Traditional Instruction Versus Direct Instruction: Teaching Content Area Vocabulary Words to High School Students with Reading Disabilities

Dissertation

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Abstract

Vocabulary knowledge impacts every area of reading achievement, yet important words are often not explicitly taught. There is published research to support the usage of direct instruction to teach vocabulary to younger children, but there are limited studies that have investigated the effects of direct instruction in teaching vocabulary to high school students with reading disabilities. The purpose of the current study was to compare the effects of the traditional approach (using context and the dictionary) to a direct instruction approach (REWARDS Plus scripted curriculum) when teaching science vocabulary words to high school students with reading disabilities. The study included three participants with reading disabilities in the 11th and 12th grades. An alternating treatments design counterbalanced across participants was used to compare the two methods of instruction. Traditional instruction included the methods employed in most high schools where students are asked to use the context of the sentence or a dictionary to figure out the meaning of unknown words. Direct instruction included the REWARDS Plus program, a published, scripted curriculum that utilizes explicit, systematic instruction. Data were collected on lesson assessments, maintenance assessments, generalization writing samples, and comprehension writing samples. The results of the study support the use of direct instruction for teaching content area vocabulary words for students with reading disabilities on the high school level.
Dedication

This document is dedicated to my family.
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Thank you!
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Chapter 1

Introduction

Reading is an essential academic skill and a critical life skill. Young children who fall behind in learning to read typically continue to struggle with reading throughout their schooling (Gardner & Hsin, 2008; Stanovich & Siegel, 1994). Struggling readers are at increased risk for dropping out of school, being unemployed or having low paying jobs, and incarceration (Wehby, Falk, Barton-Arwood, Lane, & Colley, 2003). Unfortunately, large numbers of America children fail to become proficient readers (Bursuck & Damer, 2007).

Historically there has been a contentious debate about the best ways to teach children to read (Moats, 1999). Much of the debate has centered on whether children should be instructed using a whole-language approach or a phonics-based approach. In 1998, a panel from the National Research Council presented an accumulation of evidence of effective strategies for teaching reading in a report entitled Preventing Reading Difficulties in Young Children (Snow, Burns, & Griffin, 1998). This report began to focus
the nation’s attention on evidence-based practice and systematic reading instruction. In response to this important report, Congress, the National Institute of Child Health and Human Development (NICHD), and the US Department of Education (USDE) created the National Reading Panel (NRP) (McCardle & Chhabra, 2004).

The NRP’s mission was to review the reading literature and examine the findings of studies that met the criteria for high quality research. The panel concluded after reviewing the studies that systematic instruction in five components was most effective in teaching children how to read. The five essential components of reading instruction include phonemic awareness, phonics, fluency, vocabulary, and comprehension (NICHD, 2000). Since the publication of the NRP’s report, many more panels, interest groups, and mandates have been created to encourage the usage of evidence-based practices in teaching reading (McCardle & Chhabra, 2004). As a result, when Congress enacted the No Child Left Behind Act (2001), it required the implementation of empirically validated reading instruction methods by school districts. Despite the increased focus on the five essential components of effective reading instruction, the components have not received equal emphasis. Unfortunately, vocabulary instruction has not gained the same amount of attention as the other four essential components (Biemiller, 1999).

Although empirical evidence indicates that vocabulary knowledge is strongly related to general reading achievement and the lifelong learning trajectory, there has been a trend over the years to deemphasize the instruction of this important skill (Biemiller & Slonim, 2001; Hart & Risley, 1995; Kamil, 2004). This is a potentially dangerous oversight in the development of reading programs. For example, in the seminal study
conducted by Hart and Risley (1995), results indicate that the lifelong learning trajectory is based on children’s vocabulary exposure in the first few years of life. More specifically, children from impoverished homes come to school with less vocabulary, and this causes difficulty in learning how to read. The gap between children with smaller vocabularies and those with larger vocabularies widens quickly, and a lack of vocabulary knowledge negatively impacts reading ability, especially decoding and comprehension skills (Bursuck & Damer, 2007; Hart & Risley, 1995). In other words children with smaller vocabularies may struggle to read at basic levels. If students lack basic reading skills, they are much more likely to be diagnosed with a learning disability (Coyne, McCoach, & Kapp, 2007). It is estimated that 90% of all children identified as having a learning disability are referred for special education services because of reading problems (Kavale & Forness, 2000).

As children progress through school, good readers continue to make progress and struggling readers fall further behind. This phenomenon is referred to as the “Matthew Effect.” In other words, students who can read well are exposed to larger quantities of words, which positively impacts vocabulary knowledge; students who struggle in reading are exposed to fewer words, which negatively impacts vocabulary knowledge (Bursuck & Damer, 2007). In turn, the students who have fallen behind in vocabulary development are less likely to develop vocabulary knowledge through independent reading (Cunningham & Stanovich, 1998) and often fall two grade levels below their peers in word knowledge (Biemiller, 1999). Certainly early intervention is the key to prevention and remediation, but even so, there are still no established methods of effectively
teaching vocabulary in the primary grades (Biemiller & Boote, 2006). Unfortunately, the problems struggling readers encounter will continue surfacing throughout their schooling unless these students receive effective instruction.

In fact, in the later grades, typically grade 4 and beyond, students are no longer taught basic reading skills; they are just expected to learn from reading (Bryant, Goodwin, Bryant, & Higgins, 2003). That is, students are expected to decode text fluently and accurately while also deriving meaning independently (Bursuck & Damer, 2007). Middle school and high school curricula traditionally rely heavily upon textbooks and these content area textbooks are explanatory, detailed, and full of specialized technical terms, which often hold the most important meaning (Bryant, Goodwin, Bryant, & Higgins, 2003; Mastropieri, Scruggs, & Graetz, 2003). This is problematic for older struggling readers and causes a domino effect diminishing their ability to acquire knowledge and decreasing their motivation. These students become frustrated with school, and learning is affected in all subjects, which can lead to problems in thinking strategies and attention (Mastropieri et al., 2003).

Further, the field of education has placed increased focus on accountability with high-stakes testing used as the most frequent tool to assess the impact of instruction and subsequently schools’ effectiveness (NCLB, 2001). Many of these tests include large amounts of reading and a wealth of advanced vocabulary words, regardless of the content area being assessed. Older struggling readers are less likely to pass these tests, which could lead to dropping out of school. The U.S. Department of Education reports that nationally, only about 70 percent of U.S. students graduate on time with a regular
diploma, and about 1.2 million students drop out annually (National Center for Education Statistics, 2009). Surveys indicate that nearly half of the adolescent population with criminal records and substance abuse problems have reading difficulties (The Complete Learning Center, 2006). If older struggling readers do graduate from high school and aspire to attend post-secondary institutions, they have yet another barrier to overcome. College entrance exams, such as the ACT and SAT, contain extremely complex and uncommon vocabulary words. Many undergraduate institutions require that students receive a relatively high score on these tests before their application will even be considered. The negative statistics are daunting for students with poor vocabulary skills or who are otherwise academically unprepared. In fact, in the United States only 54% of American students who entered college in 1997 graduated with a degree six years later (Diverse Education, 2006).

Compared to the other components of reading, the results of empirical studies that have evaluated teaching techniques in the area of vocabulary are somewhat mixed (NRP, 2000). That is, researchers have found both positive and no effects for vocabulary interventions. Therefore, it is not surprising that our public schools are failing to provide effective instruction in vocabulary development (Biemiller, 1999).

In addition, much of the vocabulary research focuses on instructional strategies for students in the primary grades (NRP, 2000). There is no denying that there needs to be an emphasis on early literacy and early intervention, but effective teaching methods for older students are equally as important, yet often neglected.
So, why don’t educators fix the widely recognized problems in regard to ensuring effective instructional techniques are used to teach vocabulary? It’s not that easy. Mixed research results paired with inconsistent instructional approaches could be a product of the complex nature of vocabulary. As discussed in much of the literature that was reviewed for this study, there are many challenges that educators and researchers must collaboratively address in order to build a stronger foundation for best practice in this area.

The current study sought to address some of the challenges educators face in effectively teaching vocabulary. One of the primary purposes of this study was to extend the previous research on direct instruction of vocabulary to high school students, given the paucity of research for this population. Another important purpose of this study was to compare the effectiveness of the traditional approach using context and the dictionary method to a direct instruction approach with scripted lessons in teaching science vocabulary terms to high school students with reading disabilities.

The specific research questions addressed were (a) Which method of instruction, traditional or direct instruction, will be more effective in helping students learn science vocabulary words per lesson? (b) Which method of vocabulary instruction (traditional or direct instruction) will be more effective in helping students maintain vocabulary knowledge over time? (c) Which method of vocabulary instruction (traditional or direct instruction) will be more effective in helping students apply and generalize vocabulary
knowledge in content area writing assignments? (d) Which method of vocabulary instruction (traditional or direct instruction) will be more effective in helping students comprehend main ideas? (e) Which method of vocabulary instruction (traditional or direct instruction) will students prefer?
Chapter 2

Literature Review

The purpose of this literature review will be to review what we know about effectively teaching vocabulary. The following questions will be addressed: (a) What are some of the challenges professionals in the field of education face with teaching vocabulary? (b) What do we know about current approaches to teaching vocabulary? (c) How should this knowledge be applied in the classroom? And finally, (d) what are some of the gaps in the literature that need to be addressed in future research?

Challenges

Vocabulary is a complex component of reading, and it often presents more challenges than the other essential components of reading recommended by the NRP (Bursuck & Damer, 2007). Some of these challenges include (a) difficulty defining or categorizing the infinite number of words in our language, (b) learning and applying new words based on context alone, (c) the wealth of time it takes for teachers to plan explicit and systematic instruction, (d) measuring vocabulary with high validity and reliability, and (e) conducting high quality applied research in order to support effective vocabulary instruction.
Defining vocabulary. One challenge is that the term *vocabulary* encompasses many aspects of language. A simple definition could include “units of language, or words, used by or known by a group of people” (Pearson, Hiebert, & Kamil, 2007). In attempt to provide parameters to assist educators, the NRP created categories describing various types of vocabulary including: productive or receptive and written or oral. Productive vocabulary, also known as expressive vocabulary, is the vocabulary a person uses in writing or speaking to others. Receptive vocabulary is the vocabulary a person can understand when it is presented in text or as others speak (NICHD, 2000). The NRP’s categories have led educators to further categorize vocabulary into listening (the ability to process and comprehend words that a speaker presents), speaking (the ability to use words accurately when speaking), reading (the ability to recognize and comprehend words in text), and writing vocabulary (the ability to accurately apply words in writing) (Armbruster, Lehr, & Osborn, 2001). The fact that there are so many categories and subcategories of vocabulary makes it even more difficult to define. Educators must fully understand each subtype of vocabulary and treat them differently during instruction and assessment (Bursuck & Damer, 2007).

Learning. There are many challenges students face when attempting to learn new vocabulary. The sheer number of words an individual needs to know in order to read, write, and speak successfully is overwhelming. The literature indicates that mature learners need to have knowledge of 8000-9000 word families in order to make sense of text that is read and knowledge of as many as 5000-7000 word families to comprehend oral discourse (Schmitt, 2008).
Proficient readers read approximately 1,000,000 words per year and naturally learn an average of 7 new words per day (Nagy & Anderson, 1984). Struggling readers may only learn a maximum of 2 new words per day without explicit instruction (Beck, McKeown, & Kucan, 2002). Even if teachers decide to directly teach new words, they can only realistically teach 8-10 words per week, which barely scratches the surface of the number of words that exist (Bursuck & Damer, 2007). Even with good instruction, the gap in knowledge between proficient readers and struggling readers may continue to exist.

Research supports that many students learn a large quantity of vocabulary from independent reading (Nagy, Herman, & Anderson, 1985). This assumption can be dangerous for many reasons. Students who struggle most with vocabulary may also be struggling with basic decoding skills, both of which impact comprehension. Students have to be reading text that is on their instructional level in order to fully comprehend the text. Bursuck and Damer (2007) state that in order for learners to learn from context clues, they must understand at least 95% of the words in the text they are reading.

As students matriculate through school and formal reading instruction decreases, learning and understanding various word forms (e.g., affixes, roots) is an extremely important skill. By the fourth grade, students should know 3,000 common root words if they are going to be successful in determining the meaning of novel words (Biemiller, 1999). To complicate issues even further, three out of four words in the English language are foreign born, and 70% of the most frequently used words have multiple meanings (Bromley, 2007; Spencer & Guillaume, 2006). Correctly using and applying words in
oral and written communication require students to toggle between several completely different skill-sets (Bursuck & Damer, 2007; Spencer & Guillaume, 2006). Learning new words can be incredibly frustrating for struggling readers unless they receive the best instruction. Unfortunately, even the best teachers encounter problems when trying to deliver the best vocabulary instruction.

**Teaching.** Effectively teaching vocabulary takes a great deal of time and effort (Bursuck & Damer, 2007). Over the years, various approaches have been used, but many of them have limited empirical support. The fact that there are no well established, effective instructional approaches that have been widely adopted is a challenge for educators (Biemiller & Boote, 2006). Unfortunately, the most common, but ineffective approach is to have students look up definitions in a dictionary or glossary (Biemiller & Boote). This approach fails to motivate students to become interested in or aware of words (Beck, McKeown, & Kucan, 2002). Further, this method also assumes that students will be able to apply and generalize the new knowledge when in fact, reading vocabulary, listening vocabulary, and speaking vocabulary are all different skills and should be taught in different ways (Bursuck & Damer).

A second challenge for educators is deciding the number of words to target for vocabulary instruction. It is estimated that of 100 unfamiliar words that children encounter in reading, between 5 and 15 will be learned independently (Nagy, Herman, & Anderson, 1985). Therefore, teachers could not possibly target every unknown word for instruction. Several professionals in the field have created guidelines for the number of words that should be taught as well as the type of words that should be targeted for
instruction (Ambruster, Lehr, & Osborn, 2001; Beck, McKeown, & Kucan, 2002; Bursuck & Damer, 2007). Beck et al. assert that teachers should aim to teach approximately 400 words per year in order to truly impact an individual’s verbal functioning. Other professionals in the field estimate that teachers can realistically teach only 300 words per year or approximately 8 to 10 words per week (Ambruster et al.; Bursuck & Damer).

Aside from the number of words that should be taught any given school year, another challenge is determining which words should be targeted for instruction. Some general guidelines suggested by Ambruster et al. (2001) indicate that words targeted for instruction should hold important meaning in the text, are useful in everyday language, and are difficult enough that students will not be able to learn them without instruction. Allen (1999) recommends that teachers give substantial thought to whether students can obtain the word through (a) incidental exposure where students can independently infer meaning based on context, (b) mediated support where the teacher provides guided practice when needed, or (c) direct instruction where the teacher systematically and explicitly teaches the meaning of the word and provides multiple exposures and opportunities for practice. The treatment of a word depends on its importance, frequency, and applicability (Allen, 1999).

Beck and McKeown (1985) propose a three-tiered categorization of words to assist educators in choosing words for direct instruction. Tier 1 includes the most basic words (e.g., clock, baby, happy, walk). These words rarely need attention because most children know them or can independently infer their meaning. Based on the vocabulary
knowledge of a typical third grader, Tier 1 consists of about 8,000 word families (Nagy & Anderson, 1984). Tier 2 includes high frequency words for mature readers and these words are found across a variety of domains (e.g., coincidence, absurd, industrious and fortunate). This tier consists of about 7,000 word families. Beck et al. (2002) argue that instruction of words in Tier 2 would have the most impact on verbal functioning. Tier 3 includes words that are low frequency and appear in limited domains (e.g., isotope, peninsula, lathe, and refinery). These words are best learned when a specific need for them arises. Overall, Beck et al. assert that teaching an average of 400 Tier 2 words per year will make a substantial difference in children’s verbal functioning. This classification approach is the most commonly used and often referred to in the literature but is not yet backed by empirical research (Kamil, 2004).

Still another challenge teachers face is the complex nature of the large and abstract phenomena that we refer to as “vocabulary.” The four subcategories of vocabulary (reading, writing, speaking, and listening) are all very different skills and should be taught differently through the usage of various activities (reading texts, conversing, and writing) (Bursuck & Damer, 2007). These sub-skills are important for language development and it is difficult enough for teachers to find time during the day to even focus on basic reading vocabulary instruction. Students also need several repetitions of unfamiliar words to truly learn their meanings. Reports indicate that
students need at least 12 encounters with a new word across different contexts in order to increase comprehension (Bursuck & Damer, 2007; McKeown, Beck, Omanson, & Pople, 1985). In addition, students need to use the new word in a meaningful context between 10 and 15 times to master its application (Allen, 1999)

Finally, one of the main assertions of this review is that research supporting effective vocabulary instruction is mixed compared to the other essential components of reading. For example, a wide variety of activities are recommended by the NRP (2000), creating a mixture of methodologies. This poses challenges for educators because there is no consistent approach to teaching this crucial skill (Biemiller, 1999), and many teacher education programs do not specifically address how to teach vocabulary. Students who are at-risk for reading failure or already struggling can learn as much vocabulary as typically developing peers, but the instruction they receive must include explicit and direct teaching of words, meanings, and strategies to derive meaning independently (NRP, 2000).

