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Measuring The Effect Of Vocabulary Instruction On Reading Comprehension: A Comparison Of Academic And Tier II Words

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MEASURING THE EFFECT OF VOCABULARY INSTRUCTION ON READING
COMPREHENSION: A COMPARISON OF ACADEMIC AND TIER II WORDS

by

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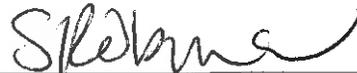
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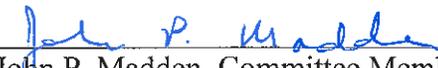
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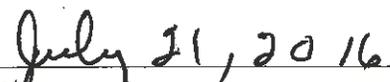|	
Title	Measuring the effect of vocabulary instruction on reading comprehension: a comparison of academic and tier II words
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ABSTRACT

The purpose of this study was (a) to determine if 4th grade students could learn academic vocabulary words or tier II general words using a vocabulary intervention program referred to as the lexicon enhancement program (LeEP), and b) to determine if the category of vocabulary words (tier II general vs. academic) impacts the number of vocabulary words learned, general vocabulary abilities, and reading comprehension. A total of 111 fourth graders participated in this study. Six classrooms were randomly assigned as either the academic group, tier II group, or control group. Pre- and posttest scores of the *Zero-One-Two (ZOT*; Robinson, 2013) were gathered to assess vocabulary knowledge, and pre- and posttest scores of the *Measures of Academic Progress (MAP*; Wang, McCall, Jiao, & Harris, 2013), a standardized, computerized test, were gathered to assess reading comprehension and general vocabulary abilities of all participants. Results revealed that intervention groups showed gains in vocabulary knowledge over the course of the intervention program when compared to the control group. Furthermore, posttest scores of the *ZOT* total score and *ZOT* words known were significantly higher for the academic group than the control group, indicating that teaching academic vocabulary words had a greater impact on the number of *ZOT* words that were learned than teaching tier II vocabulary words. Statistically significant gains were not discovered in general vocabulary abilities or reading comprehension for the interventions groups when compared to the control group suggesting that the LeEP did not generalize to general reading comprehension and vocabulary skills.

CHAPTER I

INTRODUCTION

Having a strong vocabulary has been linked with success in multiple areas, especially reading. Students need strong receptive (comprehension) and expressive (production) vocabulary knowledge to become strong readers (Jalongo & Sobolak, 2011). Reading, specifically reading comprehension, impacts almost all areas of education. Gray and Yang (2015) stated that vocabulary knowledge plays an important role in the ability to understand both spoken and written sentences and it is likely that students who have low oral vocabulary knowledge will also have poor reading comprehension skills.

Vocabulary has been defined as the collection of words in which an individual can recognize and derive meanings from in either written or spoken language (Beck, McKeown, & Kucan, 2008). Vocabulary can be categorized into two units: receptive and expressive. Receptive vocabulary is speech perception and expressive language is speech production (Richter, Eißele, Laszig, & Löhle, 2002).

Vocabulary knowledge is important for many academic and social aspects of life (Beck, McKeown, & Kucan, 2002). An individual's vocabulary and personal lexicon affect how they are able to speak, write, and understand oral and written texts. Without strong vocabulary knowledge, a student may struggle in multiple areas of education, including reading comprehension, which has been directly linked with vocabulary knowledge (Beck & McKeown, 2007; Hairrell, Rupley, & Simmons, 2011; Jalongo & Sobolak, 2011; Quinn, Wagner, Petscher, & Lopez, 2015).

Since poor reading comprehension is linked to poor vocabulary knowledge, poor readers would arguably benefit from vocabulary instruction. Researchers have also suggested that reading impacts almost all aspects of education and is important for academic success. In summary, research has shown that if a student does not have a strong vocabulary, he or she will have poor language comprehension and reading skills, which in turn will negatively impact all other areas of education (Jalongo & Sobolak, 2011).

Although recent literature shows that vocabulary knowledge is important for academic success, the caliber of vocabulary instruction in schools often is not sufficient enough for students to learn new words. Results from a survey in 2008, showed that teachers and reading specialists felt vocabulary instruction was important, but were concerned that their buildings and districts had no system-wide method to teaching vocabulary (Berne & Blachowicz, 2008). This finding supports the idea that a systematic method to teach vocabulary is needed within school districts.

Not only do typical students have trouble learning these vocabulary words, but studies have shown that students with language disorders have trouble with word learning and need to hear a word twice as many times as a student with average language abilities (Komesidou & Storkel, 2015; Zipoli, Coyne, & McCoach, 2012). The fact that students with language disorders face more difficulties than the average student strengthens the need to develop a systematic method to teach vocabulary effectively.

Research in the area of reading comprehension and how to improve reading comprehension is needed (Beck & McKeown, 2007). A recent article states that more collaborative research is needed between university speech-language pathologists, school-based speech-language pathologists, and classroom teachers on the implementation of

evidence-based treatment programs in real-life settings, such as in the school setting (Nippold, 2015). Specifically, studies are needed that investigate strategies to improve the reading comprehension skills in school-aged children (Hairrell, Rupley, & Simmons, 2011). One past study revealed that students with reading difficulties benefited three times as much while receiving vocabulary instruction than students who were not receiving explicit vocabulary instruction (Hairrell, Rupley, & Simmons, 2011).

The current study was designed to study the effects of classroom based vocabulary instruction. The following questions will be addressed:

1. Can 4th grade students learn academic vocabulary words or tier II general words using the lexicon enhancement program?

2. Does the category of vocabulary words (tier II general vs. academic) impact:

   a) the number of words learned by 4th grade students?

   b) general vocabulary abilities?

   c) reading comprehension?

CHAPTER II

REVIEW OF LITERATURE

Importance of Vocabulary Instruction

Vocabulary has been defined as the collection of words in which an individual can recognize and derive meanings from in either written or spoken language (Beck, McKeown, & Kucan, 2008). Vocabulary can be divided into two categories: receptive and expressive. Receptive vocabulary is the comprehension of words and expressive vocabulary is the production of words (Richter, Eißele, Laszig, & Löhle, 2002). Each individual's vocabulary is distinct and, for this reason, can be referred to as that individual's personal lexicon. An individual's personal lexicon affects how they are able to speak, write, and understand oral and written texts.

Vocabulary knowledge is important for many academic and social areas of life. It has been stated that vocabulary is one of the most important aspects of an educated student (Beck, McKeown, & Kucan, 2002). Without strong vocabulary knowledge, a student may struggle in multiple areas of education. Reading comprehension, specifically, has been directly linked with vocabulary knowledge (Beck & McKeown, 2007; Hairrell, Rupley, & Simmons, 2011; Jalongo & Sobolak, 2011; Quinn, Wagner, Petscher, & Lopez, 2015).

The simple view of reading (Gough & Tunmer, 1986) explains reading comprehension as two parts. Decoding is the skill that is required for individuals to understand how sounds correlate with letters to be able to "sound out" words while reading.

