & Stanovich, 1995; Wong & Underwood, 1996) may apply exclusively

to words that fall into the exception word category (Wang et al., 2011). The data reported here, support and extend the previous work by Martin-Chang et al. (in prep), Wang et al. (2011), and Cunningham (2006). This study found that context is beneficial to reading exception words, but provides no advantage over isolation for long or short regular words. In addition, reading practice improves spelling outcomes, but the type of reading practice (context or isolation) does not impact spelling skills.

In the current study, the children's reading accuracy improved over the ten trials without receiving corrective feedback. These gains are consistent both with the body of work showing that repeated exposures benefit young readers (e.g., Nation, Angell, & Castles, 2007; Wang et al., 2011) and the literature supporting self-teaching (e.g., Share, 1995, 1999). However, the participants did not make equal gains in context and isolation conditions for all word categories.

The data presented here showed that children read better in context during the first trial of training for short regular words and throughout training for exception words. Past research corroborates this robust initial advantage of context (Archer & Bryant, 2001; Kim & Goetz, 1994; Martin-Chang & Levy, 2005; Nation & Snowling, 1998; Nicholson, 1991). How might this initial boost affect novice readers? Although speculative, the greater success experienced when first encountering a word in text might help young readers persevere with reading when it is particularly difficult. Once children have successfully decoded new words, subsequent exposures may require less effort (Ehri, 2014) and give them a positive sense of themselves as readers. Greater reading accuracy on the first trial also fuels fluency and supports comprehension, thus making reading pleasurable (Mol & Bus, 2011). Rewarding reading experiences create a desire to read more, which in turn leads to better reading (Cunningham & Stanovich, 2001). Known as "the Matthew Effect" (Stanovich, 1986), children who enjoy

reading choose to read more and consequently, become even better readers, while poor readers practice less and continue to struggle. In sum, although the effect of context was brief for short regular words, its impact may be substantial.

Whereas the beneficial effect of context tapered off quickly for short words, it persisted throughout training for exception words. Exception words stood out as reaping the most benefits from context, replicating findings by Wang et al. (2011) and Nation and Snowling (1998). As Share (1999) and others (Ehri, 2014) have explained, children use context to support their decoding. When children achieve partial decoding and pronounce “*aching*” similar to “*achoo*” context can guide them to the correct pronunciation (“*aking*”) (Nation & Snowling, 1998). For example, a boy in this study misread the exception word *comb* phonetically as “My mom started to *calm-b*”, but then changed his pronunciation to the accurate word when he read the rest of sentence, “my hair”. From the information provided in the latter part of the sentence, he was able to adjust his partial decoding to select an appropriate word from his oral vocabulary, as Share (1999) described. This kind of cross-checking strategy is not available when children read words in isolation or when they read unfamiliar words in context.

Previous research (e.g., Landi et al., 2006), has suggested that words read in context are more poorly remembered compared to words read in isolation. No support for this notion was found here. Exception words read in context continued to be read more accurately a week later compared to similar words read in isolation.

Differences between the current study and Landi et al.’s (2006) experiment may explain their dissimilar outcomes for retention. Although both Landi et al. and this study controlled for word difficulty in terms of word length and frequency, Landi et al. did not control for exception words. As previously mentioned, there may be a specific benefit of context for exception words.

In addition, Landi et al.'s design consisted of only one trial (Exp 1) and three trials (Exp 2) in contrast to the current study's ten-trial design. Perhaps the retention results in this study are due to increased exposures. Another notable difference between the two studies is that Landi et al. used isolated reading as the outcome measure for both training conditions, whereas this experiment tested words by using the same materials as they were trained.

Turning now to spelling, differences between regular and exception words were notable once again. Although the participants made gains across all word categories, the greatest increases were in exception words. Similarly to Wang et al. (2011), exception words had the lowest spelling accuracy, both at pretest and post-test, showing that this was the most challenging word category for the participants. As expected, outcomes showed that short words were the easiest to spell accurately, followed by long words, and exception words.

Like Cunningham (2006), the current study found an equal advantage of contextual isolated reading practice for spelling outcomes. This result conflicts with Landi et al.'s (2006) claim that reading words in context *detracts* from learning word forms. The basis for this claim is that full decoding is not necessary when children read in context. Indeed, Martin-Chang et al. (in prep), found better spelling results for words trained in isolation than in context. Martin-Chang's experiment resembled the current study's large word set consisting of words of varying length and its study design. However, Martin-Chang et al. did not control for exception words. The findings presented here indicate that participants' spelling skills improved via self-teaching, regardless of condition, particularly on exception words. In sum, context may not hinder spelling, but it has not consistently outperformed isolation.