**Measuring and assessing vocabulary knowledge.** A challenge that researchers and educators encounter is how to measure vocabulary knowledge. Vocabulary and comprehension are abstract, broad concepts and there are limited assessments that have been validated in the field. In fact, vocabulary measures can be so insensitive that they prevent researchers from documenting a consistent, strong relationship between word learning and comprehension, which is contrary to a widely-held belief amongst reading specialists (Pearson, Hiebert, & Kamil, 2007). These difficulties have caused professionals in the field of education to narrow the focus of vocabulary assessments.
McKeown and Beck (1988) assert that word knowledge is not an all or nothing proposition and words can be known on different levels. The type of assessment used also depends on the purpose of vocabulary instruction. For example, there are different levels of processing word knowledge including association, comprehension, and generation (Bryant, Goodwin, Bryant, & Higgins, 2003).

Several researchers have created continuums in an attempt to operationalize word knowledge. Kameenui, Carnine, and Freschi (1982) refer to several levels of vocabulary knowledge including verbal association knowledge, partial concept knowledge, and full concept knowledge. Beck, McKeown, and Omanson (1987) suggest that individual word knowledge can be described as falling on the following continuum: no knowledge, general knowledge, narrow context bound knowledge, knowledge of the word but not being able to recall it readily enough to use it in appropriate situations, and rich decontextualized knowledge.

Not only is it challenging to decide what words to target for instruction, it is also difficult to decide what words to target for larger assessments. Teachers and researchers must include words that represent a wide body of knowledge, but this differs drastically across student populations (e.g., grade level, geographic location, ability level) (Allen, 1999). Given that we can only test a small number of words, we must make a distinct effort to ensure that the chosen words are representative of the larger pool of words that exists (Kamil, 2004). Standardized assessments attempt to address this problem by selecting words that cover a wide range of expected familiarity (Kamil). The NRP gives the broad recommendation that teachers should use multiple assessments that span a
variety of vocabulary skills (NICHD, 2000). Based on the NRP’s recommendations, the Institute for the Development of Educational Achievement (IDEA, 2002) analyzed and reported only the most rigorous vocabulary assessments for the primary grades (Kame’enui et al., 2002). The assessments included in the IDEA’s review encompassed screening measures, diagnostic assessments, and outcome assessments.

Overall, measuring vocabulary can be difficult and time consuming, but teachers must be diligent in creating curriculum-based measures to ensure that students are making progress according to the instruction they are receiving. Many of the vocabulary measures mentioned in this paper can be somewhat subjective, but can serve as a good guide for classroom teachers.

**Research.** There are several reasons that vocabulary is one of the most difficult components of reading instruction to research. Many of the challenges researchers face are the same that educators encounter when teaching vocabulary. It is very difficult to define vocabulary in objective terms, making it difficult to measure. As mentioned earlier, the NRP recommends that vocabulary should be measured through various assessments, and these assessments should be created based on the purpose of the instruction or intervention. Much of the published research on vocabulary utilizes researcher created assessments to measure vocabulary knowledge. However, full details of the original research procedures may not be available, making these studies difficult to replicate. Also, many of the measures used in research only assess one aspect of vocabulary (e.g., matching the correct definition to the target word). Additionally, generalization measures are somewhat problematic and subjective. For example, some
studies have attempted to score writing samples or conversations with peers as a generalization measure. These types of behavior are challenging to measure due to the high amount of variance in responses. The bottom line is, teachers need to use assessments that focus on the effectiveness of classroom instruction whereas researchers need to continue creating and validating more global assessments that are easy to replicate in subsequent studies.

The various challenges in studying vocabulary are evident in the resulting paucity of studies in the literature. After the NRP’s evaluation of research addressing vocabulary instruction, only 50 studies met the criteria for high quality research (NICHD, 2000). This provides a limited body of research for educators to reference in determining best practices. The studies that were included in the NRP’s review primarily focused on younger children and may not be easily generalized to older, struggling readers. Many of the articles pertaining to vocabulary in the literature have also come from the same handful of authors. This could be attributed to the fact that this is such a difficult area to study; however, we need more experts in the field who are willing to take on the challenge of dedicating time, effort, and resources to conduct meaningful vocabulary studies.

**Research on Various Approaches to Teaching Vocabulary**

Just as there are many difficulties in learning, teaching, measuring, and researching vocabulary, it is also difficult to classify vocabulary instruction into concise categories. A review of the literature revealed several themes, but there was often overlap between categories. Many of the instructional approaches in the literature included
components of multiple approaches (e.g., direct instruction of specific words, but also teaching students how to infer meaning from context). This overlap further supports the NRP’s recommendation, which is to use multiple approaches when teaching vocabulary (NRP, 2001). For the purposes of this review, vocabulary instruction was broken down into the following broad categories: definition instruction, contextual learning, direct instruction, and strategy instruction.

It should also be noted that the current study focused on vocabulary instruction for high school students with reading disabilities. Much of the literature located and discussed in this chapter and in the NRP’s review evaluated techniques for younger students without disabilities; thus, the need to extend the literature to older learners who have reading difficulties is further supported.

**Definition instruction.** Current school practices ignore what research and theory tell us about vocabulary instruction (Bromley, 2007) allowing a further widening of the gap between students based on vocabulary knowledge (Biemiller & Boote, 2006). For example, the most common approach to teaching vocabulary in middle school and high school consists of giving students new words and asking them to look up the definition in a dictionary or glossary (Biemiller & Boote). The definition-only approach has been found to be ineffective in various empirical studies (Irvin, 1990; Phillips, Foote, & Harper, 2008) because asking students to define words out of context is confusing (Kamil, 2004). Specifically, Stahl and Fairbanks (1986) found that this approach did not produce reliable effects on comprehension. This can be attributed to the fact that many of the definitions in dictionaries are complex, which affect students’ ability to comprehend
and apply word meanings (Bryant et al., 2003; McKeown, 1993). The definition approach also involves multiple complex skills such as decoding and discerning the correct definition, which can be problematic for struggling readers (Bryant).

Some additional problems with dictionaries include the possibility that definitions can be inaccurate for geographic locations, may not be understandable if applied literally, and may not contain enough information to allow someone to use the word correctly (Allen, 1999). Beck, McKeown, and Kucan (2002) recommend that teachers adapt dictionary definitions to make them more user friendly for students. One resource that already does this is *The Collins Cobuild Dictionary* (1995). The *Cobuild Dictionary* was created to assist English language learners but can be used for any population of students. Each definition is a whole sentence using common words to describe the new word. The definitions use the word in its typical context and show the typical grammatical pattern associated with it. This resource also provides several example sentences using the targeted word.

Further, the definition approach can be intimidating to older struggling readers. Most of the time, the words that teachers require students to look up are words that are included in a text that the class will be reading. This can make students unwilling to face the hazard of the new book and oftentimes, struggling readers can feel defeated before even starting the actual reading (Allen, 1999). The ultimate goal of vocabulary instruction is to encourage students to become interested and aware of words. This is not a likely outcome from simply asking students to look up definitions in a dictionary (Beck, McKeown, & Kucan, 2002). It is important that students learn how to use resources, such
as dictionaries, but this approach to instruction should only be an enhancement to instruction that provides more guidance. Teachers need to make sure that students possess the required skills for using a dictionary before assigning the task.

**Contextual learning.** Encouraging students to learn from context, a form of incidental learning, is another popular approach to teaching vocabulary. It is assumed that students derive meaning of new words through independently reading and searching for relationships that make sense (Schmitt, 2008). Monroe (1997) states that when the brain encounters new information it either fits new information into existing thinking structures or it modifies existing structures in order to classify the new information. Advocates of this approach contend that students should be encouraged to read vast quantities of text because exposure to words is the single most important factor in vocabulary growth (Nagy, Anderson, & Herman, 1987).

The seminal study conducted by Nagy, Herman, and Anderson (1985) showed that there is merit to a contextual approach to learning vocabulary. Participants in the study were students in the eighth grade and the experimental design was a within subject hierarchical regression analysis. The purpose of the study was to assess the volume of children’s learning from normal reading. Measures included two vocabulary assessments designed to tap partial knowledge of word meanings and results revealed that vocabulary gains were small but statistically reliable. Nagy et al. assert that these results indicate that a substantial amount of vocabulary is acquired through incidental learning.

A follow-up study conducted by Nagy, Anderson, and Herman (1987) investigated how much students learn from context and what components of text and
words may affect incidental learning. Participants included students in third, fifth, and seventh grades, and hierarchical regression procedures were used to analyze data. Small but reliable gains were found from contextual learning across grades and across ability levels. Conceptual difficulty was the only word property found to be significantly related to learning from context. The authors categorized conceptual difficulty within four levels. The first level assumes that the reader already knows the concept and knows a one-word synonym. Level two assumes that the reader knows the concept and can express the concept in terms of a familiar phrase. Level three assumes that the concept is not known but can be learned on the basis of experiences and information already available to the reader. Finally, level four assumes that the concept is not known and learning it requires new factual information or learning related concepts. The text properties that affected conceptual learning included: proportion of unfamiliar words that were conceptually difficult and the average length of unfamiliar words.

Beck, McKeown and Kucan (2002) extended Nagy et al.’s (1987) categorization levels and proposed four categories of natural contexts that are more teacher-oriented. The following categories and examples can guide teachers in predicting how much their students will struggle when attempting to derive word meaning using context. Misdirective contexts direct the reader to the incorrect meaning. The authors provide the following example, “Every step she takes is perfect and graceful,” Ginny said grudgingly as she watched Sandra dance (Beck et al., 2002, p. 4). Nondirective contexts give the reader no assistance in determining meaning. For example, “He recognized the lumbering footsteps on the stairs and knew it was Aunt Grace” (Beck et al., 2002, p. 5). General
contexts allow the reader to place the word in a general category. “Joe watched Stan having a good time at the party and Joe wished he could be that gregarious” (Beck et al., 2002, p. 5) Directive contexts lead the reader to the specific correct meaning. “All of the noise and confusion of the animals fighting caused quite a commotion” (Beck et al., 2002, p. 5). When introducing new words, teachers should first provide examples that use directive context in order to minimize confusion.

Nelson and Stage (2007) conducted one of the few published experimental studies that evaluated a contextual approach to teaching vocabulary. Their analysis is based on the assumption that it is beneficial to teach students that most words have multiple meanings that may fall into different semantic categories depending upon the context. In their study, they compared the effects of contextually-based multiple meaning vocabulary instruction to a non-specific treatment (the program that was already in place at the school). Participants included 283 third and fifth grade students. In selecting words for instruction, they classified words from a vocabulary inventory into two levels: Level 1 consisted of words with two mutually exclusive meanings and these words were targeted for instruction in the third grade; Level 2 consisted of words with 3 or 4 mutually exclusive meanings and were targeted for instruction in the fifth grade. They used a pre/post experimental and nonspecific treatment group design to assess the effects of the conditions.

The non-specific treatment included the district’s core language arts program, the Scott Foresman Basal Reading Program (2001). The experimental condition included contextually-based multiple meaning vocabulary instruction that was embedded within
the district-adopted program. Contextual instruction started with a pre-lesson activity in which the meanings of the targeted words were introduced through related words to activate students’ prior knowledge. Students also discussed and examined sentences using the target words and then created their own sentences. In the next activity, students were given information about the origins of the words and then practiced their knowledge by creating more sentences. Finally, students matched related words with the appropriate meanings of the target word within a graphic organizer format.

The Gates-MacGintie Reading Tests were used to measure vocabulary knowledge and comprehension. The format of the test is a timed multiple-choice assessment. Results indicate that students with low initial vocabulary achievement who received the contextual instruction made small gains relative to students in the non-specific treatment condition. Students in the low achievement group were also more likely to show improvements in vocabulary knowledge compared to the average to high achievement students, in general. Third grade students were also more likely to show improvement when compared to the fifth grade students. For comprehension, students in the experimental condition showed moderate to large improvements in reading comprehension relative to students in the non-specific treatment group. One of the main findings of this study is that student ability level can affect the outcome of vocabulary instruction. Specifically, contextual instruction benefited low achieving students more than average to high achieving students. These results should be interpreted with caution though, because the gains were rather small and students were receiving some direct instruction.
There are some important aspects that need to be considered when using a contextual approach to vocabulary instruction. How much a child learns from context depends on the volume of a child’s exposure to written language, the quality of the text, and the child’s ability to infer and remember the meanings of new words (Nagy, Anderson, & Herman, 1987). Students who struggle in reading may not be able learn words through context because deriving meaning is a challenging process that involves integrating several different types of information to figure out the unknown word (Bryant et al., 2003; Beck & McKeown, 1985). Using context only is an unreliable way for students to learn new words because usually only 25-50% of annual vocabulary growth can be attributed to incidental learning during independent reading (Allen, 1999; Nagy et al).

Another aspect of context that educators need to consider is the type of context provided. Even though words can be learned from various contexts, the type of context can change as individuals develop and learners must be able to recognize and adapt to these changes (Beck et al., 2002). For example, written context lacks many of the features of oral language that support learning new word meanings, such as intonation, body language, and shared physical surroundings (Beck et al.). Finally, students who need vocabulary development the most do not engage in wide reading and are much less likely to benefit from contextual learning.

This does not mean that we should never incorporate contextual learning into vocabulary lessons. Indeed, we ultimately want our students to be able to derive meaning from text independently. But, it is dangerous to assume that students know how to use
context without receiving explicit instruction on how to do so. Many instructional approaches that rely on learning from context are haphazard and highly unstructured. For example, common unstructured activities include read-aloud stories that expose children to new words, casual conversations about words, encouraging high levels of independent reading, engaging in class discussions about new words, and having students act out text in a dramatic way (Beck et al., 2002). Students may be able to learn words from some of these activities, but there are several formalized strategies students can be taught that will increase the probability that they will be able to learn meaning from context.

One strategy that can help students learn from context includes directly teaching them to connect words in the text to personal experiences (Silverman, 2007). This skill needs to be modeled first because contextual instruction alone is not enough to effectively teach vocabulary to younger children. Blachowicz and Fisher (2010) give an example about how frustrating storybook reading can be for young children when the talk is not cognitively challenging and structured. A good way to approach stories is to directly tell the student the new word and provide information that is comprehensive and supportive. The authors provide the following example: The teacher points to a picture of an elephant and tells the child that the elephant has tusks. The teacher then continues to tell the child that the tusk is white and is made out of ivory. Ivory can be used to make various things such as piano keys. In this example, the teacher is modeling how to connect new words in context and the information is provided in the story and real life applications. Some other suggestions Blachowicz and Fisher provide for storybook reading include (a) stories should be read multiple times, (b) teachers must target books
with new vocabulary that is challenging to students, (c) reading should occur in small
groups including 5 or 6 students, (d) adult/child discussions should be interactive, and (e) 
there should be some direct teaching of new words (p. 24).

Mckeown (1985) proposes teaching children active problem solving, or 
metacognitive strategies, so that they can eventually learn from context. The 
metacognitive process strategy involves teaching students the following: why and when 
to use context, what kinds of clues to look for, and how to look for clues and use them to 
derive meaning. In addition, Blachowicz and Fisher (2010) believe that students need to 
learn that context can provide them with the following information: (a) synonyms, (b) 
what a word is or is not, (c) something about the location or setting, (d) something about 
what a word is used for, (e) what kind of action it is, (f) how something is done, and (g) a 
general topic or ideas related to the words (p. 33). After students develop sensitivity to 
context, teachers can direct students to build and test hypotheses using the following 
strategy: look before, at, and after the word; reason by connecting what is known with 
what the author has written; predict possible meanings; and resolve or redo if there is not 
enough information by trying these steps again or consulting an expert or reference 
(Blachowicz & Fisher, p.33).

For older students, teachers can use synonyms, definitions, antonyms, examples, 
and general clues. Phillips, Foote, and Harper (2008) suggest teaching students how to 
use weighted words. Students can identify synonyms and antonyms for the targeted word 
in the lesson or words that come up in general conversation. Students can place words on 
a word wall in the classroom or classify them on a continuum of weakest to strongest in
regard to their relationship to each other. The authors contend that this approach creates word awareness and students are frequently exposed to and reminded of words they have not heard before.

Blachowicz and Fisher (2010) also propose teaching older students the C2QU strategy to help them use context clues and contextual thinking strategies. The teacher would first need to model this process, but students can eventually use this strategy independently or in small groups. During the C1 step, the teacher gives an example that presents the word in a broad but meaningful context. Blachowicz and Fisher provide the following example using the target word *stepmother* to demonstrate a C1 sentence: “My new stepmother moved into our house after the wedding.” (p. 41) In the C2 step, the teacher provides another sentence with more explicit context and some definitional information. “When my father married again, his new wife became my stepmother.” (p. 41) During the Q step, the teacher asks a question that involves semantic interpretation of the word. For example, “Can a person have a mother and a stepmother at the same time?” (p. 41) Finally, during the U step, the teacher asks the students to use the new word in a meaningful sentence. This strategy should be used with reading material that provides some information for hypothesizing.

Another strategy that is used widely in classrooms to help students infer meaning from context is the KWL chart (Ogle, 1986). Before reading about a new topic, students are asked to complete the chart, which includes a space for what is known, what do you
want to know, and what has been learned. Within the section that addresses what has been learned, students can identify new words and create a definition based on the context of the story. Teachers can use the last stage of the KWL model to explicitly teach these new words.