Linguistic comprehension is the knowledge of language to understand the meaning of words while reading and includes the structure of language (i.e., grammar, word order) and the meaning of language (i.e., vocabulary, concepts, slang). An individual needs to be able to integrate both of these abilities and cannot have one skill without the other to become a strong reader. In the early elementary years, students rely more heavily on their decoding skills to make meaning out of text. In the later elementary years, students switch to relying on stored language knowledge to be able to comprehend the more abstract nature of academic texts. In order for students to effectively use linguistic comprehension, they must also have a sufficient vocabulary. An example of integrating both skills would be if a student can recognize the word "vanish" but does not understand that it means "to disappear," the word will have no value to the student and will, therefore, impact comprehension. The National Institute of Child Health and Human Development (2000) published the *Report of the National Reading panel,* which stated that there is a relationship between vocabulary and learning to read. The researchers also found that poor vocabulary knowledge contributes to poor reading and, therefore, difficulty with learning.

To support the idea that vocabulary knowledge affects reading comprehension, the National Assessment of Educational Progress (NAEP) reported in 2015 that children with the highest reading scores also had the highest vocabulary scores. In addition, students who scored in the lowest 25% in reading comprehension also scored in the lowest 25% in vocabulary. These findings suggest a correlation between reading and vocabulary demonstrating that students need vocabulary knowledge to become proficient readers.

Ouellette & Harris (2006) conducted a study to examine the relationships between vocabulary (receptive and expressive), depth of vocabulary knowledge, decoding, visual

word recognition, and reading comprehension. Several standardized and nonstandardized measures were administered to explore the relationship between the variables. The measures given included: the *Test of Nonverbal Intelligence - Third Edition* (Brown, Sherbenou, & Johnsen, 1997), four sections (receptive vocabulary, expressive vocabulary, word definitions, and synonyms) of the *Test of Word Knowledge* (Wiig & Secord, 1992), the *Word Attack* (decoding) and *Reading Comprehension* subtests of the *Woodcock Reading Mastery Tests—Revised* (Woodcock, 1998), and participants were asked to read aloud from a word list composed of 47 words that became progressively more difficult. The purpose of the word list was to assess visual word recognition. Forty-seven 4th grade students' scores were analyzed in the study. The results from the study found that depth of receptive and expressive vocabulary knowledge was strongly correlated (Pearson's $r = .504$) with reading comprehension skills. Receptive vocabulary breadth and expressive vocabulary breadth were moderately correlated (Pearson's $r = .484$ and Pearson's $r = .362$, respectively) with reading comprehension skills, as well. These results suggest that the greater the extent of vocabulary word knowledge a student has (i.e., depth) and the greater the amount of vocabulary words a student knows (i.e., breadth), the better that student's reading comprehension skills will be (Ouellette & Harris, 2006).

 With an increase in vocabulary research and knowledge about the correlation between reading proficiency and vocabulary knowledge, one would expect vocabulary scores to be increasing; however, this is not what the data reveal. Within the state of North Dakota, the results from the NAEP (2015) revealed that reading scores have remained relatively stagnant since 2002 in both fourth and eighth grade, which falls in line with the national average. This

suggests that either the current methods to teach vocabulary are not effective or that

vocabulary is not being systematically taught.

What Words to Teach

Vocabulary knowledge is important and plays a role in overall academic success.

Given this knowledge, the question becomes, what vocabulary words should teachers target

for the greatest impact on academic success? Some researchers believe that academic words

should be targeted during vocabulary instruction because students need to be able to use

these words to communicate and think about academic subject areas (Nagy & Townsend,

2012; Townsend, Filippini, Collins, & Biancarosa, 2012). Others believe tier II words should

be used because they are words that are not learned through everyday interactions and are

needed for comprehension (Beck, McKeown, & Kucan, 2013).

The English language contains thousands of words, but not all words and word

meanings need to be taught directly. Some words are learned through natural experiences,

such as book, house, and cat, while others require direct instruction, for example, vanish and

circumference. Some words appear frequently in oral and written language, thus providing a

learner with multiple exposures, while others only appear in certain contexts. One way to

categorize English words is by the frequency of occurrence. Beck, McKeown, & Omanson

(1987) divided vocabulary words into three categories, or tiers. Tier I words are words that

children learn in everyday interactions and require no explicit teaching. For example,

students will learn the word "horse" by hearing others use the word when talking about the

farm animal or by watching someone point to and label a picture of a horse in a storybook.

Tier II words are considered to be uncommon in conversation, but are common in academic

readings and require more explicit teachings. This means that a student may not learn these

words through typical, nonacademic reading tasks or daily interactions with peers and adults independently. They will require some type of instruction to learn tier II words, understand the words while reading, and use them in conversation. An example of a tier II word would be "assume," meaning, "to think without proof." Students in elementary school would likely not learn the meaning of "assume" without some type of instruction because it is abstract and does not have a direct referent to it. Tier II words are essential for comprehension as they appear frequently in oral and written language. Tier III words are the most abstract and are domain-specific. This means that these words are used in particular subject areas. Tier III words are usually only taught in certain contexts; for example, a science teacher will typically provide direct instruction for the meaning of the word "mitochondria" in an upper-level science class. Beck, McKeown, and Kucan (2013) believe that tier II words should be directly taught to students because they are words that appear frequently in written and oral language, are not explicitly taught, and are essential for comprehension.

Coxhead (2000) developed a specific subset of tier II words, called academic words and combined these words to form the Academic Word List (AWL). The AWL consists of 570 frequently occurring English word families. A word family consists of the root word, regular inflections of the word, and derivations of the word; for example, inspire, inspiring, inspired, inspires, and inspiration. To develop the AWL, Coxhead used the Academic Corpus, developed by Davies (1990), as a running vocabulary list. The Academic Corpus contained approximately 3.5 million words that were collected from over 400 written materials that first-year university students were required to read. These words were discovered in a wide range of academic texts of various subject areas. They were divided into four main disciplines: arts, commerce, science, and law. The words were further divided into

seven separate subject areas for each discipline for a total of twenty-eight subject areas. Coxhead used three principles to determine which words from the Academic Corpus would be included in the AWL. First, the word family had to occur in all four of the disciplines of the Academic Corpus and in more than half of the twenty-eight subject areas. This ensured that the AWL would be useful for all learners regardless of their area of study. Second, the word family had to occur more than 100 times in the Academic Corpus to ensure that each word family occurred frequently in academic texts. Finally, the word family had to occur in each of the four disciplines at least ten times to, again, ensure that the AWL would be useful for all learners. The 2,000 most frequent words of English, proper nouns, and Latin forms were excluded from the AWL. It is estimated that 10% of all words in academic texts are made up of words from the AWL (Coxhead, 2011).

To support the idea that academic vocabulary knowledge is important for academic success, a study was conducted to determine whether greater academic word knowledge is associated with greater academic achievement in middle school students who speak English or are English language learners (ELL) (Townsend, D., Filippini, A., Collins, P., & Biancarosa, G., 2012). A sample of 339 seventh and eighth grade students was followed to determine the difference between overall vocabulary knowledge and general academic word knowledge in relation to academic success. The results of the study found a link between students' academic word knowledge and their overall academic achievement. Additionally, the study found that it is important for teachers to facilitate academic vocabulary development in middle school ELL students to promote greater academic success.