Share's (1995) self-teaching theory explains how children increase their reading accuracy and orthographic knowledge by reading independently. The goal of this study was to examine

the benefits of self-teaching in and out of context, with regular and exception words, using both reading and spelling measures. The data reported here show that when reading independently, children can successfully read many exception words with the help of context. In addition, they can make gains in spelling via self-teaching, whether in or out of context.

Implications

This study demonstrated that children can improve their reading and spelling skills via self-teaching and that context helps children read exception words. As reading in context is a feature of the self-teaching approach (Share, 1995), parents and teachers should encourage children to read regularly on their own to take advantage of the benefits of self-teaching. Independent reading practice will lead to improved reading and spelling accuracy (Mol & Bus, 2011). As repeated exposures to words are beneficial to young readers (Nation & Snowling, 1998), parents and teachers should also promote re-reading. Above all, instilling a love of reading will ensure that children choose to read on their own and experience the pleasure and rewards of reading (Cunningham & Stanovich, 2001).

In the current study, exception words were the most difficult of the three word categories for participants to read and spell. Knowledge of the relative difficulty of these three word categories could inform teaching practice. Often, teachers have limited knowledge of the linguistic features of English, which hinders their reading instruction (Joshi, Binks, Hougen, Dahlgren, Ocker-Dean, & Smith, 2009). In light of the findings presented here, teachers should be able to identify regular and exception words and teach appropriate strategies for tackling each type of word. Teachers should instruct students to use context in conjunction with partial decoding to support their reading of exception words. Employing a shared reading paradigm to support students' use of context should also be considered.

When targeting regular words, parents and teachers should be aware that longer words can be challenging to spell correctly, despite the regularity of their grapheme to phoneme features. The strategies described above for exception words may be useful. In addition, phonics-based techniques, such as stretching out the sounds and breaking up the word into syllables, can be applied.

Finally, teachers should recognize that English has a deep orthography and therefore contains numerous exception words (Cunningham, 2006; Ehri, 2005). In fact, teachers should know that whenever reading is difficult, whether due to word category (Wang et al., 2011), text level (Nicholson, 1991), or the presence of dyslexia (Nation & Snowling, 1998), context is helpful. This knowledge should give educators greater sensitivity to the challenges children face when learning to read and spell.

Limitations and Future Directions

Given the existing data on word length (Martens & de Jong, 2006; Zoccolotti et al., 2009), it was expected that long words would pose a greater challenge than short words in this study. However, long words were no harder for students to read than short words. It is possible that the words in the long category were not as difficult as anticipated. Indeed, the participants were almost at ceiling at the start of the study, reading an average of 85% long words correctly before training. Perhaps, participants with relatively weaker reading skills would have different results. Alternatively, the decision made to control for morphology might have inadvertently controlled for difficulty. Perhaps longer words are typically more difficult for children to read because they also represent words that are more morphologically complex. This issue should be explored in greater depth in future studies.

In terms of spelling outcomes, others (e.g., Martin-Chang, Ouellette, & Madden, 2014) have noted the relative difficulty of spelling over reading. Participants consistently show less progress in spelling than reading, regardless of training condition, which has led some investigators to use multiple spelling measures in addition to spelling tests, such as orthographic choice tasks and orthographic decision tasks (Cunningham, 2006; Wang et al., 2011). Perhaps the spelling measure in the current study was not sensitive enough to capture more nuanced gains made by the participants in spelling. Instead of scoring responses as correct or incorrect, a scoring scheme which attributes points for correct features, such as accurate initial phoneme, might be more sensitive at detecting progress. Another measure, the orthographic choice task, as employed by Cunningham (2006) and others (e.g., Share, 1999; Wang et al., 2011), might also have added more details to this study's results. If, as Cunningham (2006) explained, it is easier for young children to select the correct spelling of a word than to recall and reproduce it, then perhaps an orthographic choice task would be more appropriate.

Finally, the shared reading paradigm employed in this study is a common approach in self-teaching experiments to reduce frustration in less skilled readers (e.g., Landi et al., 2006; Martin-Chang & Levy, 2005). However, it must nevertheless be considered as a possible limitation. In authentic self-teaching situations, children read independently, without the support of an adult to read the bulk of the text.