Although most students learn the meaning of many new words through context (incidental learning), this method is more challenging for students who have reading difficulties. Students who struggle still need to learn how to use context and it is important for teachers to model and explicitly teach strategies to derive meaning from context. It is risky to assume that brief exposure to words and high volumes of independent reading will automatically increase vocabulary knowledge. If a contextual approach to vocabulary is the only method used in the classroom, there is an increased risk that students will learn incorrect meanings and practice errors. Contextual instruction alone is not enough to teach struggling readers the meaning of vocabulary words, but can be effective when combined with direct instruction.

**Direct instruction.** The NRP’s findings suggest that direct instruction in vocabulary is effective in improving both vocabulary and comprehension (McCardle & Chhabra, 2004). Direct instruction must be explicit and systematic in order to be effective. Bursuck and Damer (2007) define the components of direct instruction in the following ways: explicit instruction is the clear, direct teaching of skills and strategies; systematic instruction is teaching that clearly identifies a carefully selected and useful set of skills and then organizes those skills into a logical sequence for instruction.
Advocates of contextual instruction argue that there are too many words to target for direct instruction; therefore, students need to be taught how to approach word meaning independently. This argument has merit, but contenders of direct instruction emphasize that not all words call for attention (Beck et al., 2002) and it is important to directly teach new words that hold important meaning. Unfortunately, there is no empirical support to guide teachers in deciding what words to target for direct instruction, but many researchers are creating guidelines that show promise.

As mentioned earlier, Beck et al., (2002) propose categorizing words into three tiers. Tier 1 consists of high frequency words that students may already know or can learn independently through context. Tier 2 includes high frequency words that are found across a variety of domains and may not be as easy for children to learn independently. Finally, Tier 3 words are content-specific and should be taught when there is a need to learn them. Beck and McKeown (1985) argue that Tier 2 words should be targeted for direct instruction because they will make the most impact on verbal functioning. Their classification system has been noted to show promise in guiding educators and researchers based on the NRP’s findings (Kamil, 2004).

There have been minimal studies published that have investigated direct instruction approaches for older struggling readers (Kucan, Trathen, & Straits, 2007). There are however, several studies that have been published to report promising findings of direct instruction approaches with younger children.
For example, Biemiller and Boote (2006) contend that direct explanations of word meanings while reading stories provides explicit opportunities for children to relate words to meaning. Repeatedly reading aloud a story to young children helps them not only understand the story, but also give them several exposures to the taught word meanings. The authors conducted 2 studies to compare the effects of repeated reading without word explanations to repeated reading with direct instruction of word meaning. They also compared the effects of reading the story two times versus four times. Participants included kindergarten, Grade 1, and Grade 2 students. Measures included pretest versus posttest scores within a statistical analysis. Results from study 1 indicated that repeated reading alone increased posttest scores by an average of 12%. Word explanations in addition to repeated reading added another 10%, resulting in a 22% gain. Kindergarten children benefited from four versus two readings, while there were no reported benefits of additional readings for students in Grades 1 and 2.

In the second study, Biemiller and Boote evaluated the effects of repeated reading with direct instruction of word meaning on gains in word knowledge, transfer of meanings to new contexts, and words learned and maintained over time. The repeated reading with direct instruction was the same as described in study 1 as were most of the other procedures and measures. The only differences were a delayed posttest, added reviews during instruction, and added numbers of word meanings taught per week.
Results indicate that a substantial number of word meanings can be learned using this type of instruction, word meanings were not lost on the delayed posttest 4 weeks later and children were more likely to understand meanings of taught words when given novel sentences.

Beck and McKeown (2007) conducted two studies with kindergarten and first grade children from low achieving schools. The first study compared a direct instruction approach and no instruction. The direct teaching of words involved the following steps: The word was contextualized in the story, the meaning was explained, children were asked to repeat the word, additional examples of the word in context were provided, children made judgments about examples, children constructed their own examples, and the word meaning was reinforced through subsequent questioning. The no instruction group did not receive direct instruction but did participate in daily read-alouds as part of the school’s curriculum. The Peabody Picture Vocabulary Test (PPVT-3, 1997) and pre/posttests were used to examine the extent of learning. Students who received direct instruction on vocabulary learned significantly more vocabulary. In the second study, the authors compared two groups receiving the same direct instruction as described in study 1, the only difference being the amount of instructional time. The gains were twice as large for the students who received more instruction.

Coyne, McCoach, and Kapp (2007) conducted two studies in order to evaluate the effects of extended vocabulary instruction in kindergarten classrooms. The authors defined extended vocabulary instruction as explicit teaching that included contextual and definitional information as well as multiple exposures of target words in varied contexts.
In study 1, they compared extended instruction to incidental exposure. The design included two within-subjects factors, story words, and time. Measures included an expressive experimenter-developed assessment and a receptive experimenter-developed assessment. Results of study 1 were statistically significant, favoring extended vocabulary instruction. In study 2, the authors compared the effects of extended instruction to embedded instruction. Extended instruction followed the same procedures as described in study 1. Embedded instruction included providing students with simple definitions within the context of the story. The design and measures were also the same as the ones used in study 1. Results were significant again and students who received extended instruction performed better on vocabulary measures.

Another descriptive study conducted by Cohen and Byrnes (2007) compared direct word learning strategies to the traditional definition approach. The participants included third grade students, including several students who were bilingual. Direct word learning approaches included trade books with targeted vocabulary words, direct explanations of words, discussions about the words, and other direct word learning strategies. Words classified as Tier 2 words according to guidelines provided by Beck et al. (2002) were targeted for intervention. The students in the traditional instruction group did not engage in the structured read-alouds and were given worksheets to complete independently. Pre and posttests were given to measure the following: (a) accuracy; (b) correct usage of new words in sentences, measured with written student work samples;
and (c) descriptive transcripts of recorded conversations with peers to measure receptive and expressive vocabulary. Findings indicate that students who received the direct instruction of words demonstrated greater gains on all measures when compared to students who received traditional instruction.

Researchers are also finding that directly teaching words with attention given to orthological and phonological aspects can increase student understanding of vocabulary (Bromley, 2007; Silverman, 2007). Silverman (2007) conducted two studies that compared the effects of three types of instruction: contextual instruction, analytical instruction, and anchored instruction. The first study included 94 kindergarten children and the second study included 50 of the original participants 6 months after the intervention. Contextual instruction consisted of unstructured discussions about new words. The students who received analytical instruction were guided in relating words to personal experiences, encouraged to use words in new and various contexts, given opportunities to compare and contrast words, and given structured activities that required them to evaluate the new words in various contexts. Finally, anchored instruction consisted of discussions about words connected to personal experiences, analysis of words in a decontextualized way, and attention to letters and sounds in words.

Silverman (2007) based much of the curricula in this study on Beck et al.'s (2002) recommendations. Specifically, the words targeted for instruction were Tier 2 words, and components of contextual and anchored instruction were modeled after the examples provided by Beck et al. A quasi-experimental design was used and the measures included the Test of Oral Language Development (TOLD P:4, 2005) as well as researcher created
vocabulary assessments that served as a pre and posttest. Results of study 1 indicated that analytical instruction and anchored instruction were significantly more effective in promoting word learning when compared to contextual instruction. Results of study 2 indicated that the effects of anchored and analytical instruction were long-term.

For older students, direct instruction of word parts can be beneficial. Middle school and high school curricula rely heavily upon textbooks, which include a wealth of multisyllabic words that are detrimental to comprehension. The meaning of 60% of multisyllabic words can be inferred by analyzing word parts (Bromley, 2007). Knowing the meaning of common root words and affixes can help students analyze words and independently determine meaning. Bromley (2007) asserts that explicit instruction that focuses on meaning and word structure can help students connect unknown words to known words. Older students should be taught to break down multisyllabic words to aid them in analyzing word parts.

A professional development initiative by Kucan, Trathen, and Straits (2007) describes a collaborative effort between high school teachers and university faculty to enhance vocabulary instruction in secondary classrooms. Teachers were taught how to develop rich representations of word meanings through the usage of various classroom activities. Some of these activities included teaching students how to locate synonyms and antonyms, constructing visual representations, comparing and contrasting words, identifying examples and non-examples, and reading words in multiple contexts. Teachers were also taught how to help their students learn about how words work. These activities included (a) direct instruction of root word and affix meanings, (b) teaching
students how to identify root words and affixes, (c) teaching students parts of speech and how to identify them, and (d) having students generate various forms of words. In this article, teachers described personal accounts of the success their students experienced from this approach. Even though this was not an empirical study, the approaches used were based on the NRP’s findings and replicated procedures used in previous experimental studies with younger children.

Baumann, Edwards, Boland, Olejnik, and Kame’enui (2003) conducted one of the few empirical studies that evaluated the effects of a direct instruction approach including morphology with older students. The quasi-experimental study compared the effects of morphemic and contextual analysis instruction (MC) to textbook vocabulary instruction (TV) on the vocabulary learning of fifth graders. The MC instruction included explicit teaching of rules and word part meanings. Students learned a strategy for breaking words down to analyze root words and affixes. They were then instructed to apply their knowledge of the taught word parts in novel words while using context clues in the rest of the sentence. Students in the TV instruction group were directly taught content-central vocabulary from textbook selections. Measures included 9 qualitative tests (2 pretests and 7 posttests) and 3 descriptive post-assessments. Researchers found that TV students were more successful at learning textbook vocabulary and MC students were more successful at inferring meanings from novel words, but effects were more delayed. There were no differences between the two groups on comprehension measures or social studies knowledge. This study provides support for direct instruction of textbook vocabulary as well as direct instruction of morphemes and morphemic analysis strategies.
Experimental studies have demonstrated that direct instruction of vocabulary is beneficial for students, but especially younger children (Armbruster, Lehr, & Osborn, 2001; Baumann, Edwards, Boland, Olejnik, & Kame’enui, 2003; Beck & McKeown, 2007; Biemiller & Boote, 2006; Bromley, 2007; Cohen & Byrnes, 2007; Coyne, McCoach, & Kapp, 2007; Silverman, 2007). There are some gaps in the research in regard to the effects of direct instruction of vocabulary for older students, but this approach is starting to gain more attention. One of the biggest limitations of this approach is the amount of planning and instructional time direct instruction takes in order to be effective. Teachers also need to have quality training and a vast amount of knowledge on how to deliver direct, explicit, systematic instruction.

Direct instruction is necessary to ensure that students learn important new words, but it is also important that students learn how to derive meaning independently; therefore, during direct instruction of vocabulary, it is important that teachers model and describe how to determine the meaning of novel words based on the information in the text.

**Strategy instruction.** A final approach that has shown promise in teaching older students new vocabulary words is to teach them specific strategies for memorizing meanings. The most commonly cited strategies for older students include mnemonics, graphic organizers, and concept diagrams. Even though these approaches are highly popular, they are not explicitly mentioned in the NRP’s review. Some components of these instructional strategies incorporate direct instruction of words and deriving meaning.
from context, but these strategies often include a supplemental instructional aid (e.g., pictures, charts, and various organizational formats).

**Mnemonics.** Drawing from associative memory helps students remember vocabulary definitions. The mnemonics approach is a memory enhancing instructional strategy that involves teaching students to link new information to information that is known (The Access Center, 2009). There are several strategies that are considered to be mnemonics (e.g. pegwords and acronyms), but the key word strategy has been the most widely used to teach new vocabulary (Mastropieri, Scruggs, Levin, Gaffney, & McLoone, 1985). The key word strategy presents a word or phrase that assists students in remembering the definition of the new word. The new word or phrase can also be paired with a picture to illustrate the mnemonic devise. For example, if the targeted vocabulary word is “benefactor,” which means one who does nice things for others, the mnemonic link could be “Benny’s factory.” A picture could also be provided for the students, or they could draw their own, that includes a factory with people thanking Benny.

Over the past several decades, mnemonics has been one of the most researched strategies for teaching vocabulary to older students and the results of these studies have supported that this is an effective strategy to assist students in learning new words. In a literature review conducted by Scruggs and Mastropieri (2000), 34 experiments were identified, 29 of which were published. For each experiment, an effect size was computed by finding the mean difference between mnemonic instruction and comparison
conditions. The overall mean effect size was 1.62, indicating a strong effect. The review of the literature also indicated that grade level, disability, or content taught exerted an effect on the efficacy of mnemonics instruction; therefore, this type of instruction may not be appropriate for all students depending on the context.

Mastropieri et al. (1985) conducted two randomized control designs comparing a mnemonic pictorial teaching approach to a direct instruction approach. There were 32 participants in study 1 and 37 students in study 2. Students were in seventh, eighth, or ninth grades and were classified as having learning disabilities. The intervention included a mnemonic pictorial strategy that taught students a key word to help them remember the definition of a targeted vocabulary word. The direct instruction condition included an approach that was modeled after the SRA comprehension materials. Students were given a short quiz over the words at the end of the instructional sessions. In both studies, scores were substantially, and statistically higher for the students who received the mnemonic picture instruction.

Ulberti, Scruggs, and Mastropieri (2003) described a classroom application of mnemonics instruction with third grade students. Participants included 74 general and special education children. This descriptive study compared the effects of three methods of vocabulary instruction: keyword, picture, and definition. In the keyword method, the teacher showed the students a vocabulary card and taught the students a “cue word” to help them remember the meaning of the word. In the picture method, the teacher showed the students a vocabulary card and a picture to illustrate the word’s meaning. Finally, in the definition method, the teacher showed the students a vocabulary card, read the word
and read the definition. All of the information in each condition was taped to the board so students could reference it and procedures were followed to teach a total of 10 words. The measurement instrument included a teacher created pre/posttest that utilized a matching format. The mean score for the class before instruction was 2.9. Results indicate that the keyword method increased mean scores the most (8.8), followed by the definition method (7.6), and the picture method (6.3).

Terril, Scruggs, and Mastropieri (2004) conducted a repeated measures design to compare the effects of a mnemonics pictorial approach to a traditional approach. The vocabulary words that were targeted for instruction included SAT words. The participants were eight 10th grade students with learning disabilities. In the mnemonics condition, each of 10 SAT words was assigned a keyword to help the students remember the definition. In addition to the keywords, an illustration was provided to help the students connect the new word with the key word. In the traditional condition, students were given materials that included fill in the blank activities that required students to complete definitions, sentences, and synonyms after looking words up in the dictionary. A multiple-choice test was given to assess vocabulary knowledge at the end of each 10-word unit. Vocabulary recall was much greater for the students who received the mnemonic picture instruction. The students also reported enjoying the keyword method because they felt that it was fun and helpful. Several companies, including Kaplan, have created study books that use this approach to help students prepare for the ACT and SAT (Burchers, 2000).
**Graphic organizers.** A graphic organizer is defined as a visual representation of how the brain organizes information and it presents significant concepts and attendant relationships (Monroe, 1997; Moore & Readance, 1984). Graphic organizers can aid in conceptual understanding of word meanings, semantic relationships to other concepts, and linkages to prior knowledge. This approach has the potential to teach students vocabulary at a deeper word processing level for text comprehension (Bryant et al., 2003).

One example of a graphic organizer is the Frayer Model, which include: relevant and irrelevant attributes; examples and nonexamples; and various aspects of the concepts. Monroe (1997) conducted a study comparing the usage of graphic organizers to traditional instruction (definition only) in a fourth grade mathematics classroom. Fifty-eight participants were included in a randomized control design with the treatment group receiving instruction using the Frayer Model within a graphic organizer. The control group received the traditional definition only instruction. The Frayer instruction lasted approximately 5 to 10 minutes at the end of the math lesson and included the usage of a chart and class discussion of the new vocabulary words. The definition only approach also lasted 5 to 10 minutes and the students were asked to copy teacher definitions into journals. Students were asked to write journals explaining their knowledge of the lessons and these entries were coded for number of concepts mentioned, number of concepts with content, number of accurate concepts, number of applications, and number of concepts mentioned that were not explicitly taught during instruction. Results were statistically significant indicating that the Frayer model was effective in increasing student use of mathematical vocabulary.
Inspiration is a software program that facilitates the creation of graphic organizers and can be used to help students understand new vocabulary and concepts. Mastropieri, Scruggs, Abdulrahman, and Gardizi (2002) compared an intervention using Inspiration and traditional instruction in several high school history classes. During intervention, students were given graphic organizers containing a general outline of the chapters with blank boxes to fill in. During the teacher’s lectures, students were asked to fill in missing information. Later, the students went to the computer lab and inserted their new notes into graphic organizers they created. Traditional instruction included a typical lecture and note-taking format with no graphic organizers. Pre and posttests indicated that students learned significantly more content when they used the graphic organizers. There was also strong social validity in this study because the students preferred the usage of Inspiration and reported valuing the formats the software provided.

**Concept diagrams.** Concept diagrams are a type of graphic organizer that incorporate discussions about known knowledge and new terminology based on conceptual information. Word meanings are integrated with existing knowledge to build conceptual models of vocabulary for students in finding relationships between new and known vocabulary words (Rupley, Logan, & Nichols, 1998).

Fore, Boon, and Lowrie (2007) compared the effects of a traditional approach of vocabulary instruction to a conceptual model of vocabulary instruction within a single-subject design. The targeted vocabulary words included content area mathematical terms, and the participants were 6 middle school students with learning disabilities. The traditional approach, or baseline instruction, required students to independently look up
words in the dictionary and write down the first or most common definition. After students completed this portion, the teacher led the class in discussing the definitions and deciding upon a few key words for each term. The students wrote down the key words and were instructed to use them in a sentence. The teacher collected the students’ work at the end of the session and checked the work for errors. The work was handed back to the students the next day with written teacher comments.