Another study involving ELL students in middle school found similar results about academic vocabulary knowledge (Townsend & Collins, 2009). This study included 37 ELL

students in grades 6-8 who attended an after-school program to accelerate their academic vocabulary development. The students were split into two groups that received the intervention at separate times. The program included 20 sessions that were 75 minutes each where the students received direct instruction of the target words, multiple exposures to the words in multiple contexts, and many opportunities to use and personalize the word meanings. Results showed that the direct instruction of academic vocabulary words created an overall growth in the student's' knowledge of the target words compared to the control words that were not directly targeted (Townsend & Collins, 2009).

Given the fact that these words occur frequently in academic texts and contribute to the abstractness of such texts (Townsend, Filippini, Collins, & Biancarosa, 2012), it could then be argued that academic words from the AWL should be targeted in vocabulary instruction. Coxhead's list of word families makes it easier to determine which academic words should be taught in order to make the largest impact in multiple academic areas (Nagy & Townsend, 2012). While word selection is an important part of vocabulary instruction, it is only one step needed to successfully teach vocabulary. It is equally as important to use evidence-based methods of vocabulary instruction to create an effective program (Gray & Yang, 2015).

What Method to Use

Across the nation, many different methods of teaching vocabulary are used. Common methods include using reading curriculum, spelling lists, and simply looking up the definitions of unknown words in a dictionary. Beck, McKeown, and Kucan (2013) found that using a dictionary is not useful and it is more useful to use child-friendly explanations and to get the student to actively use the word themselves when speaking or writing. This finding is

related to other findings that state that a student needs to hear vocabulary words multiple times and have the experience of practicing the words to be able to comprehend them (Nagy & Townsend, 2012).

There are multiple theories related to how children learn vocabulary. Three of the main theories include the process learning approach, cognitive vocabulary approach, and the context-driven approach. The process learning approach views vocabulary development as a two-step process. The first step is learning from input and the second step is memory evolution in the absence of input (Komesidou & Storkel, 2015). For example, first students are taught vocabulary words through writing. Then, the writing is removed and the student must remember the vocabulary word from memory alone. A major component of the process learning approach is lexical engagement, which involves building connections (orthographically, phonologically, and through meaning) between the new vocabulary word and words that are already in the student's repertoire (Leach & Samuel, 2007).

The cognitive vocabulary approach involves teaching students the metacognitive skills needed to identify words they do not recognize and draw connections to other experiences and vocabulary words (Harmon, Buckelew-Martin, & Wood, 2010). Metacognitive skills include higher level thinking tasks such as actively monitoring comprehension and planning how to complete a given task. After the students independently identify words that are unfamiliar to them, the class determines which words were most commonly identified and focus on those words for instruction.

A study conducted by Lubliner and Smetana (2005) examined the effects of implementing the cognitive vocabulary approach to fifth-grade students in a low-performing, Title 1 school for a 12-week period. Each of the participating classrooms completed 12

modules, with one to three lessons each, using the school district's social studies textbook. The goal of the intervention was to increase the students' metacognitive skills, therefore, improving their vocabulary knowledge. Each lesson was focused on a specific strategy to improve the students' vocabulary skills through metacognition. Examples of lessons to increase metacognition included teaching students to read aloud, rating their knowledge of unknown words, and coloring unknown words red. During the lesson, the teacher modeled the targeted strategy and provided opportunities for the students to practice the newly learned method. After each lesson, when the students became more comfortable, they used their newly acquired strategy while reading their social studies textbooks with a partner. Finally, the class engaged in a whole-group discussion centered on the strategy that was targeted that week.

Students were evaluated three times (pretest, interim test, and posttest) using three measures. The first measure was a metacognitive test where the students were asked to read a difficult social studies passage and highlight words they did not know. This measure was designed to determine the percentage of unknown words between intervention periods. The second and third measures were a reading comprehension and vocabulary acquisition test. The students were instructed to read a social studies text at the ninth grade level and then answer 30 comprehension questions and 20 vocabulary questions. The vocabulary questions were developed from words in the passage that the researchers thought would be unknown to the students. Students at an above-average performance school within the same district were also tested as a control for the study.

The pretest data revealed significantly higher scores on the reading comprehension and vocabulary acquisition tasks for students in the control group than students in the

intervention group. By the end of intervention, the posttest data revealed that the differences between groups were not significant suggesting that teaching students vocabulary using a cognitive approach does help students in the areas of reading comprehension and vocabulary acquisition (Lubliner & Smetana, 2005).

The context-driven approach involves identifying unknown words within the context of written text, typically through storybooks. Similar to the cognitive vocabulary approach, children are taught the skills to identify words they are not familiar with, but the word that is targeted has been predetermined. A majority of context-driven studies are designed for a classroom teacher to implement and last from 18 weeks to the entire academic year. The targeted vocabulary words are typically tier II words which occur frequently in everyday interactions but are not explicitly taught (Apthorp, 2006; Loesch, 2015). Most of the core studies have found positive results in using a context-driven approach to vocabulary instruction (Gonzalez, et. al., 2014; Loesch, 2015).

Loesch (2015) examined the effect of vocabulary learning using a context-driven approach. Two kindergarten classrooms participated in the study. The teacher of the first classroom implemented the context-driven approach by teaching students to monitor their comprehension of unknown words, to rate their knowledge of words, and to define words using a word web. The teacher of the second classroom taught vocabulary through shared reading of the book and by explaining the meaning of the word to the students. Thirteen academic words were selected by the researcher to be targeted through children's picture books (one word per book). Both classrooms were provided a list of the target words and books that contained these words. During instruction, each classroom teacher introduced the target word on the first day of each week by reading a story aloud that contained the word.

Then, each teacher implemented the approach they were taught. Both teachers were also instructed to review the word meanings daily for the remainder of the week.

The intervention lasted fifteen weeks with one word being targeted per week and two weeks of review. Before instruction began, all participants were administered a pretest of the *Zero-One-Two* (*ZOT*; Robinson, 2013). During the pretest, participants were asked to define each target word and use the word in a sentence. They were given a score of 0-2 for each definition and each sentence given for a total of four points. Following the fifteen weeks of instruction, all participants were administered a posttest of the same measure.

The participants' pre- and posttest *ZOT* scores were obtained for the targeted words. Loesch found that students in the first classroom knew more academic words than the second classroom as measured by pre- and posttest data (Loesch, 2015). The results were found to be significant ($p < .001$). This study suggests that kindergarten students learn vocabulary words more successfully through more structured and interactive instruction like the context-driven approach as compared to other traditional methods. The current study will focus on exploring a context-driven approach referred to as the lexicon enhancement program (LeEP).