Conclusions

When reading on their own, children generally read in context as opposed to reading lists of words (Mol & Bus, 2011; Nation, 2008); children also read more accurately in context compared to in isolation. This study showed that when reading without feedback, the same participants fared much better when they read exception words in a story context compared to

when they read exception words in a list. Furthermore, the findings indicated that exception words were more difficult to read and spell than regular words. These results confirm that readers benefit from contextual support when decoding is difficult due to irregular grapheme to phoneme patterns. The data also showed that children improved their spelling skills via self-teaching, both in and out of context, for all word categories, with the most gains made in exception words.

The conclusions drawn from the present study suggest that children's reading and spelling skills benefit from self-teaching and that self-teaching of exception words is augmented by reading in context.

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Appendix A

Counter Balance

#	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	
1	Lis tA 1& 2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell				Test	No sch ool	No scho ol	Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7-10 spell					Test						
2						Lis tA 1& 2	Lis tA 3& 4	Lis tA 5& 6	List A 7-10	sp ell					Test	Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7- 10	spell						Test
3	Lis tA 1& 2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell				test	No sch ool	No scho ol	Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7-10 spell					Test						
4						Lis tA 1& 2	Lis tA 3& 4	Lis tA 5& 6	List A 7-10	sp ell					Test	Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7- 10	spell						Test
5	Lis tH 1& 2	Lis tH 3& 4	Lis tH 5& 6	Lis tH 7- 10	spell					Te st	Ani m 1&2	Ani m 3& 4	Ani m 5& 6	Ani m 7- 10	spell					Test						
6						Lis tH 1& 2	Lis tH 3& 4	Lis tH 5& 6	List H 7-10	sp ell					Test	Ani m 1& 2	Ani m 3& 4	Ani m 5& 6	Ani m 7- 10	spell						Test
7	Lis tH 1& 2	Lis tH 3& 4	Lis tH 5& 6	Lis tH 7- 10	spell					Te st	Ani m 1&2	Ani m 3& 4	Ani m 5& 6	Ani m 7- 10	spell					Test						
8						Lis tH 1&	Lis tH 3&	Lis tH 5&	List H 7-	sp ell					Test	Ani m 1&	Ani m 3&	Ani m 5&	Ani m 7-	spell						Test

						2	4	6	10		List	Lis	Lis	Lis	spell	2	4	6	10	Test						
9	Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7- 10	spell					Te st	List A 1&2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell					Test						
10						Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7-10	sp ell						Lis tA 1& 2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell						Test
#	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	M	T	W	R	F	
11	Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7- 10	spell					Te st	List A 1&2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell					Test						
12						Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7-10	sp ell						Lis tA 1& 2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell						Test
13	Ani 1& 2	Ani 3& 4	Ani 5& 6	Ani 7- 10	spell					Te st	List H 1&2	Lis tH 3& 4	Lis tH 5& 6	Lis tH 7- 10	spell					Test						
14						Ani 1& 2	Ani 3& 4	Ani 5& 6	Ani 7-10	sp ell						Lis tH 1& 2	Lis tH 3& 4	Lis tH 5& 6	Lis tH 7- 10	spell						Test
15	Ani 1& 2	Ani 3& 4	Ani 5& 6	Ani 7- 10	spell					Te st	List H 1&2	Lis tH 3& 4	Lis tH 5& 6	Lis tH 7- 10	spell					Test						
16						Ani 1& 2	Ani 3& 4	Ani 5& 6	Ani 7-10	sp ell						Lis tH 1& 2	Lis tH 3& 4	Lis tH 5& 6	Lis tH 7- 10	spell						Test
17	Lis tA 1& 2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell					Te st	Hal 1&2	Hal 3& 4	Hal 5& 6	Hal 7- 10	spell					Test						
18						Lis tA	Lis tA	Lis tA	List A	sp ell					Test	Hal 1&	Hal 3&	Hal 5&	Hal 7-	spell						Test

27	Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7- 10	spell					Te st	List A 1&2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell					Test					
28						Hal 1& 2	Hal 3& 4	Hal 5& 6	Hal 7-10	sp ell					test	Lis tA 1& 2	Lis tA 3& 4	Lis tA 5& 6	Lis tA 7- 10	spell					Test
29	Ani 1& 2	Ani 3& 4	Ani 5& 6	Ani 7- 10	spell					Te st	List H 1&2	Lis tH 3& 4	Lis tH 5& 6	Lis tH 7- 10	spell					Test					
30						Ani 1& 2	Ani 3& 4	Ani 5& 6	Ani 7-10	sp ell					test	Lis tH 1& 2	Lis tH 3& 4	Lis tH 5& 6	Lis tH 7- 10	spell					Test