The intervention, or concept model, used a concept diagram and a set of structured activities. Students were given the diagram and instructed to complete it the same way the teacher did on an overhead transparency. The concept diagram included (a) the definition of the term, (b) characteristics present in the word, (c) examples and non-examples of the concept, (d) examples and non-examples of the concept that were linked to the characteristics, and (e) review questions. The measures in this study included a pre and posttest with all 45 mathematical terms as well as short, frequent assessments over the 5 target words instructed during each week. The weekly tests included 10 matching items that were based on definitions. The multiple baseline design across 6 students indicated that students performed better on weekly assessments during the conceptual model condition when compared to the traditional approach.

The strategies discussed in this section have historically been used more with older students classified as having learning disabilities. Strategies using supplemental aides are becoming more common and are easier to create because of the advances in computer technology and software. Most of these strategies incorporate various underlying teaching approaches at one time, such as direct instruction, incidental
learning, and even traditional instruction. The usage of supplemental aides, such as a graphic organizer, can serve as a prompt to teachers to create more structure in vocabulary lessons or as a study guide to students when learning and reviewing new words. As with any instructional aide, this approach does require teacher time and resources and should be gradually faded over time. Nevertheless, students often report enjoying the usage of these strategies in addition to experiencing more success in learning new words.

**Implications and Recommendations**

While the current literature on vocabulary instruction is limited, there are some promising trends. First, students do seem to benefit from a combination of direct and indirect instruction of vocabulary. Second, the mnemonics approach and graphic organizers have shown promise. Third, relying on context alone for the development of vocabulary is ineffective.

Vocabulary and comprehension are the most challenging components of reading to study and teach (McCardle & Chhabra, 2004). Many of the studies that have evaluated instructional methods for teaching vocabulary have utilized a mixture of several approaches and the exact mechanisms that effectively teach children novel words are somewhat unknown. What is known is that vocabulary knowledge is an indicator of how successful children will be in learning how to read and can influence the lifelong learning trajectory (Hart & Risley, 1995); therefore, it is important that educators continue to evaluate what really does work best in teaching vocabulary.
The NRP’s (2000) suggestions are based on a limited number of studies, but the results of their review seem to be consistent with recommendations given by many experts in the field. The NRP contends that the most effective way to teach students new words is through a mixture of indirect and direct instruction. An indirect approach would consist of contextual instruction and can be incorporated through read alouds in the classroom as well as encouraging students to read extensively on their own. Studies have shown that these activities promote independent word learning, but are not reliable enough on their own (Nagy, Herman, & Anderson, 1985). The NRP also recommends using direct instruction to teach vocabulary words and strategies to ensure that students are making gains. Specifically, teachers should teach important words before students read instructional texts, new words should be taught over an extended period of time through activities that encourage active engagement, and students need repeated exposure to vocabulary in various contexts (Ambruster, Lehr, & Osborn, 2001). Finally, students need to learn strategies to independently derive meaning; therefore, teachers need to instruct students on how to use references (e.g., dictionary), word parts (e.g., root words and affixes) and context clues (e.g., definitions, restatements, examples, or descriptions) to determine word meanings (Ambruster, Lehr, and Osborn, 2001). The NRP broadly states that perhaps 8 to 10 words per week should be targeted for direct instruction.

Based on this literature review, it is apparent that much of the research has focused on methods for teaching younger children, specifically kindergarten through third grade. This is important because effectively teaching early reading skills and delivering early intervention can make a huge difference in later reading success. Most of
the research that has focused on teaching vocabulary to older students has investigated strategy-based instruction including mnemonics, graphic organizers, and concept organizers. It can only be assumed that the positive results of the studies using direct instruction with younger children can be generalized to older students.

**Summary**

Vocabulary knowledge is extremely important for all students, yet it continues to be deemphasized (Biemiller, 2001). We need to reverse this trend by ensuring that all educators have an appreciation of the impact that vocabulary knowledge has on a student’s future success or failure. The days of assigning students lists of words to look up in the dictionary, memorize, regurgitate, and forget are over. It is important to eliminate the assumptions that older students do not need formalized vocabulary instruction and they have the skills to derive meaning independently. In fact, middle school and high school curricula contain the most challenging words that hold the most meaning (Bryant, Goodwin, Bryant, & Higgins, 2003; Mastropieri, Scruggs, & Graetz, 2003). Educational standards are becoming much more stringent, graduation requirements more demanding, and postsecondary education more of a necessity. Educators must ensure that an excitement and appreciation for words and word meaning through best practice (Beck, McKeown, & Kucan, 2002).

The purpose of the current study was to compare the traditional approach (context and definition) of teaching vocabulary to high school students to a direct instruction approach (explicit, systematic, scripted curriculum). Another purpose of the study was to extend the direct instruction literature to high school students with reading difficulties,
while testing the effectiveness of the REWARDS Plus Program in teaching content area vocabulary. The research questions addressed in this study are as follows:

1. Which method of instruction, traditional or direct, will be more effective in helping high school students with reading disabilities learn science vocabulary words per lesson?

2. Which method of vocabulary instruction, traditional or direct, will be more effective in helping high school students with reading disabilities maintain vocabulary knowledge over time?

3. Which method of vocabulary instruction, traditional or direct, will be more effective in helping high school students with reading disabilities apply and generalize vocabulary knowledge in content area writing assignments?

4. Which method of vocabulary instruction, traditional or direct, will be more effective in helping high school students with reading disabilities comprehend main ideas?

5. Which method of vocabulary instruction, traditional or direct, will high school students with reading disabilities prefer?
Chapter 3

Method

Setting and Participants

Participants in this study were high school students in a public school located in central Ohio. The school administrator provided a letter of support for the study (Appendix A). According to the Department of Education, the school’s designation for the 2008-2009 school year was Continuous Improvement. The school met 7 of the 12 performance indicators, had a performance index of 90.4, and did not make Adequate Yearly Progress (AYP). The passage rate on the Science portion of the Ohio Graduation Test was the lowest of all of the subsections. The average daily enrollment of the school is 1,568 students, with 15.3% Black, non-Hispanic, 1.7% Asian or Pacific Islander, 14.0% Hispanic, 1.9% Multi-Racial, and 66.8% White non-Hispanic. More than half (53.6%) of the students who attend this school are economically disadvantaged. The percentage of students who speak limited English is 12.1% and 15.9% of the students in this school are classified as having a disability.

Inclusion criteria for this study included reading at minimum of a grade equivalent of 3.0 or higher according to the student’s evaluation team report (ETR), receiving special education services in the resource room for at least part of the day, IEP
goals and objectives addressing reading, and a record of consistent school attendance. The rationale for the inclusion criteria for the specified reading level was chosen because the REWARDS authors recommend that students have the minimum reading skills associated with the end of the second grade in order to be successful in the program.

Prior to beginning the study, a general letter was sent home with all students in the special education resource room classes. The letter described the purpose of the study and the inclusion criteria and asked parents for permission (as part of the parental permission process) to allow teachers to provide information about their children and provide the researcher access to student records (Appendix B). Parents and students were told that participation is voluntary and that they could withdraw from the study at anytime without penalty. If students were 18 years old, they were given a different consent form since they can make their own educational decisions (Appendix B).

Students were asked to return signed consent forms directly to the researcher through the usage of locked box located in the main office of the school. The letter of explanation stated that consent forms should be folded and stapled to protect student identification and returned to the designated location. Upon consent, participants also received further explanation of the study from the researcher during an in-person
meeting (Appendix C). No identifying data was used during data collection. Pseudonyms for participants were used on data collection forms and any written account of the study during data analysis. Data collection sheets were stored in a locked filing cabinet and only the principal investigator and key personnel had access to it.

Four students returned signed consent forms and all of them met the inclusion criteria for the study. One of the students had to drop out of the study early in data collection due to a death in the family; therefore, the study included three participants. The first participant, Lebron, was an African American male in the twelfth grade. He was receiving special education services under the category of Specific Learning Disability. The primary investigator administered the Woodcock Reading Mastery Test (WRMT-R/NU, 1998) to gain more information about each participant’s reading levels before the study began. Lebron received the following grade equivalent scores for each section: K.9 for Visual Auditory Learning, 1.3 for Letter Identification, 1.4 for Word Identification, .0 for Word Attack, 3.6 for Word Comprehension, and 2.8 for Passage Comprehension.

Becky, a Caucasian female in the eleventh grade, was also receiving special education services under the category of Specific Learning Disabilities. Becky’s grade equivalent scores on the WRMT subtests were 1.9 for Visual Auditory Learning, 3.6 for Letter Identification, 1.4 for Word Identification, and 3.8 for Word Attack. The primary investigator was unable to administer the Word Comprehension and Passage
Comprehension subtests due to the time constraints of the school year. It should also be noted that Becky had inconsistent attendance during the last portion of the study (around Lesson 7 of the intervention) due to tonsillitis, which later required surgery.

The third participant, Moe, was a Caucasian male in the eleventh grade. He was also diagnosed with a Specific Learning Disability. His scores for the WRMT were 1.4 for Visual Auditory Learning, 2.3 for Letter Identification, 4.7 for Word Identification, 4.4 for Word Attack, 2.2 for Word Comprehension, and 1.2 for Passage Comprehension.

The study took place within an isolated area in the learning center (i.e. the library) outside of the classroom during the participants’ resource room class time (e.g., Science or Language Arts). The researcher instructed participants either one-on-one or in small groups. Lebron received one-on-one instruction for all the instructional sessions. Moe and Becky received small group instruction (i.e. two-to-one) for most of the sessions. Due to Becky’s illness, Moe and Becky received one-on-one instruction for Lessons 7 through 10. Sessions were scheduled for three days per week and lasted the duration of one instructional period (approximately 60 minutes). Variations in the number of sessions per week were caused by the school calendar (e.g., spring vacation, holidays, state testing, assemblies, and early releases). The instructional conditions were delivered over a period of four weeks for Moe and five weeks for Lebron and Becky.

**Dependent Variables**

The dependent variables for this study were (a) cumulative gain scores, (b) on-going maintenance, (c) long-term maintenance, (d) generalization scores, (e) and
comprehension scores. Data were also collected on interobserver agreement and procedural integrity. Finally, participants were given a social validity survey at the conclusion of the study.

**Cumulative gain score per lesson.** Before and after each lesson participants were given a list of 15 vocabulary words (Appendix F). Most of the words included on these assessments were from that session’s lesson, but a few of the words (e.g., one to three) were from previous lessons. The words from previous lessons were used to assess maintenance. Participants were asked to write a definition for each word. The vocabulary words were on the left side of the paper, and a space was provided for definitions to be written. If participants didn’t know a word, they were told to try their best and they could skip the word if necessary. Participants’ responses that matched exactly or contained the key elements of the definition on the answer key (Appendix G) were marked as correct. Participants’ responses that did not match the answer key (i.e., do not contain the key elements) or non-responses (i.e., skipped items) were marked as incorrect. This assessment served as a pre and post-test for each lesson. A cumulative gain score was calculated for each lesson by dividing the actual gain by the potential gain. After the lesson pre and post assessments, number correct was calculated by counting the number of correct responses. The formula that was used to determine the cumulative gain per lesson was the standard formula (post-assessment number correct for the lesson − pre-assessment number correct for the lesson) / (Total number of new words for the lesson − pre-assessment number correct for the lesson). This calculation determined how much the student gained out of the total possible that they could have gained from pre to post-
assessment. For example, if a student received 3 points out of 13 points on the pretest and 7 points out of 13 points on the posttest, the cumulative gain score for that lesson would be calculated in the following way: \((7-3 / 13 -3)\) or \(4/10\), which equals .40 multiplied by 100 for a final score of 40.

**Ongoing maintenance.** On the lesson assessments described in the previous section, a few of the words (ranging from one to three words) were from previous lessons. Participants were asked to write definitions in the same way as described above and responses were scored in the same way described above. If participants accurately defined the maintenance words before instruction (e.g., on the initial lesson assessment in which the word appeared), the word was not counted. Data for short-term maintenance were reported using percentage maintained per condition for the entire study. The number of correct responses for the ongoing maintenance words was divided by correct responses plus incorrect responses and multiplied by 100% for each condition at the end of the study.

**Long-term maintenance.** Before the study began and at the end of the study, participants were given the Science Vocabulary Knowledge Test as a pre and post assessment (Appendix H). The vocabulary words included on these tests provide a sample of words from the entire program (all 15 lessons), but only words from lessons 1 through 10 were used for a total of 30 words. Participants were asked to write a definition for each vocabulary word. The vocabulary words were on the left side of the paper and a space was provided for participants to write the definitions. If the participants’ responses matched or contained the key elements of the definition
(Appendix I), the responses were marked as correct. If the participants’ responses did not match the answer key or contained the key elements, the response were marked as incorrect. No response or a response that did not match the answer key was scored as incorrect. The researcher kept track of which words were taught under which instructional condition for each participant.

A cumulative gain score using percentages was calculated for each instructional condition for each participant by dividing the actual gain by the potential gain; therefore, each participant has two cumulative gains scores (i.e., one for direct instruction and one for traditional instruction). After the maintenance pre and post assessment, percentage correct was calculated for each condition for each participant by dividing the number of correct responses by the number of total possible responses and then multiplying by 100%. The formula that was used to determine the cumulative gain for each condition was \((\text{post-assessment percentage} - \text{pre-assessment percentage}) / (100\% - \text{pre-assessment})\). This calculation determined how much the participant gained in each instructional condition out of the total possible that he or she could have gained from pre to post-assessment. In other words, this assessment is a measure of how well participants maintained vocabulary knowledge over time and if the instructional condition was related to maintenance.

**Generalization.** At the end of each lesson, participants were given a short writing prompt related to the topic of the lesson. They were instructed to write a response to the prompt using as many of the vocabulary words as possible from the lesson in their written descriptions. Word usage was scored using the following classification rubric: (0
points) word is present but there was no demonstration of knowledge or there was a demonstration of incorrect knowledge, (1 point) word was present and definition information was provided, (2 points) word was used and demonstrates a practiced example, and (3 points) word was used and an appropriate novel example was provided (Appendix K). The number of points earned per writing assessment was reported. If participants used a word more than once, every occurrence was measured for knowledge according to the rubric and a median score was reported. A writing sample is provided in Appendix L.

**Comprehension.** The writing responses were also scored for the number of main ideas discussed as a measure of comprehension. Participant responses were checked with an answer key that included the main ideas (Appendix M). If participants’ responses matched the answer key or included the key elements of a main idea, participants were given a point. Responses that did not match the answer key or did not include the key elements were not given any points. The number of points earned were added, divided by the total number of points possible, and multiplied by 100%. Data were reported by displaying the percentage of main ideas addressed for each lesson.

**Independent Variables**

**Traditional vocabulary instruction.** Traditional instruction consisted of encouraging participants to derive meaning from words independently by using the context of the sentence or the passage in which the sentence occurs, and by looking up the meaning of the words in a dictionary. The most common approach to teaching vocabulary in middle school and high school consists of giving students new words and
asking them to look up the definition in a dictionary or glossary (Biemiller & Boote, 2006). Another popular approach to teaching vocabulary is to encourage students to figure out the meaning of unknown words by using context (Nagy, Anderson, & Herman, 1987). It is assumed that students derive meaning of new words through independently reading and searching for relationships that make sense (Schmitt, 2008). When the brain encounters new information, it either fits new information into existing thinking structures or it modifies existing structures in order to classify the new information (Monroe, 1997). Advocates of this approach contend that students should be encouraged to read vast quantities of text because exposure to words is the single most important factor in vocabulary growth (Nagy, Anderson, & Herman, 1987).

**Direct vocabulary instruction.** Direct instruction is an explicit and systematic approach to teaching new skills. The components of direct teaching are defined in the following ways: explicit instruction is the clear, direct teaching of skills and strategies; systematic instruction is teaching that clearly identifies a carefully selected and useful set of skills and then organizes those skills into a logical sequence. Direct instruction also includes a high level of active student responding and ample opportunities to practice newly learned skills. Teachers deliver immediate feedback to students during instructional activities including error correction and reinforcement.

The direct instruction curriculum used for this study was the REWARDS Plus: Reading strategies applied to Science passages program. An example lesson from the teacher’s manual and student workbook are provided in Appendix N and O. The 15 REWARDS Plus Application Lessons are based on science passages (varied in length
from 567-696 words) that were written specifically to be interesting and representative of text commonly found in science. These passages require little specialized background knowledge, contain many multisyllabic words, and have a readability range from 8th to 9th grade (Archer, Gleason, & Vachon, 2005).

REWARDS Plus includes several activities per lesson that follow the same basic pattern in each lesson. Before reading the passage in each lesson the teacher introduces the meanings of critical vocabulary and provides background knowledge required for passage comprehension. During reading, the teacher asks literal and inferential comprehension questions, and after reading, students practice strategies for answering multiple-choice and short-answer items. There are also other activities to support vocabulary acquisition such as making discriminations amongst newly learned words, graphic organizers to assist passage comprehension and connecting new words to personal experiences (Archer et al., 2005). For the purposes of this study, some of the REWARDS Plus activities were eliminated. The researcher closely followed the teacher’s script when delivering the activities that were used in the direct instruction condition. The exact procedures for the experimental conditions are described below.