Why Target 4th Grade

When students enter the fourth grade, the academic demands for reading change. Before the fourth grade, students are taught to use decoding skills because they are learning to read. At the fourth grade level, teachers are no longer teaching decoding skills, but are instead focusing on using vocabulary for language comprehension skills. Fourth grade students must be able to read in order to learn about academic subjects. The switch comes in the fourth grade because the language presented to students in conversation and textbooks becomes increasingly more complex at this age (Nagy & Townsend, 2012).

All grade school levels teach vocabulary in some way. As a student gets older, the vocabulary demands increase. For example, according to the Common Core State Standards, fourth grade students are expected to read and comprehend challenging informational material contained in textbooks that are used to teach the various academic subjects (Nippold, 2015). Due to these standards, the *Measures of Academic Progress* (MAP) begins measuring vocabulary in the fourth grade.

CHAPTER III

METHODOLOGY

Participants

Fourth grade students at Viking Elementary School and Kelly Elementary School served as participants in the study during the 2015-2016 school year. Both schools are located within the Grand Forks Public School district (GFPS) in Grand Forks, ND. There are several variables present in the school setting that impact vocabulary knowledge and vocabulary learning. The most documented variable is socioeconomic status (SES). Students who are from disadvantaged backgrounds hear, and thus use, significantly fewer vocabulary words than their peers (Hart & Risley, 1995). For this reason, it was important to select two schools that were similar in SES. The GFPS provided the research team with the data showing percentage of students receiving free and reduced lunch per school. Viking Elementary reports a rate of 18% free and reduced lunch and Kelly Elementary reports a rate of 15%. Both are considered low SES for the GFPS. Other demographic information about the students that was collected included: gender, ethnicity, grade in school, proficiency in the English language, and whether students were on an Individualized Education Plan (IEP) or a 504 Plan. Three fourth grade classrooms from Viking and four classrooms from Kelly were included in all pretest and posttest procedures. A total of 131 fourth grade students completed all pre- and posttest measures. The academic group consisted of 16 participants from Viking Elementary (male, n=11 and female, n= 5) and 21 participants from Kelly Elementary (male,

n=11 and female, n=10). The tier II group consisted of 17 participants from Viking Elementary (male, n=9 and female, n=8) and 21 participants from Kelly Elementary (male, n= 10 and female, n=11). The control group consisted of 17 participants from Viking Elementary (male, n= 10 and female, n= 7) and 19 participants from Kelly Elementary (male, n=8 and female, n=11). The ethnicity of the participants in the six classrooms included Caucasian (n=98), African American (n=6), Hispanic (n=4), Native American (n=2) and Asian (n=1). Twenty students received free and reduced lunch and all participants were proficient in the English language. Two participants in the academic group received special services through an IEP and four were on a 504 plan. Four participants in the tier II group received special services through an IEP and six were on a 504 plan. The control group included six students who received special services through an IEP and two who were on a 504 plan.

Procedure

Prior to intervention, the literacy committee in the GFPS reported no systematic approach to teaching vocabulary. All teachers taught vocabulary within the context of literacy instruction, but they did not focus on specific words or categories of words to target. One class in each school was randomly assigned to the academic intervention group, in which, the teachers were instructed and trained to teach academic words. One class per school was randomly assigned to the tier II intervention group, in which the teachers were instructed to teach tier II words, and the remaining classrooms did not receive systematic vocabulary instruction and served as the control group.

The intervention groups were assigned either 15 academic words or 15 tier II words to teach depending on the group assigned. Although the academic and tier II groups were

taught different words, they were both provided with the same children's books. The vocabulary words in each book were predetermined for the academic and tier II groups and both groups used the same method of vocabulary instruction, referred to as the lexicon enhancement program (LeEP). The control group continued vocabulary instruction as was done prior to the study.

The LeEP is a context-driven approach that consists of three components: comprehension monitoring, a vocabulary knowledge scale, and word mapping. The first two components, comprehension monitoring and the vocabulary knowledge scale, were taught on the first day of the week when the classroom teacher read the storybook. The third component, word mapping, was taught every day throughout the week and lasted no longer than ten minutes each day. All of the components were completed as a whole class.

During the comprehension monitoring component, students were instructed to alert the teacher when they heard a word that they did not know while listening to a story. The teacher then flagged that page in the book and all of the flagged words were discussed at the conclusion of the story. After all of the flagged words were discussed, the teacher presented to the class the word that had been designated as either the target academic or the tier II word for that week. As a part of the whole group discussion, the teacher asked each student to rate his/her knowledge of the word using the Vocabulary Knowledge Scale (Paribakht & Wesche, 1997). This scale is based on a 1-4 rating system. Students raised their hand for one if they had never heard the word before and had no clue what it meant; a two if they had maybe heard the word but did not know the meaning; a three if they had an idea of what the definition was; or a four if they could give the dictionary definition of the word.

The final component was word mapping on a word web. On the first day of the week, when the story was read, the students in the class wrote the target word in the middle of a white board and circled it. Then, they wrote in bubbles off of the main word to build a word web. The students in the classrooms wrote definitions, synonyms, and antonyms, each in a different color. For example, definitions were written in red, synonyms in blue, and antonyms in purple. Each day of the week, the students in the class discussed the target word and added 3-4 additional bubbles to build onto the word web.

Outcome Measures

Zero-One-Two Assessment

The *Zero-One-Two* (*ZOT;* Robinson, 2013) is a researcher-designed, non-standardized measure used to assess students' knowledge of vocabulary words. Scoring on the *ZOT* is determined by the student's definition and sentence generation using the target word. This assessment was used as a pretest to measure students' knowledge of words prior to intervention. The *ZOT* contained 30 words: 15 words were academic and the other 15 were tier II words. In this way, the 15 non-targeted words for each group served as the control words. The *ZOT* was then re-administered as a posttest to determine word learning.

Graduate students in the Communication Sciences and Disorders department at the University of North Dakota were taught in a one-on-one training session by the *ZOT* developer how to administer the *ZOT* to students in the tiered, academic, and control groups. Testing was completed in a one-on-one setting in the hallway or other quiet space. Each administration was audio-recorded. Students were verbally presented with a target word and asked to first provide a definition of the word followed by a sentence using the target word. Two scores were obtained on the *ZOT*. The first was the *ZOT* total score, which is a broad

measure of word learning. To obtain the total score, students' knowledge of each word was rated on a 0-4 point scale. Zero, one, or two points were earned for the definition that the student provided, and up to two points could be earned for using the target word correctly in a sentence. The total points possible ranged from 0-120 points. The second score obtained on the *ZOT* was the *ZOT* words known score, which is the number of words that a student scored either 3 or 4 points. This score reflects depth of word knowledge and yields a possible range of 0-30 points.

Measures of Academic Progress

The *Measures of Academic Progress* (*MAP*) is a standardized, computer-based test for students in grades 2-12. The test is used to assess students' knowledge and academic abilities in a variety of subjects including math, reading, and language use. Each of the subject area is also broken into multiple subcategories, called RITs. For example, the reading section has RITs that include vocabulary (Vocabulary RIT) and reading comprehension (Reading RIT). The *MAP* test was developed by the Northwest Evaluation Association and each of the content areas on the *MAP* are customized to individual states based on that state's content standards. Each section of the test ranges from 40-50 multiple-choice questions and students are allotted 60 minutes to complete each section (Wang, McCall, Jiao, & Harris, 2013). The *MAP* test is typically administered 2-3 times per year, depending on the school district. The scores that students obtain allow districts to track students' progress throughout the years and help teachers discover which areas need more instruction (NWEA, n.d.).