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>4</p> <p>WEEK 1</p>	<p>5 Partic. 1: List Set A, trials 1 + 2</p> <p>Partic. 2: Story Set B, trials 1 + 2</p> <p>Partic. 3: List Set B, trials 1 + 2</p> <p>Partic. 4: Story Set A, trials 1 + 2</p>	<p>6 Partic. 1: List Set A, trials 3 + 4</p> <p>Partic. 2: Story Set B, trials 3 + 4</p> <p>Partic. 3: List Set B, trials 3 + 4</p> <p>Partic. 4: Story Set A, trials 3 + 4</p>	<p>7 Partic. 1, 3: List Set A, trials 5 + 6</p> <p>Partic. 2: Story B, trials 5 + 6</p> <p>Partic. 3: List Set B, trials 5 + 6</p> <p>Partic. 4: Story Set A, trials 5 + 6</p>	<p>8 Partic. 1, 3: List Set A, trials 7-10</p> <p>Partic. 2: Story Set B, trials 7-10</p> <p>Partic. 3: List Set B, trials 7-10</p> <p>Partic. 4: Story Set A, trials 7-10</p>	<p>9 Partic. 1, 3: Set A, SPELLING</p> <p>Partic. 4: Set A, SPELLING</p> <p>Partic. 2: Set B, SPELLING</p> <p>Partic. 3: Set B, SPELLING</p>	10
<p>11</p> <p>WEEK 2</p>	12	13	14	15	<p>16 Partic. 1: List Set A, READING</p> <p>Partic. 2: Story Set B, READING</p> <p>Partic. 3: Lit Set B, READING</p> <p>Partic. 4: Story Set A, READING</p>	17
<p>18</p> <p>WEEK 3</p>	<p>19 Partic. 2: List Set A, trials 1 + 2</p> <p>Partic. 1: Story Set B, trials 1 + 2</p> <p>Partic. 3: Story Set A, trials 1 + 2</p> <p>Partic. 4: List Set B trials 1 + 2</p>	<p>20 Partic. 2: List Set A, trials 3 + 4</p> <p>Partic. 1: Story Set B, trials 3 + 4</p> <p>Partic. 3: Story Set A, trials 3 + 4</p> <p>Partic. 4: List Set B, trials 3 + 4</p>	<p>21 Partic. 2: List Set A, trials 5 + 6</p> <p>Partic. 1: Story Set B, trials 5 + 6</p> <p>Partic. 3: Story Set A, trials 5 + 6</p> <p>Partic. 4: List Set B, trials 5 + 6</p>	<p>22 Partic. 2: List Set A, trials 7-10</p> <p>Partic. 1: Story Set B, trials 7-10</p> <p>Partic. 3: Story Set A, trials 7-10</p> <p>Partic. 4: List Set B, trials 7-10</p>	<p>23 Partic. 2: Set A, SPELLING</p> <p>Partic. 3: Set A, SPELLING</p> <p>Partic. 1: Set B SPELLING</p> <p>Partic. 4: Set B, SPELLING</p>	24
<p>25</p> <p>WEEK 4</p>	26	27	28	29	<p>30 Partic. 1: List Set B READING</p> <p>Partic. 2: Story Set A, READING</p> <p>Partic. 3: Story Set A, READING</p> <p>Partic. 4: List Set B, READING</p>	31

Appendix B

Target Words Divided into Sets and Word Categories

Word Set A

Exception	Regular-Short	Regular-Long
Aching	Arctic	Acrobat
Comb	Cot	Comfort
Scarce	Scabs	Scrape
Cough	Cove	Compass
Crow	Crabs	Crocodiles
Flood	Flee	Flaunt
Gauge	Gala	Gargle
Hearth	Heap	Hundred
Leapt	Leak	Lesson
Pour	Pond	Poacher
Shone	Shed	Shiver

Word Set B

Exception	Regular-Short	Regular-Long
Sword	Swig	Sweep
Choir	Chat	Chortle
Deaf	Dew	Decide
Dreamt	Drab	Drank
Flown	Flinch	Floated
Ghoul	Gown	Gossip
Gross	Grin	Grizzly
Hearse	Hem	Hermit
Mauve	Mask	Manicure
Pear	Pests	Pencil
Ton	Tone	Tonsil

Appendix C

Stories

Word Set A

Animal Diary

February 15: I read that snakes **shed** their skin. A snake **shed** one near the **cove**. The skin was a big **heap** on the ground. Its scales **shone** in the sun. I am going to use my **compass** to go back to the same spot at the **cove** and search the area for another one. Snakeskins are **scarce**. It's hard to get them before they are blown away by the **Arctic** wind.