**Materials**

Letter of support from the school (Appendix A), letter to the parents/ students and consent forms (Appendix B), classroom script (Appendix C), data collection sheets (Appendix D), procedural integrity checklists (Appendix E), example lesson assessment (Appendix F), example answer key for lesson assessment (Appendix G), example maintenance assessment (Appendix H), example answer key for maintenance assessment
(Appendix I), example writing prompt (Appendix J), writing rubric for generalization assessment (Appendix K), example writing response (Appendix L), example answer key for main ideas and comprehension (Appendix M), example direct instruction lesson from REWARDS Science teacher’s manual (Appendix N) and example direct instruction lesson from REWARDS Science student workbook (Appendix O), traditional instruction checklist (Appendix P), and social validity questionnaire (Appendix Q).

**Experimental Design**

An alternating treatment design counterbalanced across participants was used to investigate the experimental questions. One or two participants were assigned to one condition (i.e., traditional instruction) while one or two other participants were assigned to the other condition (i.e., direct instruction). This was to control for the difficulty of each lesson. Conditions were alternated between traditional instruction and direct instruction, and participants did not receive the same instructional condition twice in a row.

**Interobserver Agreement**

Observers were trained prior to the beginning of the study. The study did not begin until the observers achieved 100% agreement for 3 consecutive days during training. Two observers independently checked participants’ responses against the answer keys for assessments and writing samples for at least 67% of the assessments. Given that data collection involved the usage of participant work samples, permanent products were copied for scoring (Appendix D). Two photocopies were made of the original participant’s work sample and observers directly marked on their respective copies.
Assessments were scored for exact agreement, meaning that each individual item was compared for agreement. Agreements were divided by agreements plus disagreements and multiplied by 100% to determine the percentage of agreement for each assessment.

**Procedural Integrity**

Procedural integrity was defined as the number of steps completed per session by the researcher and participants. The primary researcher completed one procedural integrity checklist per session (Appendix E). The checklist indicated whether or not the participants were given the proper materials for the lesson, the teacher/researcher followed the instructional method accurately, whether the participants fully participated in the activities, and student materials were collected at the end of the session. The researcher completed the procedural checklists daily and steps that were completed were marked with a checkmark. A second observer observed independently for 40% of the total sessions throughout the experiment and completed a second procedural integrity checklist. Procedural integrity checklists were scored using exact agreement, meaning that each item was evaluated and compared. Agreement for the procedural integrity checklist were the number of agreements divided by agreements plus disagreements and multiplied by 100% to obtain a percentage. Agreements were steps being checked as occurring to both observers. Disagreements were steps that one observer checked as completed while the second observer did not note its occurrence. Observers were trained to use the procedures before the study and data collection began after observers reached 100% agreement for 3 consecutive training sessions.
**Procedures**

**Training.** The researcher has extensive experience with teaching high school students and delivering reading instruction; therefore, the researcher also served as the teacher in this case. Secondary observers were trained to independently read and check off the procedural integrity checklist to ensure that the researcher implemented the treatment with integrity. The secondary observers were also trained to score assessments using the answer keys and the rubrics. The study did not begin until the primary and second observer scored data with 100% agreement for three consecutive training sessions.

**Pre-assessment for long-term maintenance.** Before the study began, participants were given the long-term maintenance assessment (Appendix H) as a pre-assessment. This assessment is part of the REWARDS Plus curriculum, thus created by the authors of REWARDS. The vocabulary words included on the test provided a sample of words from lessons one through ten. There were a total of 30 words on the assessment. Participants were asked to write a definition for each vocabulary word and the researcher read each word aloud. The vocabulary words were on the left side of the paper and a space was provided for participants to write the definitions. Any words that participants accurately defined on the pre-test were not counted when determining percentage of words learned and maintained over the course of the study. If the participants’ responses matched or closely resembled the answer key (Appendix I), the response was marked as correct. If the participants’ responses did not match the answer key, the response was marked as incorrect. No response or a response that did not match the answer key was
scored as incorrect. At the end of the study, the same assessment was given as a post-assessment.

**Pre-assessment for each lesson.** Participants were given a pre-assessment before each lesson (Appendix F). Participants were asked to write the definition for each vocabulary word that would be targeted for the subsequent lesson. The lesson pre-assessment was used to determine which words participants already knew. A few maintenance words (e.g., one to three words) from previous lessons were also included on the assessment, with the exception of the first assessment, in order to measure short-term maintenance (discussed below). Responses were checked using an answer key (Appendix G). The same assessment was given at the end of each lesson in order to determine if and how much overall progress the participants made based on the experimental condition.

**Traditional instruction.** The traditional instruction lessons followed the same basic structure of the approach that was already being used in the resource room for vocabulary instruction. Participants were given a reading passage from the REWARDS Plus Science program and a checklist that served as a prompt to complete all tasks in this condition. The researcher began the session by telling the participants what the topic of the lesson was for that session. Participants were told to read the passage independently and write any words they did not know the meaning of in their journal. The stopwatch was started as soon as the participants appeared to begin silently reading the passage. When participants completed the independent reading, they were instructed to create definitions for the words they recorded in their journals as unknown. Participants could
use context clues found in the rest of the sentence or passage in which the word appeared or to use a dictionary to look up the meaning of the word in a dictionary. When participants finished creating definitions for the unknown words, they were instructed to do additional independent readings about the topic. Participants had access to computers to search for additional information and other printed materials related to the topic. While they were reading the additional information, they were allowed to take notes on anything they found interesting in their journals, but this was not required. If participants asked questions during the traditional instruction condition, the researcher reminded them that they must do their best to figure out the meaning of the words independently. The researchers only provided verbal prompts to remind the participants to stay on-task and complete the independent activities. When the each participant finished with the traditional instruction activities, the researcher stopped the stopwatch and checked to make sure all components had been completed. If there were any components that had not been completed, the researcher directed the participants to complete the task and started the stopwatch again. If all components had been completed, the researcher gave the participant the lesson post-assessment. In order to keep exposure to the content consistent, participants were encouraged to spend the same amount of time on the activities in each condition (e.g., 40-45 minutes on average). The researcher kept track of this with the stopwatch. There were only two occasions during the study that the researcher had to encourage participants in the traditional instruction condition to continue working because they had not spent enough time with the lesson. Each participant was exposed to 5 lessons in the traditional instruction condition.
**Direct instruction.** The REWARDS Plus Science lessons consist of the following components: A) Vocabulary, B) Spelling Dictation, C) Passage Reading and Comprehension, D) Fluency Building, E) Comprehension Questions, F) Vocabulary Activities (Yes/No/Why and Completion), G) Expository Writing and H) Discussion. For the purposes of this study and for the sake of time, instruction only included the components of the program that focused on vocabulary development; therefore, components B (Spelling Dictation), D (Fluency Building), G (Expository Writing) and H (Discussion) were omitted from the lessons. In Activity B, students are instructed to spell a word that the teacher says. In Activity D, students read the passage multiple times and count the number of words they read in one minute. In Activity G, students are taught how to engage in pre-writing planning, include important details in response to writing prompts, and editing activities. Finally, in Activity H, students are taught how to engage in class discussions about the topic of the lesson.

The researcher followed the teacher script for Activities A (Vocabulary), C (Passage Reading and Comprehension), E (Comprehension Questions), and F (Vocabulary Activities) when delivering the direct instruction vocabulary lessons. An example of the teacher script is included in Appendix N, and an example lesson from the student workbook is provided in Appendix O. The researcher started the stopwatch immediately after stating what the topic of the lesson was and directly before reading the first vocabulary word in List 1 aloud.
In the Vocabulary portion of the lesson (Activity A), the researcher read each word in List 1 and 2 aloud and then asked participants to repeat each word and read the definition. If participants made an error, the teacher will provided immediate corrective feedback and additional practice until the participants mastered decoding the words and reading the definitions. The researcher then read a definition out loud and asked the participants to tell her the word that matched the definition. Participants read word families and definitions out loud in List 3. Again, the researcher provided immediate feedback.

Participants were instructed to skip to Activity C. In Activity C (Passage Reading and Comprehension), the researcher told the participants to read the title and the headings of the passage out loud. The participants were asked to tell the researcher two things that will be discussed in the passage without looking at the passage. Participants then read the passage out loud and were told to stop when they reached the numbers. The numbers indicated a comprehension question. Many of the comprehension questions required participants to recall important vocabulary words and apply vocabulary knowledge to determine the correct answer. The researcher asked the participants the comprehension questions throughout the entire passage and gave immediate feedback if the student answered incorrectly.

Participants were then told to skip to Activity E. In Activity E, Comprehension Questions, participants were asked to read and review the multiple-choice strategy. Then they read each question and multiple-choice answer out loud while discussing how each option may be correct or incorrect. Comprehension questions included targeted
vocabulary terms in various contexts and required participants to recall previously learned vocabulary knowledge. Finally, they checked their answers using an answer key.

Activity F included two additional vocabulary activities. The first activity was a Yes/No/Why Vocabulary task. The activity included questions that required participants to make discriminations between newly learned vocabulary words across various contexts. They read the questions out loud and answered the question with a Yes or No and then explained why the words were related to each other or not related to each other. The researcher gave them immediate feedback and participants wrote their final answer in the space provided. The second activity was a completion task. Participants read the vocabulary word and definition out loud and then answered a question. The questions required participants to apply the newly acquired vocabulary knowledge to personal experiences. When participants completed the last question, the researcher stopped the stopwatch. The researcher reviewed the participants’ workbooks to ensure that all of the required activities had been completed. If there were incomplete activities, the researcher directed the student to complete the missing portions and started the stopwatch again. If all of the activities were complete, the researcher gave the participants the lesson post-assessment. Each participant was exposed to 5 lessons in the direct instruction condition.

**Post assessment for each lesson.** After each lesson, participants were given the same list of vocabulary terms as the lesson pre-assessment (Appendix F). The words were on the left side of the page and a blank space was provided after the word. Participants were asked to write the definition of the word. Responses were checked using an answer key (Appendix G). The post assessment results were compared to the pre assessment
results to determine if and how much overall progress the participants made based on the type of instruction received. A cumulative gain score was calculated for each lesson pre/post set.

**Ongoing maintenance.** On the lesson assessments, a few of the words participants were asked to define (ranging from one to three words) were from previous lessons. Participants were asked to write definitions and responses were scored in the same way described under lesson assessments. Data for ongoing maintenance were reported using percentage maintained per condition for the entire duration of the study. The number of correct responses for the ongoing maintenance words was divided by correct responses plus incorrect responses and multiplied by 100% for each condition at the end of the study.

**Generalization.** At the end of each lesson, participants were given a short writing prompt related to the topic of the lesson (Appendix J). They were instructed to write a response to the prompt using as many of the vocabulary words as possible from the lesson in their written descriptions. Word usage was scored using the following classification rubric: 0) word is used but there is no demonstration of knowledge or there is a demonstration of incorrect knowledge, 1) word is present and definitional information is provided, 2) word is used and a practiced example is described correctly, and 3) word is used and a novel example is described correctly (Appendix K). There were a total of 15 targeted words per lesson therefore the maximum number of points that could be earned according to the rubric was 45 total points.
Comprehension. The same writing samples described under generalization were also scored for comprehension. Researchers checked the participants’ responses with an answer key that included the main ideas that should have been addressed according to the writing prompt. A percentage of main ideas addressed was calculated for each written response.

Long-term maintenance post-assessment. At the end of the study, participants were given the same assessment that was given as the maintenance pre assessment (Appendix H). The vocabulary words included on the test provided a sample of words from lessons one through ten. There were a total of 30 words on the assessment. Participants were asked to write a definition for each vocabulary word. The vocabulary words were on the left side of the paper and a space was provided for participants to write the definitions. Any words that participants accurately defined on the pre-test were not counted when determining how many words were learned and maintained over the course of the study. If the participants’ responses matched the answer key (Appendix I), the responses were marked as correct. If the participants’ responses did not match the answer key, the responses were marked as incorrect. No response or a response that did not match the answer key was scored as incorrect. A cumulative gain score reported as a percentage was calculated for each instructional condition.

Social Validity. At the conclusion of the study, the participants were asked to complete a social validity questionnaire about their reaction to the vocabulary instructional methods (Appendix O). The questionnaires are confidential, easy to read, and easy to respond to.
Chapter 4

Results

This chapter will present the data for interobserver agreement (IOA), procedural integrity, lesson assessments, short-term and long-term maintenance, generalization points, comprehension of main ideas, and social validity.

Interobserver Agreement and Procedural Integrity

Interobserver agreement for each assessment was calculated for total agreement by dividing the number of agreements by agreements plus disagreements and multiplied by 100%. Procedural integrity was defined as the number of instructional steps completed by the researcher and the participants during each session.

Lesson assessments. The lesson assessments included 15 vocabulary words that participants were asked to define. These assessments were given directly before and after each lesson to measure the cumulative gain. Two observers scored 90% of the lesson assessments independently. The overall range of interobserver agreement across all three participants for the lesson pre/ post assessments was 67-100% with a mean agreement of 95%. It is important to note that only one score fell below 85%. 
Table 1. Interobserver agreement on lesson assessments for individual participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Range</th>
<th>Number of Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Becky</td>
<td>95%</td>
<td>93%</td>
<td>93% and 100%</td>
<td>87-100%</td>
<td>9</td>
</tr>
<tr>
<td>Lebron</td>
<td>97%</td>
<td>100%</td>
<td>100%</td>
<td>93-100%</td>
<td>8</td>
</tr>
<tr>
<td>Moe</td>
<td>92%</td>
<td>93%</td>
<td>93%</td>
<td>67-100%</td>
<td>10</td>
</tr>
</tbody>
</table>

**Generalization assessments.** The generalization assessments were a written product from the participants in response to a prompt relating to the lesson. Points were awarded for responses based on (a) if participants used the newly learned vocabulary words in their responses and (b) how they used the new vocabulary word. Two observers scored 90% of the generalization assessments independently. The overall range of interobserver agreement for the generalization assessments was 97-100% with a mean on 99%.

Table 2. Interobserver agreement on generalization assessments for individual participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Range</th>
<th>Number of Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Becky</td>
<td>99%</td>
<td>100%</td>
<td>100%</td>
<td>98-100%</td>
<td>9</td>
</tr>
<tr>
<td>Lebron</td>
<td>99%</td>
<td>100%</td>
<td>100%</td>
<td>97-100%</td>
<td>8</td>
</tr>
<tr>
<td>Moe</td>
<td>99%</td>
<td>100%</td>
<td>100%</td>
<td>98-100%</td>
<td>10</td>
</tr>
</tbody>
</table>
**Comprehension assessments.** The same written responses that were used to measure generalization were also used to measure comprehension. Written responses were scored according to what percentage of main ideas of the passages participants included in their responses. Two observers scored 100% of the comprehension assessments independently. The overall range of agreement was 75-100% with a mean agreement of 96%. Only one IOA score fell below 85%.

Table 3. Interobserver agreement on comprehension assessments for individual participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Range</th>
<th>Number of Lessons IOA Calculated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Becky</td>
<td>94%</td>
<td>100%</td>
<td>100%</td>
<td>75-100%</td>
<td>10</td>
</tr>
<tr>
<td>Lebron</td>
<td>97%</td>
<td>100%</td>
<td>100%</td>
<td>86-100%</td>
<td>10</td>
</tr>
<tr>
<td>Moe</td>
<td>98%</td>
<td>100%</td>
<td>100%</td>
<td>88-100%</td>
<td>10</td>
</tr>
</tbody>
</table>

**Long-term maintenance.** The long-term maintenance assessments included 30 words that participants were asked to define before the study began and after the study ended. A cumulative gain score was calculated to determine how many words participants remembered according to the instruction they received. Two observers scored 83% of the long-term maintenance (pre and post) assessments independently. The overall range of agreement was 90-97% with a mean agreement of 94%.
Table 4. Interobserver agreement for long-term maintenance assessments for individual participants.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Becky</td>
<td>95%</td>
<td>No IOA</td>
</tr>
<tr>
<td>Lebron</td>
<td>97%</td>
<td>90%</td>
</tr>
<tr>
<td>Moe</td>
<td>97%</td>
<td>93%</td>
</tr>
</tbody>
</table>

**Procedural integrity.** Procedural integrity verified the accuracy of instructional steps completed by the researcher and the participants. Procedural integrity was checked for 100% of the sessions by the primary observer through the usage of a checklist. All steps for every session were marked as accurately completed on session checklists and there were no discrepancies to report. Two observers checked procedural integrity independently for 40% of the sessions across both conditions. The observers agreed that all steps were completed accurately 100% of the time.

**Lesson Assessment Results**

The lesson assessments included 15 vocabulary words that participants were asked to define. These assessments were given directly before and after each lesson. Results for individual participants are discussed in the following sections.

**Becky.** The range of cumulative gain scores for Becky during the traditional instruction condition was 0 – 20 while the range of scores for the direct instruction condition was 30 – 57. The mean score for the traditional instruction condition was 6.6 and the mean score for the direct instruction condition was 42.8. There was a clear separation between the two conditions, with no overlapping points. For lessons one,
three, and five in the direct instruction condition there was an increasing trend, but for lessons seven and nine there was a decreasing trend. The data indicate that there was a functional relation between direct instruction and accurately defining new vocabulary words.

Figure 1. Cumulative gain scores for Becky on lesson assessments.