In the current study, *MAP* Vocabulary RIT and Reading RIT scores were used as pre- and post-intervention measures of general vocabulary ability and of reading comprehension ability. Scores from the fall testing, which occurred in late September, served as the pre-

intervention scores and scores from the spring testing, which occurred in late April to early

May, served as post-intervention scores. Scores were obtained from the data manager in the

GFPS.

CHAPTER IV

RESULTS

The purpose of this study was to evaluate the effect of the lexicon enhancement

program on vocabulary knowledge and reading comprehension in 4th grade students. To

determine the effect of the intervention on vocabulary growth, the *Zero-One-Two* (*ZOT*) was

used as a pre- and posttest measure of the participants' knowledge of 30 academic and tier II

vocabulary words. Two scores were calculated from this measure. The *ZOT* total score

ranges from 0-120 possible points (0-4 points were obtainable for each word) and it is a more

broad measure of the targeted words. Words were considered to be "known" if students

received a score of three or four on a word. The possible scores for the *ZOT* words known

range from 0-30. To determine the effect on reading comprehension, scores from the Reading

RIT of the *Measures of Academic Progress* (*MAP*) assessment were collected in the fall and

spring for all participants. Scores from the Vocabulary RIT of the *MAP* were also collected in

the fall and spring to determine general vocabulary growth (non-targeted words).

Inter-Rater Reliability

Each administration of the *ZOT* was audio-recorded to be analyzed by a second rater.

Raters recorded scores on separate protocols and the second rater was blind to the

participants' initial score. Inter-rater reliability was calculated on 43% of the testing sample

to determine the reliability of *ZOT* scoring. Inter-rater reliability of Pearson's r>.90 indicates

a high correlation between the scores from separate raters. The correlation coefficient (Pearson's r) was r=.92 indicating that *ZOT* scores were reliable.

Data Analysis

Seven 4th grade classrooms (two academic, two tier II, and three control groups) participated in the study. Three control classrooms were included in an effort to control for attrition. A total of 139 students participated in part or all of the study. Of this number, eight students were excluded from the study because they did not complete all pre- and posttest measures; thus, the attrition rate was low so attrition bias is not a concern. To determine which two control groups were most similar to the intervention groups at the beginning of the year, the means of the Reading RIT pretest scores and *ZOT* total pretest scores were compared between the three control groups. The two control groups that had the most closely matched means were selected for analysis. Data were analyzed for a total of 111 students. The number of participants that were analyzed in each group is presented in Table 1.

Table 1. The number of participants analyzed in each group.

Viking Elementary School				Kelly Elementary School		
Academic	Tier II	Control		Academic	Tier II	Control
n = 16	n = 17	n = 17		n = 21	n = 21	n = 19

All data were analyzed using the Statistical Package for the Social Sciences, version 23 (SPSS). A Multivariate Analysis of Variance (MANOVA) was conducted to compare each group's mean pretest scores of the *ZOT* total score, Reading RIT, and Vocabulary RIT. There was not a significant difference ($p < .05$) between the means of the pretest scores of the six classrooms for the *ZOT* total score [$F (5, 105) = 0.132, p = 0.985$], Reading RIT [$F$ (5,

105) = 1.661, $p = 0.15$], and Vocabulary RIT [$F(5, 105) = 1.941$, $p = 0.094$]. Therefore, the six classrooms were collapsed into three groups: academic intervention group (*n*=37), tier II intervention group (*n*=38), and control group (*n*=36).

Descriptive statistics, including the mean and standard deviation, were calculated for the pre- and posttest scores of the *ZOT* total score, *ZOT* words known, Reading RIT, and Vocabulary RIT and are presented in Table 2 and Table 3, respectively.

Table 2. Means and standard deviations of pretest scores for each group.

	ZOT Total Score	ZOT Words Known	Reading RIT	Vocabulary RIT
	M (SD)	M (SD)	M (SD)	M (SD)
Academic Group				
Pretest (n=37)	51.35 (18.48)	11.78 (5.33)	204.11 (13.04)	203.68 (13.77)
Tier II Group				
Pretest (n=38)	52.11 (23.61)	11.97 (7.08)	201.26 (15.26)	201.53 (16.01)
Control Group				
Pretest (n=36)	53.22 (25.99)	12.58 (7.58)	203.67 (13.50)	204.08 (14.68)

Table 3. Means and standard deviations of posttest scores for each group.

	ZOT Total Score	ZOT Words Known	Reading RIT	Vocabulary RIT
	M (SD)	M (SD)	M (SD)	M (SD)
Academic Group				
Posttest (n=37)	79.68 (20.43)	20.97 (5.64)	213.49 (11.48)	211.11 (11.52)
Tier II Group				
Posttest (n=38)	73.24 (21.94)	19.50 (5.63)	206.82 (16.63)	208.37 (17.13)
Control Group				
Posttest (n=36)	68.19 (25.06)	17.28 (7.12)	211.56 (14.32)	209.64 (14.60)

To determine if there was a difference between the pre- and posttest measures in each group, a series of three paired-sample t-tests were conducted on each of the four variables. The mean differences and standard deviations between the pretest and posttest measures for each of the three groups are presented in Table 4. The academic group had significant differences ($p < 0.01$) between the pre- and posttest means of the *ZOT* total score [$t (36) = 17.36, p = 0.00, d = 1.39$], the *ZOT* words known [$t (36) = 16.73, p = 0.00, d = 1.63$], the Reading RIT [$t (36) = 7.09, p = 0.00, d = 0.82$], and the Vocabulary RIT [$t (36) = 4.59, p = 0.00, d = 0.64$]. The tier II group had significant differences ($p < 0.01$) between the pre- and posttest means of the *ZOT* total score [$t (37) = 9.97, p = 0.00, d = 0.96$], the *ZOT* words known [$t (37) = 10.48, p = 0.00, d = 1.34$], the Reading RIT [$t (37) = 4.52, p = 0.00, d = 0.33$], and the Vocabulary RIT [$t (37) = 4.18, p = 0.00, d = 0.40$]. The control group had significant differences ($p < 0.01$) between the pre- and posttest means of the *ZOT* total score [$t (35) = 6.85, p = 0.00, d = 0.60$], the *ZOT* words known [$t (35) = 5.75, p = 0.00, d = 0.66$], the Reading RIT [$t (35) = 8.08, p = 0.00, d = 0.55$], and the Vocabulary RIT [$t (35) = 4.21, p = 0.00, d = 0.38$].

Table 4. Paired differences of means and standard deviations between pre- and posttest scores for each group.