February 16: After what I found yesterday, I probably have a **hundred** live **crabs** now. I also started collecting **crow** feathers yesterday. I put them in a **heap** near the **crabs**.

February 17: Sam says I talk too much about my animals. It's hard to **gauge** if he is right. I try not to **flaunt** my cool things. He's one to talk! His aunt hates it when he brags. Once, his aunt made him **gargle** with soap to teach him a **lesson** because he would not stop bragging.

February 28: Did you know when a person hunts **crocodiles** illegally he or she is called a **poacher**. If we had **crocodiles** in the **Arctic** I would protect them. I would give everyone a **lesson** about how wrong it is to hunt illegally. I would make the punishment for hunting so terrible, every **poacher** would leave. They would **flee** when they saw me coming.

March 14: When I grow I am going to throw a **gala** to raise money for animals that are **scarce**. The **gala** is going to be named after me, but I will try not to **flaunt** it.

March 18: I saw a nest knocked down during a **flood** at the **pond** a few days ago. I **leapt** to catch it but I missed. Even an **acrobat** would have had a hard time catching it, and I'm no **acrobat**! You should see the **scrape** on my knee! I have lots of **scabs**. Let me start at the beginning...

The baby **crow** was not hurt from the fall because the nest landed in part of the **pond** that wasn't frozen. The nest was like a boat. It was hard to **gauge** what to do. But then the nest started to **leak**. The **leak** got bigger and bigger and I saw the bird **shiver** in the freezing water. I decided to take the nest home without touching the baby bird. The water was rising so I knew I had to **flee**. I used my **compass** to find my way.

When I got close, the glow from the fire **shone** brightly through the window promising the **comfort** of home. I set the nest on the **hearth** by the fire. I started to **shiver** after the **flood**, too. Then I started to **cough** and my **scrape** started **aching**.

My mom set up a **cot** for me by the **hearth**, too. She started to **comb** my hair, but then noticed I had a temperature. She put down the **comb**. She said my temperature was one **hundred** degrees. From the **comfort** of my **cot**, I watched her **pour** some medicine for me. Then I watched her **pour** some water for the baby bird. The flames **leapt** in the fireplace. The **aching** stopped. My mom still made me **gargle** with salt because of my **cough** (but at least it wasn't soap!). What a great day. The big **scabs** on my knees make me look cool.

Word Set B Story

A Cold Night

It was a **drab**, chilly night. Mist **floated** off the swamp. In the morning, the sparkly **dew** looked beautiful, but in the moonlight the **dew** set a creepy **tone**. There was a **gross**, moldy stench in the air from the swamp. Someone had searched for treasure, but all they had found was a **ton** of **pests**.

A **grizzly** old man took a **swig** of coffee. He was a **hermit**. The coffee made him **flinch** as he **drank** because he had sore throat. His right **tonsil** was fine, but his left **tonsil** had hurt for a week. He took another **swig** of coffee. He needed to **decide** whether or not see a doctor. He grabbed a **pencil** to make a note about it. The **pencil** broke. Maybe it was a sign that he should not **decide** right now, he thought with a **grin**. After that, he **drank** his coffee more slowly. He did not **flinch** again.

He looked out the window into the **drab** evening. Suddenly he saw a **hearse** drive towards him. The other cars had **flowed** by, but the **hearse floated** as slowly as a **ghoul**. He turned away from the window. At first, the man thought that he had **dreamt** it, but on a night like this anything was possible.

The man was partly **deaf** but he still knew people were coming. Normally, the **hermit** didn't like visitors. Tonight was an exception.

Waiting was hard. The old man started to read a **gossip** magazine and eat a **pear** to pass the time. He dozed off and **dreamt** of a beautiful **choir** that sang with a perfect **tone**. He awoke to find the **gossip** magazine and **pear** were real but the **choir** was not.