Lebron. The range of cumulative gain scores for Lebron during the traditional instruction condition was 0 – 14 while the range of scores for the direct instruction condition was 30 – 90. The mean score for the traditional instruction condition was 4.4 and the mean score for the direct instruction condition was 58.8. There was a clear separation between the two conditions, with no overlapping points. For the direct
instruction condition there was an increasing trend and for the traditional instruction condition there was a decreasing trend for the entire duration of the study. The data indicate that there was a functional relation between direct instruction and accurately defining new vocabulary words.

Figure 2. Cumulative gain scores for Lebron on lesson assessments.

Moe. The range of cumulative gain scores for Moe during the traditional instruction condition was 0 – 18 while the range of scores for the direct instruction condition was 0 – 81. The mean score for the traditional instruction condition was 9.6 and the mean score for the direct instruction condition was 45.8. There was a separation between the two conditions, with the exception of one overlapping point. For the direct
instruction condition there was an increasing trend with the exception of lesson 7 and for the traditional instruction condition accuracy remained somewhat low with no apparent trend. The data indicate that there was a functional relation between direct instruction and accurately defining new vocabulary words.

Figure 3. Cumulative gain scores for Moe on lesson assessments.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Direct Instruction</th>
<th>Traditional Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Ongoing Maintenance Results**

On the lesson assessments, a few previously taught words were included to probe for ongoing maintenance. Typically, there was one to three maintenance words included on each assessment. A percentage maintained was calculated per condition based on the number of words accurately defined per condition throughout the entire study.
Becky. When given maintenance probes throughout the duration of the study, Becky was able to accurately define 29% (2 out of 7) of the vocabulary words she learned in the traditional instruction condition and 40% (6 out of 15) of the vocabulary words she learned in the direct instruction condition. The data indicate a slight difference (11%) between the conditions with a slightly higher percentage of maintenance in the direct instruction condition. Figure 4. Percentage of words accurately defined on ongoing maintenance assessments for Becky.

Lebron. When given maintenance probes throughout the duration of the study, Lebron was able to accurately define and 53% (8 out of 15) of the vocabulary words he learned in the traditional instruction condition and 71% (5 out of 7) of the vocabulary
words he learned in the direct instruction condition. The data indicate a slight difference (18%) between the conditions with a higher percentage of maintenance in the direct instruction condition for Lebron.

Figure 5. Percentage of words accurately defined on ongoing maintenance assessments for Lebron.

Moe. When given maintenance probes throughout the duration of the study, Moe was able to accurately define 14% (1 out of 7) of the vocabulary words he learned in the traditional instruction condition and 40% (6 out of 15) of the vocabulary words he learned in the direct instruction condition. The data indicate a substantial difference (26%) between the conditions with a higher percentage of maintenance in the direct instruction condition.
Long-term Maintenance Results

Long-term maintenance was measured through the usage of a pre/post assessment that was given before and after the study. The assessment included 30 vocabulary words that participants were asked to define. These words were a sample of the words presented in lesson one through ten in the REWARDS program. A cumulative gain score was calculated for each condition.

Becky. On the long-term maintenance assessment Becky was able to accurately define four vocabulary words on the pretest; therefore, these words were omitted from the posttest calculation. The data indicate that Becky was able to accurately define 9% (1 out of 11) of the words she learned in the traditional instruction condition and 0% (0 out of 15) of the words she learned in the direct instruction condition. The data indicate that
there was minimal difference between the conditions (9%) with a higher score in the traditional instruction condition. Long-term maintenance scores were very low for both conditions.

Figure 7. Percentage of words accurately defined on long-term maintenance assessments for Becky.

![Becky Long-term Maintenance](image)

**Lebron.** On the long-term maintenance assessment Lebron was able to accurately define three vocabulary words on the pretest; therefore, these words were omitted from the posttest calculations. The data indicate that Lebron was able to accurately define 33% (6 out of 18) of the words he learned in the traditional instruction condition and 56% (5 out of 9) of the words he learned in the direct instruction condition. The data indicate that
there was a difference between the conditions (23%) with a higher score in the direct instruction condition. Long-term maintenance scores were somewhat low for both conditions, but above 50% in the direct instruction condition.

Figure 8. Percentage of words accurately defined on long-term maintenance assessments for Lebron.

**Moe.** On the long-term maintenance assessment Moe was able to accurately define five vocabulary words on the pretest; therefore, these words were omitted from the posttest calculations. The data indicate that Moe was able to accurately define 0% (0 out of 10) of the words he learned in the traditional instruction condition and 27% (4 out of 15) of the words he learned in the direct instruction condition. The data indicate that there was a difference between the conditions (27%) with a higher score in the direct instruction condition. Long-term maintenance scores were very low for both conditions.
Figure 9. Percentage of words accurately defined on long-term maintenance assessments for Moe.

**Generalization Writing Assessments**

Generalization was measured through the participants’ writing responses to lesson prompts. Participants could earn generalization points if they used the new vocabulary words in their written responses. Participants received one point if the word was used and definititional information was provided, two points if the word was used correctly and a practiced examples was provided, and three points if the word was used correctly and a novel example was provided. Participants could earn a maximum of 45 points on these assessments.
Becky. When asked to use newly learned vocabulary words on writing assessments, Becky received scores ranging between 0 and 2 in the traditional instruction condition and scores between 0 and 3 for the direct instruction condition. Even though there were opportunities to earn up to 45 points, Becky never received more than 3 points for the writing samples. There was also a great deal of overlap of the points between the two instructional conditions. The data indicate that neither instructional condition effectively promoted generalization of vocabulary words. It should be noted that in four out of the five assessments involving words learned during the direct instruction condition Becky scored at least 1 point. Becky scored points in only one of the assessments involving vocabulary from the traditional conditions.

Figure 10. Number of points earned on generalization writing assessments for Becky.
Lebron. When asked to use newly learned vocabulary words on writing assessments, Lebron received scores ranging between 0 and 3 in the traditional instruction condition and scores ranging between 0 and 2 for the direct instruction condition. Even though there were opportunities to earn up to 45 points, Lebron never received more than 3 points for the writing samples. There was also a great deal of overlap of the points between the two instructional conditions. The data indicate that neither instructional condition effectively promoted generalization of vocabulary words.

Figure 11. Number of points earned on generalization writing assessments for Lebron.

Moe. When asked to use newly learned vocabulary words on writing assessments, Moe received scores ranging between 0 and 2 in the traditional instruction condition and scores ranging between 2 and 6 for the direct instruction condition. Even though there were opportunities to earn up to 45 points, Moe never received more than 6 points for the
writing samples. There was also some overlap of the points between the two instructional conditions. The data for Moe indicate that more words from the direct instruction condition were generalized however neither condition showed a strong effect.

Figure 12. Number of points earned on generalization writing assessments for Moe.

<table>
<thead>
<tr>
<th>Points Earned</th>
<th>Lesson</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

**Comprehension Writing Assessment Results**

Written responses were also scored for the percentage of main ideas discussed by the participants per condition. Participants earned a point for each main idea accurately discussed when compared to the answer key. Percentage of main ideas was calculated by dividing the number of main ideas accurately discussed by the total number of main ideas in the lesson.
Becky. When responding to writing prompts, Becky was able to discuss 0-69% (mean of 19% or 9 out of 48 opportunities) of the main ideas when she received the traditional instruction and 0-47% (mean of 20% or 9 out of 44 opportunities) of the main ideas when she received direct instruction. The data indicate that out of the ten assessments the highest score was obtained on lesson 6, which was the traditional instruction condition. The next three highest scores were all from the direct instruction condition.

Figure 13. Percentage of main ideas discussed in comprehension writing assessments for Becky.
**Lebron.** When responding to writing prompts, Lebron was able to discuss 0-44% (mean of 16% or 7 out of 44 opportunities) of the main ideas when he received the traditional instruction and 8-54% (mean of 29% or 14 out of 48 opportunities) of the main ideas when he received direct instruction. The data indicate that there was a pattern of more accurate responding for words instructed during the direct instruction condition.

Figure 14. Percentage of main ideas discussed in comprehension writing assessments for Lebron.

![Lebron Comprehension](image.png)

**Moe.** When responding to writing prompts, Moe was able to discuss 0-36% (mean of 15% or 7 out of 48 opportunities) of the main ideas when he received the traditional instruction and 30-50% (mean of 34% or 15 out of 44 opportunities) of the main ideas when he received direct instruction. The data indicate that there was a pattern of more accurate responding for words instructed during the direct instruction condition.
Figure 15. Percentage of main ideas discussed in comprehension writing assessments for Moe.

Social Validity Questionnaire Results

At the end of the study the participants were asked to respond to a six-question survey that asked them which method of instruction they preferred. For questions one through three, participants were asked to circle one of three choices: (a) traditional instruction, (b) direct instruction, (c) no opinion. Participants responded in the following way for questions one through three.
Table 5. Participant responses for questions one through three on the social validity questionnaire.

<table>
<thead>
<tr>
<th>Question</th>
<th>Number of participants who chose Traditional Instruction</th>
<th>Number of participants who chose Direct Instruction</th>
<th>Number of participants who chose No Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which method of instruction helped you learn science vocabulary the best?</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Which method of instruction did you enjoy the most? (Which one was more fun?)</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Which method of instruction would you prefer in the future?</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Question four asked the participants if there was anything they would change about the traditional instruction. Lebron was the only participant who responded to this question by saying, “It is hard, but I can do it.” Question five asked if there was anything the participants would change about direct instruction. None of the participants responded to this question. Finally, question six asked the participants to write any additional comments, criticisms, questions, or suggestions. Lebron responded by stating, “Helped me with words I needed to know. Some of them were on the OGT (Ohio Graduation Test).” Moe responded to question six by saying, “It was fun.” The results of the social validity survey support that the participants unanimously reported that they preferred the direct instruction over the traditional instruction.
Chapter 5

Discussion

Overall, the alternating treatment design counterbalanced across participants indicates that direct instruction was more effective than traditional instruction in teaching content area vocabulary to high school students with reading disabilities. The results of this study support the previous research on the effectiveness of direct instruction in teaching vocabulary words (Beck & McKeown, 2007; Biemiller & Boote, 2006; Cohen & Byrnes, 2007; Coyne, McCoach, & Kapp, 2007; Kucan, Trathen, & Straits, 2007; NRP, 2000). This study extends the literature in three important ways. First, the participants of this study were high school students with reading disabilities. This study will add to the dearth of literature that addresses effective instructional approaches for teaching reading skills to high school students with reading difficulties (Mastropieri, Scruggs, Abdulrahman, & Gardizi, 2002; Mastropieri, Scruggs, & Graetz, 2003). Second, this study extends the direct instruction literature to high school students, whereas much of the direct instruction literature in the past has focused on the primary grades (Kucan, Trathen, & Straits, 2007). Finally, this study further supports the effectiveness of a promising published curriculum that was developed for middle school and high school students (Archer, Gleason, & Vachon, 2005).
The remainder of this chapter will provide a discussion of the results for this study in regard to each dependent variable and individual participants. In addition, limitations of the current study will be discussed, recommendations for future research will be made, and classroom implications will be highlighted.

**Cumulative gain scores per lesson.** The research question that was addressed through the cumulative gain scores was “Which method of instruction, traditional or direct, will be more effective in helping high school students with reading disabilities learn science vocabulary words per lesson?” A functional relation between direct instruction and accurately defining vocabulary words was most apparent with the lesson assessment cumulative gain scores for each participant. There was a distinct separation between the two conditions for each participant with the exception of lesson seven for Moe. Lebron’s graph also demonstrates that direct instruction became more effective over time with an increasing trend, while traditional instruction became less effective over time with a decreasing trend. One explanation for Moe’s low score on lesson seven in the direct instruction condition was that he wrote accurate definitions, but he associated the definitions with the wrong words. For example, three of the target words for lesson seven included protons (atoms that are positively charged), electrons (atoms that are negatively charged), and neutrons (atoms with no charge). Moe defined neutrons as having a negative charge, protons as having no charge, and electrons having a positive charge. Overall, the lesson assessment cumulative gain scores provide the most support for the usage of direct instruction to teach vocabulary words to high school students with reading disabilities.
**Maintenance.** The research question that was addressed through the maintenance scores was “Which method of instruction, traditional or direct, will be more effective in helping high school students with reading disabilities maintain science vocabulary words per lesson?” Overall, a difference between the conditions was more evident in the ongoing maintenance data than the long-term maintenance data. Lebron’s graphs show the most difference between the two conditions. According to the data, direct instruction was more effective in helping participants maintain newly learned vocabulary words with the exception of Becky’s long-term maintenance graph. It should be noted that Becky’s attendance was inconsistent toward the end of the study due to tonsillitis. There was also a lengthy delay in Becky’s completion of the long-term maintenance assessment due to her illness. These factors could have impacted her scores on the assessments. Still, maintenance was somewhat low for all participants in both conditions, which presents a practical dilemma. Maintenance is highly important and experts argue that a word is not fully learned unless it can be recalled and accurately used at a later time (Beck, McKeown, & Omanson, 1987).

Research supports that direct vocabulary instruction should provide repeated opportunities for practicing the new word in a variety of contexts (Beck, McKeown, & Kucan, 2002). Even though the participants in this study were exposed to the words several times in the direct instruction condition, it might not have been enough to reach high levels of maintenance. Some of the literature indicates that it can take up to 40 repetitions for children with disabilities to truly learn a new word (McCormick, 1999). In this study, the participants were exposed to the new words several times in various
contexts (e.g., various activities), but the number of exposures was not held constant in each condition; therefore it is difficult to draw any real conclusions as to what variables affected maintenance in the current investigation.

Further, the difference in the on-going maintenance and the long-term maintenance could have been impacted by the few opportunities to use the new vocabulary over time. While the participants learned the words initially and showed an ability to maintain the words during ongoing maintenance assessments, these words could have become victims of apathy due to limited exposure in the science curriculum. In other words, vocabulary words for academic content areas (e.g., science) may focus on a particular topic for a series of lessons then move to another topic. Without on-going opportunities to use the new vocabulary the words may be forgotten by students, especially students with disabilities. This relates to the Beck et al.’s assertion that there are three levels of vocabulary words. These highly specialized words are considered level three words but are typically not encountered in general reading. Teachers may have to develop additional instructional activities (e.g., review activities, homework, learning games, etc.) to assist students with disabilities in maintaining level three words over a long period of time.

**Generalization.** The research question that was addressed through the generalization scores was “Which method of instruction, traditional or direct, will be more effective in helping high school students apply and generalize vocabulary knowledge in content area writing assignments?” Of all the dependent variables, the results for generalization were the least compelling. Participants were unable to
generalize at high rates when responding to lesson prompts regardless of the instructional condition.

This could be the result of several variables. First, the participants were not explicitly taught to use the vocabulary words in written responses. There are several types of vocabulary and learning each subtype requires a different set of skills (e.g., expressive which includes written and speaking vocabulary and receptive which includes reading and listening vocabulary); therefore, being able to use new words in written expression requires a different type of vocabulary knowledge and this skill should be taught differently (Bursuck & Damer, 2007). The REWARDS Plus program includes an activity in each lesson that explicitly teaches writing, but due to time constraints and the scope of this study, the writing instruction was eliminated from the direct instruction lessons. Thus, the generalization results might have been different if the participants were directly taught to use the new words in writing activities.

Other important factors that might have influenced participants’ generalization include skill levels in reading, writing, and spelling. All of the participants were reading well below grade level and might have had difficulty recalling and decoding the new vocabulary words independently. In addition, the REWARDS Plus program does not explicitly teach spelling, but does provide students with additional practice of spelling some of the new words. Again, due to the scope of this study and time constraints, the spelling activity was omitted; therefore, students might have avoided using the new words because they were too challenging to spell. Another possible reason for low rates of generalization could be due to participant writing abilities. The researcher only
accessed reading level information, so it is possible that the students also had disabilities with written expression as well.

Finally, the rubric that was used to measure generalization might have been unrealistic. In order to earn a high number of points, participants would have to consistently create novel examples, which would not always be appropriate for answering the questions posed by the writing prompts.

**Comprehension.** The research question that was addressed through the comprehension scores was “Which method of instruction, traditional or direct, will be more effective in helping high school students with reading disabilities comprehend main ideas?” Participants were able to more accurately and reliably discuss the main ideas of the passages after receiving direct instruction. One reason for this could be an effect of direct instruction implementation, meaning, the researcher spent time discussing and drawing attention to the main ideas with the participants during the session. Another reason could be that the participants were instructed to read the passages out loud during the direct instruction condition, which means that they were required to attend to the entire passage. During the traditional instruction condition, there was no way of knowing if the participants read or attended to the entire passage because they were engaged in silent reading. Regardless, students with reading disabilities may not be able to independently pick out the main ideas of a passage without explicit instruction on how to do so; therefore, it is not a surprise that the data indicate that the participants were able to comprehend more consistently after the additional prompting they received in the direct instruction condition. Teachers may need to model how to determine main ideas from
passages prior to having students read silently or orally, rather than assuming that older students already have the ability to determine main ideas for passages.

**Social validity.** All of the participants preferred the direct instruction lessons. Anecdotally, toward the end of the study, participants displayed higher levels of off-task behavior during the traditional instruction condition. For example, they had to be encouraged to spend more time on the activities or stay focused on completing the tasks. It was interesting that Lebron recognized that some of the vocabulary words he was exposed to during experimental conditions were also on the Ohio Graduation Test. This supports that the REWARDS Plus program could be aligned with the state content standards, which should make the program more palatable to school districts.