	ZOT Total Score	ZOT Words Known	Reading RIT	Vocabulary RIT
	M (SD)	M (SD)	M (SD)	M (SD)
Academic Group				
(n=37)	28.32 (9.92)*	9.19 (3.34)*	9.38 (8.05)*	7.43 (9.84)*
Tier II Group				
(n=38)	21.13 (13.07)*	7.53 (4.43)*	5.55 (7.57)*	6.84 (10.08)*
Control Group				
(n=36)	14.97 (13.11)*	4.69 (4.90)*	7.89 (5.86)*	5.56 (7.92)*

*= $p < 0.01$

A Multivariate Analysis of Variance (MANOVA) was conducted to compare the means between all groups to determine if the gains in vocabulary and reading comprehension that were demonstrated from pretest to posttest differed between the groups. The results show that there was a significant difference ($p < 0.10$) in the means of the *ZOT* total score posttest between the groups [$F (2, 108) = 2.385$, $p = 0.097$ with Power $= 0.473$]. Figure 1 represents the pre- and posttest means of the *ZOT* total score for each group. The means (SD) of the *ZOT* total score for the academic group were 51.35 (18.48) on the pretest and 79.68 (20.43) on the posttest. The means (SD) for the tier II group were 52.11 (23.61) on the pretest and 73.24 (21.94) on the posttest. The means (SD) for the control group were 53.22 (25.99) on the pretest and 68.19 (25.06) on the posttest. A post-hoc analysis, Fisher's least significant difference (LSD) test, was then conducted to further examine the differences in the means of the *ZOT* total posttest between the groups. There was a significant difference ($p < 0.05$) between the means of the academic group and control group ($p = .032$). There were no significant differences between the means of the tier II group and control group ($p = .338$) or

between the means of the academic group and tier II group ($p = .219$). Cohen's *d* was

calculated to determine the magnitude of the difference in the posttest means of the *ZOT* total

score between the academic group and control group. Cohen's effect size suggested a

medium effect ($d = 0.56$) between the two groups (Cohen, 1988).
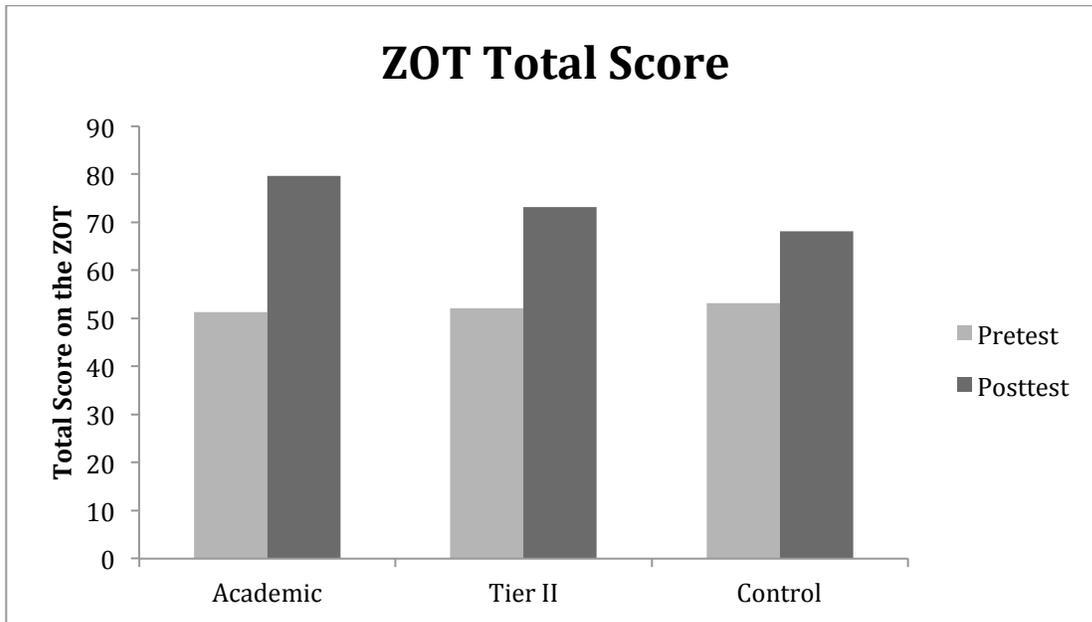
ZOT Total Score

Figure 1. Pre- and posttest means of the *ZOT* total score for each group.

The results of the MANOVA also show a significant difference ($p < 0.05$) in the

means of the posttest scores of the *ZOT* words known between the groups [$F (2, 108) =$

3.328, $p = .040$, with Power $= 0.619$]. Figure 2 represents the pre- and posttest means of the

ZOT words known for each group. The means (SD) of the *ZOT* words known for the

academic group were 11.78 (5.33) on the pretest and 20.97 (5.64) on the posttest. The means

(SD) for the tier II group were 11.97 (7.08) on the pretest and 19.50 (5.63) on the posttest.

The means (SD) for the control group were 12.58 (7.58) on the pretest and 17.28 (7.12) on

the posttest. A post-hoc analysis, Fisher's LSD test, was also conducted to further examine

the differences in the means of the *ZOT* words known posttest between the groups. There was

a significant difference ($p < 0.05$) between the means of the academic group and control group ($p = .012$). There were no significant differences between the means of the tier II group and control group ($p = .124$) or between the means of the academic group and tier II group ($p = .302$). Cohen's *d* was calculated to determine the magnitude of the difference in the posttest means of the *ZOT* words known between the academic group and control group. Cohen's effect size suggested a medium effect ($d = 0.65$) between the two groups (Cohen, 1988).

Figure 2. Pre- and posttest means of the *ZOT* words known for each group.

The results of the MANOVA show no significant differences in the means of the posttest scores of the Reading RIT between the groups [$F (2, 108) = 2.157$, $p = .121$, Power = 0.433]. Figure 3 represents the pre- and posttest means of the Reading RIT scores for each group. The means (SD) of the Reading RIT scores for the academic group were 204.11 (13.04) for the pretest and 213.49 (11.48) for the posttest. The means (SD) for the tier II group were 201.26 (15.26) for the pretest and 206.82 (16.63) for the posttest. The means (SD) for the control group were 203.67 (13.50) for the pretest and 211.56 (14.32) for the