Finally, a few boys and girls arrived at the old man's home. One girl had a **mauve gown** and a matching **mauve manicure**. She got the **hem** of her dress caught in the door. The **hem** was slightly torn but the rest of the dress was fine. Then two boys came. The first had a **grizzly bear mask**, the second had **sword**. The girl with the **gown** showed off her **manicure** as she held out her bag. The other boy put down his **sword** to do the same. With a **chortle** and a **sweep** of his arm, the old man gave them a **ton** of sweet candy. They had a short **chat** and then said goodbye.

The doorbell rang again. This time it was a little girl with a **ghoul mask**. He gave her a friendly **grin** as he handed out more candy with a **sweep** of his hands. She started to **chat**. The man pointed to his hearing aid to show he was partially **deaf**. The child gave a **chortle** and then said "thank you" very loudly.

Soon the evening was over. It had **flowed** by. The moldy stench no longer seemed **gross**. The **pests** were asleep. It had been a perfect Halloween.

Appendix D

Images for Teaching Target Words

1. "Arctic"



2. "Aching"



3. "Acrobat"



4. "Chat"



5. "Choir"



6. "Chortle"



7. "Comb"



8. "Comfort"



9. "Compass"



10. "Cot"



11. "Cove"



12. "Crocodiles"



13. "Crow"



14. "Deaf"



15. "Decide"



16. "Dew"



17. "Drab"



18. "Drank"



19. "Dreamt"



20. "Flaunt"



21. "Flee"



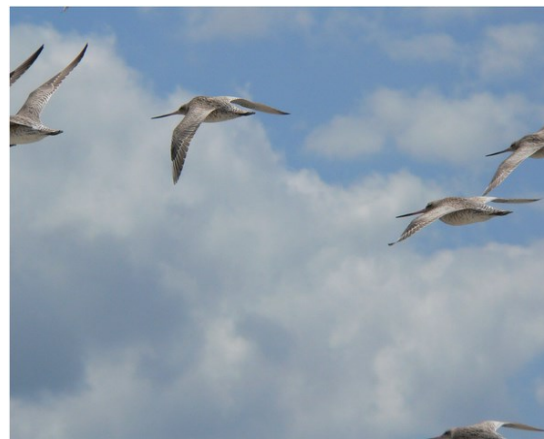
22. "Flinch"



23. "Flood"



24. "Flown"



25. "Gala"



26. "Gargle"



27. "Gauge"



28. "Ghoul"



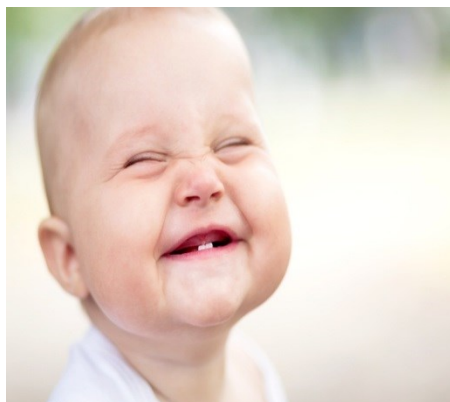
29. "Gossip"



30. "Gown"



31. "Grin"



32. "Grizzly"



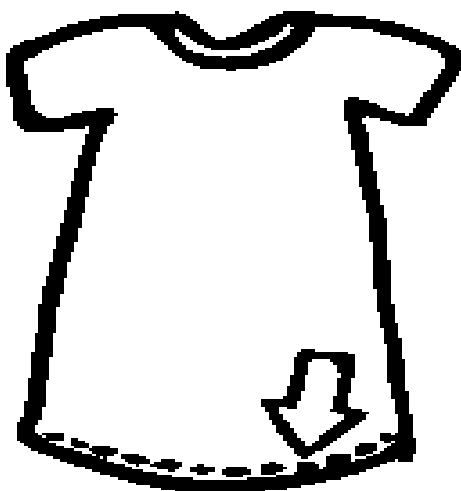
33. "Hearse"



34. "Hearth"



35. "Hem"



36. "Hermit"



37. "Hundred"

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

38. "Leak"



39. "Leapt"



40. "Manicure"



41. "Mask"



42. "Mauve"



43. "Pests"



44. "Poacher"



45. "Scabs"



46. "Scarce"



47. "Scrape"



48. "Shed"



49. "Shiver"



50. "Shone"



51. "Swig"



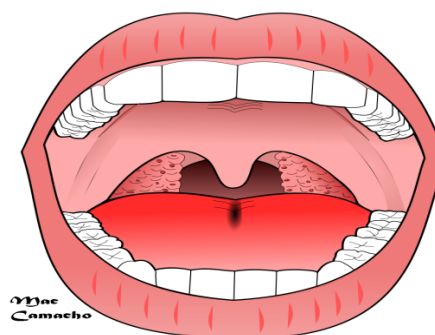
52. "Ton"