Lebron’s other comment in regard to traditional instruction (e.g., “It was hard but I could do it.”) captures the frustration or confusion that many high school students with reading disabilities likely experience. There seems to be an expectation in high school that students are to be completely independent and they must engage in a journey to discover their own knowledge. This is a disservice to students with learning disabilities and any student who does not possess the required skills. Instructional time is extremely valuable and teachers must do everything they can to deliver the most intense interventions to prevent learners from becoming so frustrated that they give up or dropout of school. The data indicate that Lebron was not learning words at high rates in the
traditional instruction conditions, yet his response on the survey indicates that he felt that he could learn this way. This implies that even high school students with disabilities can’t fully recognize whether they are learning or not, or even worse, they are too embarrassed to admit that they are struggling.

**Limitations and Future Research**

There are a few important limitations of this study that need to be discussed. The first limitation was the small number of participants in this study. It would be difficult to generalize these results to a large population without more replications across a larger number of participants. This is just the first study in a potentially long line of research and many more empirical studies are needed to replicate and extend these findings. Another limitation in regard to the number of participants is the imbalance between the two groups within the alternating treatments design. The results would be more compelling if there would have been at least two participants per condition. There was a fourth participant who dropped out early in the study due to a death in her family. Because of the time constraints of the school calendar, it was not possible to recruit another participant who met the inclusion criteria and finish data collection before the conclusion of the school year.

The next limitation that needs to be addressed is the low level of interobserver agreement on some of the assessments. There were only two scores that were below 85% (specifically, 67% on a lesson assessment for Moe and 75% on a comprehension assessment for Becky). These low scores could be due to the subjective nature of how
responses were scored. All of the measures in this study required participants to write a definition or a response. Writing is a difficult behavior to measure because there are so many possible variations that it is nearly impossible to define exact correct or incorrect responses based on topography. The researcher knew this was going to be a challenge and attempted to minimize this limitation by having a second observer score a large percentage of the assessments in this study. In single subject designs, the standard rule for interobserver agreement is that a minimum of 30% of the sessions should be scored by a second observer. In the current study, two observers independently scored 90% of the assessments, which is much higher than the standard minimum. Future research needs to address the subjective nature of vocabulary assessments that require written responses, but also require demonstration of deep vocabulary knowledge unlike highly objective forced choice assessments (e.g., matching and multiple choice).

Another minor limitation to this study was the short duration of the intervention. Due to the time constraints of the school calendar, the participants only received a total of five direct instruction lessons over a two-month period. The REWARDS Plus Science program includes 15 lessons; therefore, participants were only exposed to one-third of the curriculum. The results might have been even more compelling if the participants would have completed the entire program. Future studies should investigate the effects of all 15 lessons without omitting any of the activities in the lessons.

The omission of several of the activities within each REWARDS lesson is also a limitation. For example, as discussed earlier it is logical that the participants did not receive high scores on the generalization assessments because the activity in the
REWARDS Plus lessons that is designed to explicitly teach writing was deleted from the experimental sessions. Future studies should evaluate the effects of the REWARDS Plus program in its entirety.

In regard to the low levels of maintenance, it is also logical that participants were unable to maintain vocabulary knowledge over time. Even though they were exposed to new words numerous times, this might not have been enough. This also leads to a discussion about the inconsistent number of words tested per condition during the maintenance assessments. The results would be less skewed if the number of words tested per condition were held constant. Future studies should investigate several components of maintenance. First, further replications and extensions should be performed to determine how many exposures it takes high school students with reading disabilities to truly learn, maintain, and generalize a new word. Second, the number of words tested during maintenance probes should be held constant in order to make a more sound comparison. Further, there needs to be a better alignment of words targeted for instruction and the general education curriculum. This may promote better maintenance of newly learned words.

Finally, data were not collected on the on-task behavior of participants during the instructional conditions. Anecdotally, it seemed like the participants displayed higher rates of on-task behavior during the direct instruction condition and higher rates of off-task behavior during the traditional instruction conditions. This would be an interesting
empirical question to investigate in future research. Future studies could investigate which method is more efficient (e.g., words learned per instructional minute or time students are on-task).

**Classroom Implications**

The results of this study suggest several important implications for classroom instruction. First, direct instruction approaches (specifically, scripted curricula) continue to be effective in teaching important reading skills. This study also extends the direct instruction literature beyond the primary grades into the secondary setting. In fact, the widely held notions and beliefs about the best ways to teach vocabulary to middle school and high school students (e.g., the dictionary method, context, or no formal approach) have been further discounted by the results of this study. The data support that direct instruction can be much more effective in teaching vocabulary than traditional methods for high school students with reading difficulties.

The responses on the social validity surveys also support the notion that high school students enjoy direct instruction lessons therefore more high school teachers should try these programs. The REWARDS programs have a lot of potential as effective direct instruction curricula for high school students who need remedial instruction in various areas of reading, including vocabulary. REWARDS is easy to implement and does not take a lot of time (e.g., the programs only consist of 15-25 lessons). Given the pressure on teachers to have all children successfully complete the general education
curriculum, this type of direct instruction curriculum can be a valuable resource in increasing the success of older learners. Classroom teachers and students should continue to evaluate these programs further in the applied setting.

Even if teachers do not use the REWARDS program, they should consider using the direct instruction tactics used in the program. For example, teachers should use the model-lead-test strategy for presenting information and teaching skills. This strategy ensures that teachers are providing the students with clear expectations for the task and that the students have the required skills to do the assignment.

Finally, teachers must program for maintenance and generalization when teaching vocabulary words. This means that educators need to systematically plan how students will be exposed to new words multiple times, across several contexts, and in several environments. Students must have ample opportunities to practice new words across various subskills (e.g., listening, writing, speaking, and reading). Special education teachers should carefully align their instruction with the general education curriculum that their students are exposed to. This will allow special education teachers to target difficult words to directly teach the students and increase the probability that students will have additional opportunities to practice the words in their academic content classes. Ensuring generalization and maintenance of any skill is a difficult task, but it was especially apparent in this study. The participants in this study were receiving high quality instruction and making substantial progress on short-term assessments, but these
effects were minimized over time. Generalization and maintenance are especially important in high school because it may be the last opportunity these students get to receive formal instruction.

**Conclusion**

As educators and scholars continue to search for best practices in teaching reading, it is important that the needs of high school students are not ignored. The results of this study support the usage of direct instruction to teach vocabulary to high school students with reading disabilities. This study also adds to the evidence that the REWARDS Plus program is a promising curriculum. Researchers need to continue improving assessments to measure vocabulary while also determining the maximal instructional conditions for maintenance and generalization. Hopefully this is just one of the first studies in a line of research that will attempt to uncover the mechanisms of effective reading instruction for high school students.
REFERENCES


APPENDIX A: LETTER OF SUPPORT
November 23, 2009

To Whom It May Concern:

Mrs. Kristall Day has shared with me the rationale and method sections for her research project entitled "Contextual learning versus direct instruction: Teaching struggling high school students content area vocabulary words". Westland High School fully supports this research and we are excited to be part of the project. We look forward to working with Mrs. Day, Dr. Ralph Gardner, III and the Ohio State University in the exploration of instructional programs for students. Please feel free to contact me with any further questions.

Sincerely,

Kathryn Buckerfield, Principal
146 Galloway Road
Galloway, OH 43119
(614) 851-7000
APPENDIX B: COVER LETTERS & CONSENT FORMS
Dear student,

The following letter is a consent form to participate in a research project. This cover letter has been included to give you a quick overview of what the project includes.

- You do not have to participate in this project. If you decide to participate, you can change your mind and withdraw at any time.
- The purpose of the project is to compare two types of vocabulary instruction. One type of instruction is less structured and students have the freedom to determine word meanings. The other type of instruction is highly structured including many activities and teacher directions.
- If you decide to participate, we will be working together for one or two class periods per week during class time or study hall. The study will last for 3 to 5 months.
- If you agree to participate, the information I will need access to includes your IEP goals, scores of previous reading assessments and discussions with your teacher about how you do in class. Everything will be kept confidential.
- There are minimal risks involved in participating in this project. You may dislike the instructional methods or you may feel singled out because you are receiving extra instruction outside of class.
- The benefits may include increased vocabulary, better reading skills and higher levels of self-confidence in school.

If you are interested in participating in this study, please read the following consent form closely. If you need help reading the consent form, please ask me or another adult to read it to you. If you decide not to participate, please check the box that says “No” at the bottom of the page and return it to the school office. If you decide you would like to participate, please check the box that says “Yes” at the bottom of this page and also sign the last page of the consent form.

Sincerely,
Kristall J. Graham, The Ohio State University

☐ Yes, I would like to participate and I have read and signed the consent form.

☐ No, I would not like to participate in this research project.
The Ohio State University Consent to Participate in Research

Study Title: Traditional instruction versus direct instruction: Teaching high school students content area vocabulary words.

Researcher: Dr. Ralph Gardner, III and Kristall J. Graham-Day

Sponsor: N/A

This is a consent form for research participation.

It contains important information about this study and what to expect if you decide to participate. If you sign the consent form, your resource room teacher will be asked about your classroom performance, IEP goals and objectives and reading achievement scores. In order to qualify to be a participant in this study, you will have to be recommended by your teacher due to reading difficulties, including difficulty in vocabulary acquisition and you must be reading on a grade equivalent of 3.0 or higher. Signed consent forms should be folded in half, stapled and returned to the locked box located in the main office of the school.

Your participation is voluntary.

Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate. If you decide to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose:

My name is Kristall Day and I am currently a graduate student in Special Education at The Ohio State University. An important requirement for completing my course of study is to conduct research as part of PhD program. I am in the process of preparing research that I will be carrying out in your school. I will be conducting the research under the supervision of Dr. Ralph Gardner, a professor in the College of Education.

This study will compare the effects of two methods of vocabulary instruction in teaching content area vocabulary words. The purpose of the research is to determine which method of instruction is more effective. I will also be asking you which method you prefer.
Procedures/Tasks:

This study will compare the effects of two methods of vocabulary instruction in teaching content area vocabulary words. In the first method, traditional instruction, students will be asked to independently read passages and use context clues or a dictionary to determine the meaning of the words. The students will then be asked to write definitions and sentences in a journal. Students will then be asked to complete additional choice readings on the topic for each lesson and then write a reaction to the additional reading materials. The second method of instruction, direct instruction, will utilize an explicit and systematic approach to teaching the meaning of new words. The direct instruction program includes several activities to provide additional practice opportunities to apply new knowledge. The REWARDS Plus curriculum will be used to deliver the direct instruction of vocabulary words. You will learn several science vocabulary words throughout this study and can apply the strategies that will be taught to future classes. The study will use several assessment measures including pre/post assessments for lessons and maintenance over time, generalization of word knowledge in writing assignments, and a survey to determine which method participants enjoy more. You will benefit by having opportunities to improve your science vocabulary knowledge.

Duration:

You may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

If you consent to participation, you will participate in 3 to 4 sessions per week lasting approximately 60 minutes. Sessions will be conducted during resource room classes or independent study time so that you will not miss regular education classes. Instruction will occur in a one-on-one or small group setting within the school, away from distractions.

Risks and Benefits:

Students will benefit by learning science vocabulary words and potentially finding a strategy to apply to future classes. A lot of the vocabulary words that will be used for this study are included in the content standards; therefore, students may increase their scores on classroom assignments/assessments or possibly even the Ohio Graduation Test. The knowledge acquired during instruction could also increase overall reading ability.

Reading difficulties contribute to the largest educational need in our country. Vocabulary has been defined as one of five aspects of good reading instruction according to the National Reading Panel. Teaching vocabulary to high school students is one of the least studied aspects of reading and conducting research on the most effective methods will aid in developing better methodology in public schools. Vocabulary development is crucial for adolescents that want to attend a post-secondary institution.

The risks in this study are the same risks that are encountered in typical instruction or in any classroom. Students will only have the opportunity to improve
literacy skills because this instruction is supplemental to what they are already receiving.

Confidentiality:

Efforts will be made to keep your study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law. Also, your records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

No session will be video- or audio-taped. Your name will not be revealed in any kind of publication, document, or any other form of report or presentation developed from this study. I am excited about this project, and I hope you will grant permission for participation in this study. I will only ask you for the following information: your age, gender, grade level, if you have any documented disability and whether or not you attend school regularly (i.e., is rarely absent from school). If you agree to participate in this study, I will be asking your resource room teacher for the following information: reading achievement scores, information pertaining to classroom performance, and any IEP goals and objectives pertaining to reading.

Incentives:

N/A

Participant Rights:

You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you are a student or employee at Ohio State, your decision will not affect your grades or employment status.

If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Contacts and Questions:

For questions, concerns, or complaints about the study you may contact Kristall Day at (614) 599-8901 or at day.368@osu.edu. You may also contact Dr. Gardner at (614) 292-3308 or gardner.4@osu.edu.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team,
you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If you are injured as a result of participating in this study or for questions about a study-related injury, you may contact Kristall Day at (614) 599-8901 or at day.368@osu.edu. You may also contact Dr. Gardner at (614) 292-3308 or gardner.4@osu.edu.

**Signing the consent form**

I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

<table>
<thead>
<tr>
<th>Printed name of subject</th>
<th>Signature of subject</th>
<th>AM/PM</th>
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<td>Date and time</td>
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<table>
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<tr>
<th>Printed name of person authorized to consent for subject (when applicable)</th>
<th>Signature of person authorized to consent for subject (when applicable)</th>
<th>AM/PM</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Date and time</td>
</tr>
</tbody>
</table>

**Investigator/Research Staff**

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

<table>
<thead>
<tr>
<th>Printed name of person obtaining consent</th>
<th>Signature of person obtaining consent</th>
<th>AM/PM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Date and time</td>
</tr>
</tbody>
</table>
Dear parent/guardian,

The following letter is a consent form for your child to participate in a research project. This cover letter has been included to give you a quick overview of what the project includes.

• Your child does not have to participate in this project. If you and your child decide that he or she will participate, either of you can change your mind and withdraw at any time.

• The purpose of the project is to compare two types of vocabulary instruction. One type of instruction is less structured and students have more freedom to determine word meanings. The other type of instruction is highly structured including many activities and teacher directions.

• If you decide to allow your child to participate, I will be working with him or her for one or two class periods per week during class time or study hall. The study will last for 3 to 5 months.

• If you agree to allow your child participate, the information I will need access to includes his or her IEP goals, scores of previous reading assessments and discussions with his or her teacher about how he or she does in class. Everything will be kept confidential.

• There are minimal risks involved in participating in this project. Your child may dislike the instructional methods or he or she may feel singled out for receiving extra instruction outside of class.

• The benefits may include increased vocabulary, better reading skills and higher levels of self-confidence in school.

If you are interested in allowing your child to participate in this study, please read the following consent form closely. If you need assistance with the consent form, please contact me. If you decide not to allow your child to participate, please check the box that says “No” at the bottom of the page and return it to the school office. If you decide you would like to allow your child to participate, please check the box that says “Yes” at the bottom of this page and also sign the last page of the consent form.

Sincerely,
Kristall J. Graham, The Ohio State University

☐ Yes, I would like my child to participate and I have read and signed the consent form.

☐ No, I would not like my child to participate in this research project.
The Ohio State University Parental Permission
For Child’s Participation in Research

Study Title: Traditional instruction versus direct instruction: Teaching high school students content area vocabulary words.

Researcher: Dr. Ralph Gardner, III and Kristall J. Graham-Day

Sponsor: N/A

This is a parental permission form for research participation.

It contains important information about this study and what to expect if you permit your child to participate. If you sign the consent form, your child’s resource room teacher will be asked about his or her classroom performance, IEP goals and objectives and reading achievement scores. In order to qualify to be a participant in this study, your child will have to be recommended by his or her teacher due to reading difficulties, including difficulty in vocabulary acquisition and he or she must be reading on a grade equivalent of 3.0 or higher. Signed consent forms should be folded in half, stapled and returned to the locked box located in the main office of the school.

Your child’s participation is voluntary.

Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose:
My name is Kristall Day and I am currently a graduate student in Special Education at The Ohio State University. An important requirement for completing my course of study is to conduct research as part of PhD program. I am in the process of preparing research that I will be carrying out in your child’s school. I will be conducting the research under the supervision of Dr. Ralph Gardner, a professor in the College of Education.

This study will compare the effects of two methods of vocabulary instruction in teaching content area vocabulary words. The purpose of the research is to determine which method of instruction is more effective. I will also be asking your child which method he or she prefers.

Procedures/Tasks:
This study will compare the effects of two methods of vocabulary instruction in teaching content area vocabulary words. In the first method, traditional instruction, students will be asked to independently read passages and use context clues or a dictionary to determine the meaning of the words. The students will then be asked to
write definitions and sentences in a journal. Students will then be asked to complete additional choice readings on the topic for each lesson and then write a reaction to the additional reading materials. The second method of instruction, direct instruction, will utilize an explicit and systematic approach to teaching the meaning of new words. The direct instruction program includes several activities to provide additional practice opportunities to apply new knowledge. The REWARDS Plus curriculum will be used to deliver the direct instruction of vocabulary words. Your child will learn several science vocabulary words throughout this study and can apply the strategies that will be taught to future classes. The study will use several assessment measures including pre/post assessments for lessons and maintenance over time, generalization of word knowledge in writing assignments, and a survey to determine which method participants enjoy more. Your child will benefit by having opportunities to improve his or her science vocabulary knowledge.