posttest. No further analysis was needed since there were no significant differences in the means of the Reading RIT posttest scores between the three groups.
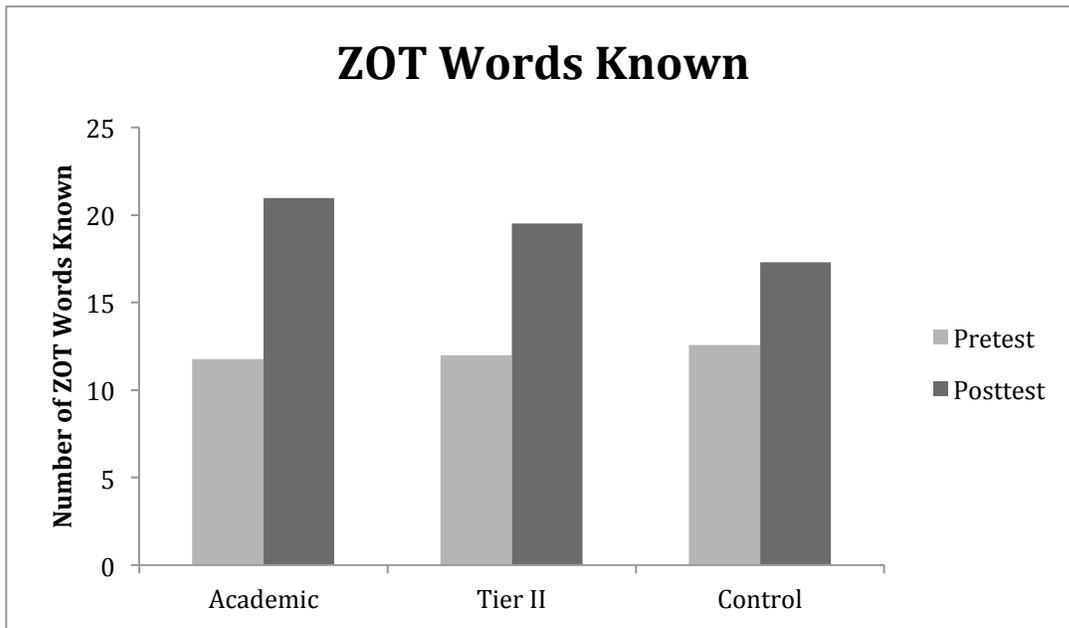

Reading RIT

Figure 3. Pre- and posttest means of the Reading RIT for each group.

The results of the MANOVA also show no significant differences in the means of the posttest scores of the Vocabulary RIT between the groups [F (2, 108) = 0.329, p = .720, Power = 0.101]. Figure 4 represents the pre- and posttest means of the Vocabulary RIT scores for each group. The means (SD) of the Vocabulary RIT scores for the academic group were 203.68 (13.77) for the pretest and 211.11 (11.52) for the posttest. The means (SD) for the tier II group were 201.53 (16.01) for the pretest and 208.37 (17.13) for the posttest. The means (SD) for the control group were 204.08 (14.68) for the pretest and 209.64 (14.60) for the posttest. No further analysis was needed since there were no significant differences in the means of the Vocabulary RIT posttest scores between the three groups.
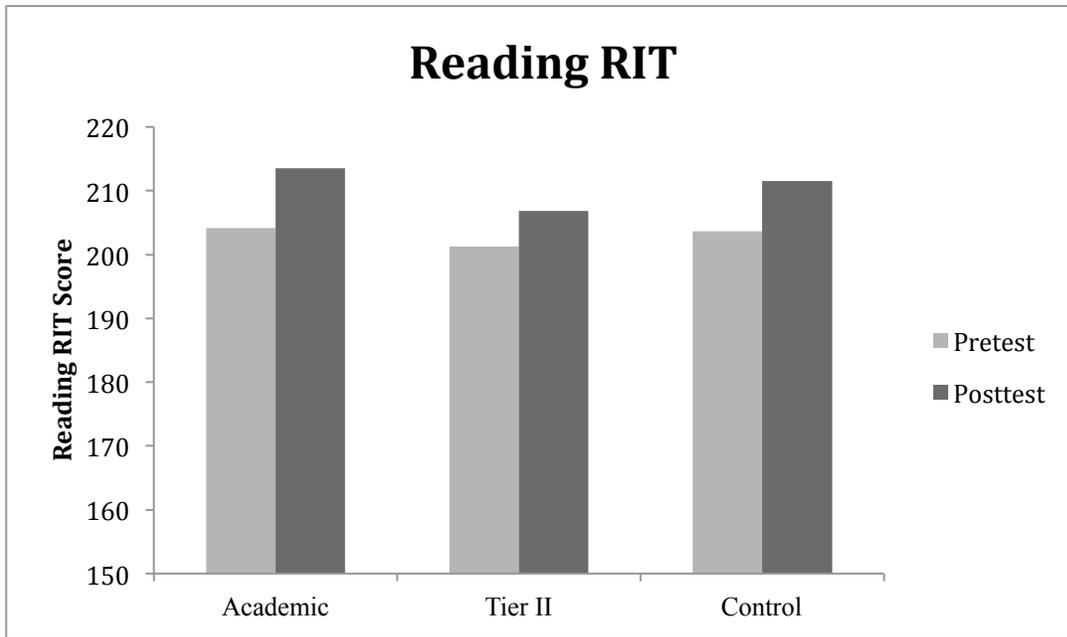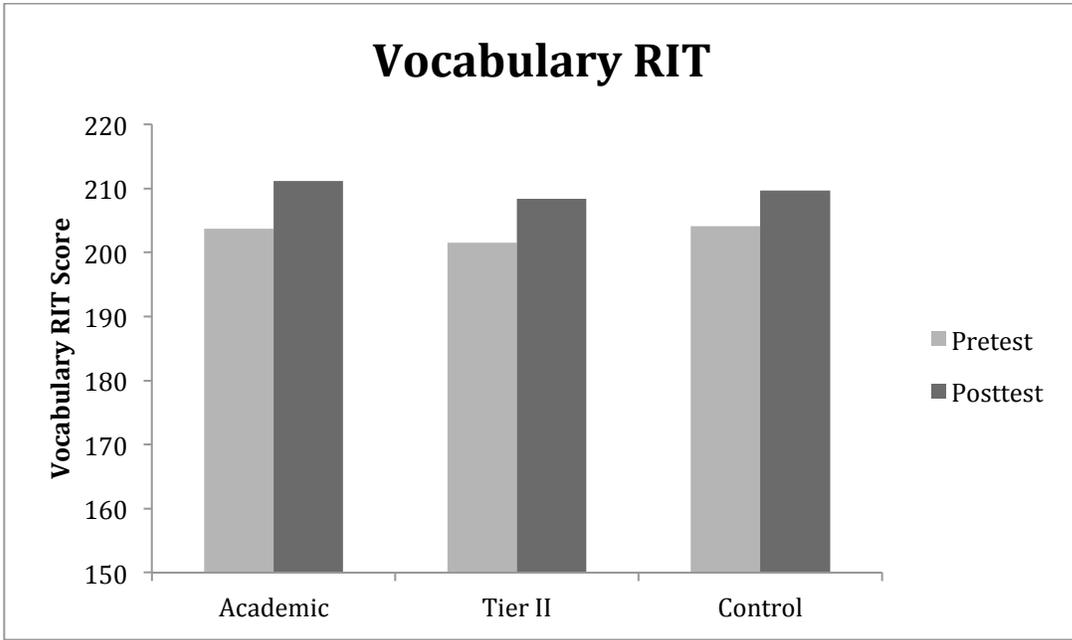
Figure 4. Pre- and posttest means of the Vocabulary RIT for each group.