53. "Tone"



54. "Tonsil"



Appendix E

Target Words with Definitions Used for Teaching Vocabulary

1.	Arctic—a cold place in the North
2.	Aching—sore; his back is aching/sore; you can also have an aching head or tooth or other body parts
3.	Acrobat—a person who does tricks up high at the circus
4.	Chat—talk with your friends, have a short conversation
5.	Choir—a group of singers, like at a church or some schools
6.	Chortle—a big laugh
7.	Comb—a tool for your hair; it takes away tangles
8.	Comfort—make someone feel better when they're sad or hurt
9.	Compass—a tool that helps you find your way, especially when you're in the woods
10.	Cot—a small bed you can fold up to put away, like at a hotel or camp
11.	Cove—a curve in the land by the water
12.	Crocodiles—a big, green animal, with sharp teeth
13.	Crow—a black bird
14.	Deaf—people who have a hard time hearing, or can't hear at all. They could learn sign language and/or wear a hearing aid, like this boy (in the image)
15.	Decide—make a choice about which way to go or what you want
16.	Dew—little drops of water, like on leaves and grass in the morning
17.	Drab—dark, boring colours, not bright
18.	Drank—drank is the past of drink
19.	Dreamt—he is dreaming, but last night he dreamt, the past of dream
20.	Flaunt—show off; he likes to flaunt his big muscles
21.	Flee—Captain Sparrow is scared and running away from the cows; he wants to flee the cows.
22.	Flinch—make a quick, nervous movement; reaction to surprise, fear or pain. Someone is throwing sticks at him and he knows it, so he flinched before getting hit
23.	Flood—when there's so much water it overflows (gets high) and spills into the streets and onto land. It can happen after a big storm or when snow melts.
24.	Flown—means fly in the past; these birds have flown south many times
25.	Gala—a fancy party
26.	Gargle—swishing water in your mouth and then spitting it out, like with mouthwash or warm water and salt
27.	Gauge—when you need to figure out something, like a reaction to something
28.	Ghoul—a spooky creature (not just a ghost)

29.	Gossip—the girls in the back are talking about the girl in pink. She feels bad because they are saying things about her or secrets that could be true or not true—that is gossip
30.	Gown—a fancy dress
31.	Grin—a big smile
32.	Grizzly—a type of bear
33.	Hearse—a long car with curtains in the windows, it has a funny shape in the back; sometimes in spooky movies (not a limo)
34.	Hearth—it goes around the fireplace to protect the floor
35.	Hem—the bottom of a shirt, skirt, or pants, where it is sewn
36.	Hermit—this is a hermit crab, but some people are called hermits because they like to live alone and they don't like to have any visitors; they might live in a shack in the woods or mountains, far away from people
37.	Hundred—the last number on this chart
38.	Leak—a hole in a pipe where water comes out
39.	Leapt—the past of leap (big jump)
40.	Manicure—putting on nail polish and shaping your nails to look pretty
41.	Mask—a disguise that covers your face
42.	Mauve—a light, pinky-purple colour
43.	Pests—animals and insects you usually don't want in your house
44.	Poacher—a person who hunts animals even though he is not allowed to do it. A poacher sells the animals to make money. If he gets caught, he will be in big trouble
45.	Scabs—when you scrape your skin
46.	Scarce—not enough of something; water is scarce in the desert
47.	Scrape—they're using a knife or tool to take off/scrape the old paint
48.	Shed—when old skin peels off, like lizards' and snakes'; dogs and cats can also shed fur
49.	Shiver—when you get cold and your body shakes
50.	Shone—is the past of shine, the stars shone last night
51.	Swig—means to take a big drink of something, like when you're very thirsty
52.	Ton—something that is very heavy can weigh a ton; too big for this scale! A ton means a lot of something
53.	Tone—this boss looks angry, his tone of voice is loud and angry
54.	Tonsil—in the back of your throat, you have one on each side, they can get red and sore