CHAPTER V

DISCUSSION

The current study examined the effect of the lexicon enhancement program (LeEP) on the growth of vocabulary and reading comprehension as measured by scores from two assessments: the *Zero-One-Two* (*ZOT*) assessment and the *Measures of Academic Progress* (*MAP*) assessment. Data were analyzed to answer the following questions: 1) can 4th grade students learn academic vocabulary words or tier II general words using the LeEP, and 2) does the category of vocabulary words (tier II general vs. academic) impact a) the number of words learned by 4th grade students, b) general vocabulary abilities, and c) reading comprehension.

Effectiveness of Teaching Academic and Tier II Vocabulary Words

The first aim of this study was to determine whether 4th grade students could learn academic vocabulary words or tier II general words using the LeEP. In general, the intervention groups showed gains in vocabulary knowledge over the course of the intervention program when compared to the control group. This suggests that the LeEP had a positive impact on vocabulary word learning. These results are consistent with existing literature that states that a more structured and interactive approach to vocabulary instruction (e.g., LeEP) improves vocabulary knowledge (Apthorp, 2006; Gonzalez, et. al., 2014; Loesch, 2015).

Academic vs. Tier II Vocabulary Instruction

The second aim of the study was to determine whether the category of vocabulary words (academic vs. tier II general words) impacted the number of words learned, general vocabulary abilities, and reading comprehension in 4th grade students. The number of words learned was measured by the *ZOT* total score and *ZOT* words known score. Posttest scores of the *ZOT* total score and *ZOT* words known were significantly higher for the academic group than the control group, while the difference in posttest scores between the tier II and control group were not significant. This indicates that teaching academic vocabulary words had a greater impact on the number of *ZOT* words that were learned than teaching tier II vocabulary words. This idea supports existing literature that states that academic vocabulary words should be targeted during vocabulary instruction because these words appear more frequently in academic texts and will have a greater impact on vocabulary knowledge and reading comprehension (Coxhead, 2000; Nagy & Townsend, 2012; Townsend, Filippini, Collins, & Biancarosa, 2012).

The impact of the LeEP on general vocabulary abilities was measured by the Vocabulary RIT score and the impact on reading comprehension was measured by the Reading RIT score. The vocabulary words that were tested in the *MAP* assessment were not words that were targeted during the LeEP. The results of the Vocabulary RIT scores and Reading RIT scores show that academic and tier II vocabulary word instruction did not show statistically significant gains in general vocabulary abilities or reading comprehension when compared to the control group suggesting that the LeEP did not generalize to general reading comprehension and vocabulary skills.

Limitations

This study had limitations that should be considered when interpreting the results. While each of the three groups included more than 30 participants, all of the students were from six classrooms in two different schools within the Grand Forks public school system resulting in similar demographics between participants. This suggests that interventions similar to the LeEP may not be as effective for a sample with a variety of demographic backgrounds and language minorities.

Future Research

Additional research is needed to continue to explore the effectiveness of vocabulary instruction on reading comprehension and vocabulary growth. A sample of 4th graders with a variety of demographic backgrounds, bilingual backgrounds, and language abilities would be desirable. This would allow researchers to better analyze different factors that may affect vocabulary learning.

Further research is also needed on the effect of academic vocabulary instruction on reading comprehension and vocabulary growth in 4th grade students receiving special services through an IEP or 504 Plan. Other vocabulary instructional methods should be examined to determine the effectiveness of academic word learning on this population.

Future research in this area should focus on the effect that learning academic vocabulary at an early age has on future academic success. A longitudinal study to investigate these effects would provide more evidence of the impact of academic vocabulary knowledge on reading comprehension and general vocabulary abilities.

APPENDIX

Appendix A

ZOT Protocol

Zero-One-Two

Date: _____   **Group:** _____

Subject Number: _____   **School:** _____

Word	Definition	Sentence	Total
1. Temporary	**0 -** **1 -** here and gone, sometimes here **2 -** limited, not permanent	 0 1 2	
2. Develop	**0 -** **1 -** expand, spread, start **2 -** grow, advance	 0 1 2	
3. Collapse	**0 -** **1 -** faint, break **2 -** crumble, fall to the ground	0 1 2	
4. Vanished	**0 -** **1 -** become zero, invisible **2 -** disappear, lose sight	0 1 2	

5. Convincing	**0 -** **1 -** strong, telling **2 -** persuasive, compelling, changing one's beliefs		**0 1 2**	
6. Captivated	**0 -** **1 -** charm, delight **2 -** get the attention, hold someone's interest, fascinate		**0 1 2**	
7. Revolutionary	**0 -** **1 -** extreme, agitate **2 -** new idea, promoting		**0 1 2**	
8. Assume	**0 -** **1 -** expect, believe **2 -** think without proof, suppose		**0 1 2**	
9. Preparation	**0 -** **1 -** research, planning **2 -** getting ready, putting together		**0 1 2**	

10. Stable	**0 -** **1 -** solid, strong, sure **2 -** not likely to change, secure	**0 1 2**	
11. Emerge	**0 -** **1 -** something you see **2 -** appear, come into sight, visible	**0 1 2**	
12. Plentiful	**0 -** **1 -** large, rich, great **2 -** a lot, abundant	**0 1 2**	
13. Hoist	**0 -** **1 -** grab, hold, pull **2 -** lift, raise, elevate	**0 1 2**	
14. Display	**0 -** **1 -** look at, see **2 - t**o show, to put in view	**0 1 2**	

15. Bellowed	**0 -** **1 -** mean, mad **2 -** shout, yell loudly, scream	**0 1 2**	
16. Exhibit	**0 -** **1 -** piece, showcase **2 -** show, reveal, display	**0 1 2**	
17. Descends	**0 -** **1 -** fall **2 -** going down, move towards the ground	**0 1 2**	
18. investigate	**0 -** **1 -** go into, analyze **2 -** probe, explore, look into	**0 1 2**	
19. inspire	**0 -** **1 -** instigate **2 -** motivate, encourage, influence	**0 1 2**	

20. Reluctant	**0 -** **1 -** not sure, uninterested **2 -** Unwilling, don't want to, hesitant, resistant	**0 1 2**	
21. Refusing	**0 -** **1 -** drop **2 -** decline, say no, turn down	**0 1 2**	
22. Instructed	**0 -** **1 -** command **2 -** direct, teach	**0 1 2**	
23. Encountered	**0 –** **1 –** met, stumbled **2-** experience, face, go up against	**0 1 2**	
24. Extinct	**0 -** **1 -** old **2 -** gone, dead, lost, no longer have	**0 1 2**	

25. Attempting	**0** - **1** - guess, struggling **2** - to try, make an effort	**0 1 2**	
26. Inspected	**0** - **1** - view, look at, search **2** - study, explore, examine, check, look at closely	**0 1 2**	
27. Satisfied	**0** - **1** - better **2** - pleased, content, at east, happy	**0 1 2**	
28. Revise	**0** - **1** - fix, change **2** - review, reconsider, update	**0 1 2**	
29. Advanced	**0** - **1** - higher **2** - ahead in progress, far on	**0 1 2**	
30. Appeared	**0** - **1** - to see, pop up **2** - come into view	**0 1 2**	

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