Appendix F

Spelling Pre-Test Sentences

1.	pond	Next to my cottage, there is a pond where many frogs live.
2.	ghoul	The ghoul in that scary movie was creepy.
3.	can	I can do it!
4.	lesson	I am going to my violin lesson after school today.
5.	grizzly	The grizzly bear came out of his den.
6.	acrobat	The brave acrobat walked the tightrope.
7.	flinch	The loud noise made me flinch .
8.	crabs	I saw some crabs on the beach.
9.	pencil	I need to sharpen my pencil .
10.	leak	After a storm, the old pipes usually leak .
11.	mauve	Her favourite colour dress is mauve .
12.	flaunt	He drives fast to flaunt his fancy car.
13.	run	I run very fast.
14.	sweep	After a messy activity, I sweep the floor.
15.	shiver	The cold air made me shiver .
16.	flown	I have never flown in a hot air balloon.
17.	shone	The stars shone brightly last night.
18.	mask	She wore a mask to the Halloween party.
19.	crow	A crow flew by its nest.
20.	pests	He used a spray to kill the pests in the kitchen.
21.	comfort	When I was sad, my mom would always comfort me.
22.	gown	Cinderella wore a beautiful gown to the ball.
23.	poacher	The poacher was caught and arrested.
24.	tone	Her voice had a clear tone .
25.	pour	Pour your milk carefully.
26.	gossip	They liked to gossip about the other kids.
27.	cough	I have a cough and a sore throat.
28.	his	His name is John.
29.	chat	Let's chat about our party plans.
30.	scarce	In the desert, water is scarce .
31.	swig	After the race, I took a swig of water.
32.	flee	The villagers were forced to flee from the invaders.
33.	gross	The squished bug looked gross .
34.	gargle	I gargle with warm water and salt.
35.	drank	He drank a whole carton of juice.
36.	gauge	It was hard to gauge their reaction to the Prime Minister's speech.
37.	decide	She will decide where to have her party.
38.	scabs	I got these scabs from falling off my bike.
39.	dreamt	He dreamt about flying.
40.	scrape	After lunch, scrape your dish.
41.	sword	The pirate held a shiny sword .

42.	Arctic	She travelled North to the Arctic .
43.	deaf	He uses sign language because he is deaf .
44.	cove	The beach at the cove is beautiful.
45.	chortle	She gave a big chortle at the joke.
46.	leapt	I leapt across the puddles.
47.	drab	The uniform was a drab green.
48.	shed	The lizard shed its skin.
49.	hem	I sewed the hem of your dress.
50.	hearth	Let's warm up by the hearth .
51.	manicure	Her manicure made her hands look pretty.
52.	crocodiles	The river is home to many crocodiles .
53.	hearse	The hearse drove by slowly.
54.	flood	The heavy rains caused a flood .
55.	tonsil	His left tonsil was red.
56.	hundred	We had a hundred day party at school.
57.	floated	The ghost floated through the air.
58.	compass	She used her compass to find the way.
59.	grin	The Cheshire cat has a big grin .
60.	aching	My feet were aching after walking for hours.
61.	hermit	The hermit lived in a small shack in the woods.
62.	help	I need some help with my zipper.
63.	cot	At camp, I slept on a cot .
64.	dew	The dew on the grass glistened.
65.	heap	I left my dirty clothes in a heap on the floor.
66.	pear	He ate a juicy pear for snack.
67.	comb	She should comb her tangled hair.
68.	ton	The teacher gave us a ton of homework!
69.	gala	Tonight, we are going to a gala for the Children's Hospital.
70.	choir	I enjoy listening to the choir sing.

Appendix G

Scripts

List Condition Script

“I am going to ask you to read a list of words today. When we meet next time, I will ask you to read the list again. We’re going to read this list so many times!

I will show you one word at a time on my computer screen. Do your best to read it. I am not allowed to give you any hints. I will just keep track of all the words you have read on my paper.

After each word, you will see a slide with a little cross in the middle; this is a short break from reading. Then, the next word will appear. We will move along quickly, so keep your eyes on the screen.

When you have read all the words, you will pick out a small prize for helping me today.”

Story Script

“We are going to read a story together. We will read it in a special way. I will read most of the words to you as you listen and follow along.

When I point to a word written in red, that means you read it aloud, not me. Do your best to read the word without my help. I am not allowed to read any of the red words. If you get stuck on a word, we will just move on.”

Spelling Script

“Today, I will ask you to spell a bunch of words. This is not like a regular spelling test because you have not studied the words. Do your best to write the words on your sheet. Remember, you will not get a mark for this test; it is just an activity for my project.

I will say the word, then say the word in a sentence, and then repeat the word. Please listen carefully and don’t talk.

If you need me to repeat a word or sentence, wait until I have said all the words and then raise your hand. I will repeat the ones you need.”