**Duration:**

Your child may leave the study at any time. If you or your child decides to stop participation in the study, there will be no penalty and neither you nor your child will lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

If you consent to participation, your child will participate in 3 to 4 sessions per week lasting approximately 60 minutes. Sessions will be conducted during resource room classes or independent study time so that your child will not miss regular education classes. Instruction will occur in a one-on-one or small group setting within the school, away from distractions.

**Risks and Benefits:**

Students will benefit by learning science vocabulary words and potentially finding a strategy to apply to future classes. A lot of the vocabulary words that will be used for this study are included in the state content standards; therefore, students may increase their scores on classroom assignments/ assessments or possibly even the Ohio Graduation Test. The knowledge acquired during instruction could also increase overall reading ability.

Reading difficulties contribute to the largest educational need in our country. Vocabulary has been defined as one of five aspects of good reading instruction according to the National Reading Panel. Teaching vocabulary to high school students is one of the least studied aspects of reading and conducting research on the most effective methods will aid in developing better methodology in public schools. Vocabulary development is crucial for adolescents that want to attend a post-secondary institution.

The risks in this study are the same risks that are encountered in typical instruction or in any classroom. Students will only have the opportunity to improve literacy skills because this instruction is supplemental to what they are already receiving.
Confidentiality:
Efforts will be made to keep your child’s study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your child’s participation in this study may be disclosed if required by state law. Also, your child’s records may be reviewed by the following groups (as applicable to the research):

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- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

No session will be video- or audio-taped. Your child’s name will not be revealed in any kind of publication, document, or any other form of report or presentation developed from this study. I am excited about this project, and I hope you will grant permission for your child to participate in this study. I will only ask you for the following information: your child’s age, gender, grade level, if he or she has any documented disability and whether or not your child attends school regularly (i.e., is rarely absent from school). We will not need to see your child’s school records in order to conduct this study.

Incentives:
N/A

Participant Rights:
You or your child may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you or your child is a student or employee at Ohio State, your decision will not affect your grades or employment status.

If you and your child choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights your child may have as a participant in this study.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

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If your child is injured as a result of participating in this study or for questions about a study-related injury, you may contact Kristall Day at (614) 599-8901 or at day.368@osu.edu. You may also contact Dr. Gardner at (614) 292-3308 or gardner.4@osu.edu.

Signing the parental permission form

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Printed name of subject

Printed name of person authorized to provide permission for subject  Signature of person authorized to provide permission for subject

Relationship to the subject  AM/PM

Date and time

Investigator/Research Staff

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

Printed name of person obtaining consent  Signature of person obtaining consent

AM/PM

Date and time

118
My name is Kristall Day and I am currently a graduate student in Special Education at The Ohio State University. I will be conducting a study in your school during the next few months.

This study will compare the effects of two methods of vocabulary instruction. In the first method of instruction, called traditional instruction, you will be asked to read a passage and record unknown words into a journal. After you have completed the list you will be asked to create a definition for the unknown words using context clues or a dictionary. Next, you will be asked to use the computer to do additional reading on the topic of the lesson for that day. Finally, you will write a reaction to the additional reading in your journal.

The second method of instruction, called direct instruction, will provide you with definitions of the new words and several opportunities to practice your knowledge of the new words. We will be using a program called REWARDS Plus and you will be given a workbook with activities. Some of the additional activities include answering comprehension questions, responding to vocabulary questions based on personal experiences and writing short answers to questions.

This study will use assessment measures to examine which method is more effective and practical for vocabulary instruction. We will work one-on-one or in small groups at school in a room away from distractions. We will complete 3-4 sessions per week, each lasting approximately 60 minutes. Sessions will be held during your independent study time or during your resource room classes. You will benefit by learning strategy to apply to future classes. If you or your parents decide at any time you do not want to participate you can drop out of the study without any negative consequences.

Do you have any questions?
APPENDIX D: DATA COLLECTION SHEETS
Student Pseudonym: __________________________________________________

Date of session: __________________________ Condition: ________________

Name of primary observer: ____________________________________________

Name of secondary observer: __________________________________________

IOA % ____________________ PI % ____________________

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Score</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lesson Pre-Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lesson Post-Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generalization Points</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session Timing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX E: PROCEDURAL INTEGRITY CHECKLISTS
### Traditional Instruction

<table>
<thead>
<tr>
<th>Instructional step</th>
<th>Checkmark if completed and additional comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) The researcher gives the student(s) the lesson pre-assessment,</td>
<td></td>
</tr>
<tr>
<td>2.) All instructional materials are given to the student(s) including: the reading passage, student journals, writing utensil, dictionary and access to a computer with internet.</td>
<td></td>
</tr>
<tr>
<td>3.) The researcher tells the student(s) what the topic of the lesson will be for the session.</td>
<td></td>
</tr>
<tr>
<td>4.) The researcher directs the student(s) to read the passage independently and write down any unknown words.</td>
<td></td>
</tr>
<tr>
<td>5.) When the student(s) begins reading, the researcher starts the stopwatch.</td>
<td></td>
</tr>
<tr>
<td>6.) The student(s) reads independently and writes words in his or her journal.</td>
<td></td>
</tr>
<tr>
<td>7.) When the student is done reading, the researcher directs the students to write a definition of the words based on the context of the sentences/passage or to use a dictionary to look up the definition of the word.</td>
<td></td>
</tr>
<tr>
<td>8.) When the student(s) is done writing definitions for the words, the researcher directs the student(s) to look up additional reading materials on the topic using the computer.</td>
<td></td>
</tr>
<tr>
<td>9.) The student(s) uses to the computer to find additional reading material on the topic. If the student(s) get off-task, the researcher redirects the student to focus on the topic.</td>
<td></td>
</tr>
<tr>
<td>10.) When the student(s) is done reading additional choice materials, the researcher directs the student(s) to write a reaction to what he or she read in his or her journal.</td>
<td></td>
</tr>
<tr>
<td>11.) The student(s) writes a reaction in his or her journal.</td>
<td></td>
</tr>
<tr>
<td>12.) When the student(s) is done writing, the researcher stops the stopwatch and checks for completion of instructional activities.</td>
<td></td>
</tr>
<tr>
<td>13.) If the activities are incomplete, the researcher directs the student(s) to complete the activities and starts the stopwatch again.</td>
<td></td>
</tr>
<tr>
<td>14.) Once the instructional activities are complete, the researcher gives the student(s) the lesson post-assessment.</td>
<td></td>
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</tbody>
</table>
## Direct Instruction

<table>
<thead>
<tr>
<th>Instructional step</th>
<th>Checkmark if completed and additional comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.) If procedural integrity is being checked for the session, a copy of the teacher script is provided for the second observer.</td>
<td></td>
</tr>
<tr>
<td>2.) The researcher gives the student(s) the lesson pre-assessment.</td>
<td></td>
</tr>
<tr>
<td>3.) The researcher tells the student(s) the topic of the lesson and starts the timer.</td>
<td></td>
</tr>
<tr>
<td>4.) The researcher follows the teacher script for Activity A: Vocabulary</td>
<td></td>
</tr>
<tr>
<td>5.) Student(s) fully participate, the researcher provides praise for correct responses and if an error is made, corrective feedback is given and student(s) get additional opportunities to practice.</td>
<td></td>
</tr>
<tr>
<td>6.) The researcher follows the teacher script for Activity C: Passage Comprehension</td>
<td></td>
</tr>
<tr>
<td>7.) Student(s) fully participate, the researcher provides praise for correct responses and if an error is made, corrective feedback is given and student(s) get additional opportunities to practice.</td>
<td></td>
</tr>
<tr>
<td>8.) The researcher follows the teacher script for Activity E: Comprehension Questions</td>
<td></td>
</tr>
<tr>
<td>9.) Student(s) fully participate, the researcher provides praise for correct responses and if an error is made, corrective feedback is given and student(s) get additional opportunities to practice.</td>
<td></td>
</tr>
<tr>
<td>10.) The researcher follows the teacher script for Activity F: Vocabulary</td>
<td></td>
</tr>
<tr>
<td>11.) Student(s) fully participate, the researcher provides praise for correct responses and if an error is made, corrective feedback is given and student(s) get additional opportunities to practice.</td>
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<tr>
<td>12.) The researcher stops the stopwatch at the end of the lesson.</td>
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</tr>
<tr>
<td>13.) The student(s) are given the lesson post-assessment.</td>
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</tbody>
</table>
APPENDIX F: EXAMPLE LESSON ASSESSMENT
Lesson 1 Assessment
Please write a definition for each vocabulary term in the space provided.

1.) nutrients-____________________________________________________________

2.) universe-____________________________________________________________

3.) bacteria-____________________________________________________________

4.) extinction-____________________________________________________________

5.) ecosystem-____________________________________________________________

6.) eventually-____________________________________________________________

7.) predator-____________________________________________________________

8.) interactions-___________________________________________________________

9.) organisms-____________________________________________________________

10.) scientists-____________________________________________________________

11.) tropical-______________________________________________________________

12.) climate-_______________________________________________________________

13.) protists-_______________________________________________________________

14.) requirements-__________________________________________________________

15.) fungus-_______________________________________________________________
APPENDIX G: EXAMPLE ANSWER KEY FOR LESSON ASSESSMENT
Lesson 1 Answer Key

1.) nutrients - matter needed by plants and animals so they can live

2.) universe - all things that exist, including our solar system and beyond

3.) bacteria - very tiny single-celled organisms

4.) extinction - the end of or dying out of a type of plant or animal

5.) ecosystem - a living community of organisms and their physical environment

6.) eventually - finally

7.) predator - an animal that hunts or kills another for food

8.) interactions - actions or influences on each other

9.) organisms - all living things, including plants or animals

10.) scientists - people with expert knowledge of science

11.) tropical - very humid or hot or having to do with the tropics

12.) climate - the pattern of weather conditions in an area or region

13.) protists - usually single-celled organisms that have both plant and animal characteristics

14.) requirements - things that are needed or depended upon

15.) fungus - a plant-like organism without leaves, flowers, or green coloring
APPENDIX H: EXAMPLE MAINTENANCE ASSESSMENT
Set A

Please write a definition for each vocabulary term in the space provided.

1.) emergent-____________________________________________________________

2.) glucose-____________________________________________________________

3.) virus-_______________________________________________________________

4.) fissures-____________________________________________________________

5.) immune-____________________________________________________________

6.) chemosynthesis-____________________________________________________

7.) biology-____________________________________________________________

8.) canopy-____________________________________________________________

9.) photosynthesis-______________________________________________________

10.) nutrients-___________________________________________________________
APPENDIX I: EXAMPLE ANSER KEY FOR MAINTENANCE ASSESSMENT
Set A

1.) emergent- rising or coming out of (Lesson 14)

2.) glucose- a simple sugar (Lesson 2)

3.) virus- a tiny, infectious particle (Lesson 7)

4.) fissures- long, narrow openings (lesson 11)

5.) immune- protected from a disease or infection (Lesson 6)

6.) chemosynthesis- the process by which certain organisms break down energy rich molecules in order to make their own food (Lesson 3)

7.) biology- the science of living organisms (Lesson 10)

8.) canopy- a covering (Lesson 14)

9.) photosynthesis- the process by which green plants use the sun’s energy to make food (Lesson 2)

10.) nutrients- matter needed by plants and animals so they can live (Lesson 1)
APPENDIX J: EXAMPLE WRITING PROMPTS
Lesson 1- What are some important things about ecosystems?

Lesson 2- Describe the processes that plants perform to keep the life cycle in ecosystems functioning.

Lesson 3- Explain the roles of producers, consumers, and decomposers in the transfer of energy within an ecosystem.

Lesson 4- Describe the types of food preservation methods used today and why they are important.

Lesson 5- Describe the structure and function of the parts of the cardiovascular system.
APPENDIX K: WRITING RUBRIC FOR GENERALIZATION ASSESSMENT
Lesson 1 Vocabulary Writing Rubric

Student pseudonym: 

Date: ____________________  Instructional Condition: ____________________

Observer name: ____________________  IOA %: ____________________

This rubric is to be stapled to a copy of the student work sample. Circle the appropriate score for each vocabulary word that is used. If a word is not used, the student receives 0 points. If a word is used more than once, score each response and determine the median score. Write any additional comments on the student work sample.

<table>
<thead>
<tr>
<th>Target Word</th>
<th>Word is used but there is no demonstration of knowledge or word usage is incorrect</th>
<th>Word is present and definitional information is provided</th>
<th>Word is used and a practiced example is included</th>
<th>Word is used and a novel example is provided</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>bacteria</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>requirements</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>scientists</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>nutrients</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>predator</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
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<tr>
<td>fungus</td>
<td>0</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>climate</td>
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<td>3</td>
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<tr>
<td>extinction</td>
<td>0</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>protists</td>
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<td>2</td>
<td>3</td>
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<tr>
<td>organisms</td>
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<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
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<tr>
<td>interactions</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td></td>
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<tr>
<td>ecosystem</td>
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<td>2</td>
<td>3</td>
<td></td>
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<tr>
<td>universe</td>
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<tr>
<td>tropical</td>
<td>0</td>
<td>1</td>
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<td>3</td>
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<tr>
<td>eventually</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
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</tbody>
</table>
APPENDIX L: EXAMPLE WRITING RESPONSE
Example of how writing responses would be scored if the target word is *hydrothermal*. The following examples are individual sentences that could appear in a written response.

0 points- Word is used but there is no demonstration of knowledge or there is a demonstration of incorrect

**No knowledge-**

The hydrothermal process is very important.

**Incorrect knowledge-**

The hydrothermal vents cause everything to be cold.

1 point- Word is present and definitional information is provided

Hydrothermal vents refer to fissures, deep cracks in the ocean floor, that spew very hot, mineral-rich water.

2 points- Word is used and a practiced example is provided.

Hydrothermal vents can reach very high temperatures and can be formed by underwater volcanoes.

3 points- Word is used and includes a novel example.

I saw a real life example of a hydrothermal vent when I went to Yellowstone National Park.
APPENDIX M: EXAMPLE ANSWER KEY FOR COMPREHENSION ASSESSMENTS
MAIN IDEAS FOR REWARDS WRITING PROMPTS

Lesson 1

a. Definition of ecosystem- composed of living and nonliving things interacting with each other
b. All organisms require energy and matter, must be available in the ecosystem, energy cycle
c. Beneficial interactions, and non-beneficial interactions
d. Changes in an ecosystem can effect how they function
e. Extinction is possible if there is too much of a change

Lesson 2

1. Photosynthesis- process for making food
   a. Leaves have chloroplasts which contain chlorophyll
   b. Chloroplasts collect the sun’s energy and light energy is used to split water
   c. Hydrogen stays in plants and oxygen leaves
   d. Plants combine hydrogen with carbon dioxide to form glucose OR glucose is an energy rich food
2. Cellular respiration- process for releasing energy
   a. Plants take in oxygen from air and combine it with glucose
   b. Release energy, carbon dioxide and water
   c. Stored energy powers the plant and helps them live and grow

Lesson 3

1. Producers
   a. Use photosynthesis (capture energy from sun to make food), chemosynthesis (produce food by breaking apart molecules to capture energy) to produce food
   b. Producers provide food for other organisms
   c. Without them there is no life
2. Consumers
   a. Unable to produce own food
   b. Eat other organisms (e.g., producers) to gain energy, in food webs
      consumers eat other consumers
3. Decomposers
   a. Break down and feed on dead organisms
   b. When they die, energy and nutrients are released into the ecosystem
   c. Plants can take the energy and nutrients from the soil (cycle)
APPENDIX N: EXAMPLE DIRECT INSTRUCTION LESSON FROM REWARDS PLUS TEACHER’S MANUAL
ACTIVITY A

Vocabulary

Tell students each word in the list. Then, have students repeat the word and read the definition aloud. For each definition, provide any additional information that may be necessary. Then, have students practice reading the words themselves.

Note A.1: If you wish to emphasize the part of speech, have students say the part of speech before reading the definition.

Use Overhead 1: Activity A

List 1: Tell

1. (Show the top half of Overhead 1.) Before we read the passage, let's read the difficult words. (Point to words.) The first word is scientists. What word? Now, read the definition.
2. (Point to words.) The next word is universe. What word? Now, read the definition.
3. (Point to words.) Pronounce each word in List 1, and then have students repeat each word and read the definition.

4. Open your Student Book to Application Lesson 1, page 13.
5. Find Activity A, List 1, in your book. Let's read the words again. First word... Next word... (Continue for all words in List 1.)

The second list of words can be read using the part-by-part strategy. Have students circle prefixes and suffixes, then underline the vowels. Using the overhead transparency, assist students in checking their work. Next, have students figure out each word by themselves, then say it aloud. Have them read the definition aloud.

Note A.2-1: Provide additional information for any definitions as needed.
Note A.2-2: If you wish to emphasize the part of speech, have students say the part of speech before reading the definition.
Note A.2-3: If you are teaching older students for whom "thumbs-up" is inappropriate, have students look at you when they can read the word.

ACTIVITY A

Vocabulary

List 1: Tell

1. scientists n. (people with expert knowledge of science)
2. universe n. (all things that exist, including all stars, planets, and living things)
3. organisms n. (all living things, including all plants and animals)
4. ecosystem n. (living community of organisms and their physical environment)
5. climate n. (the pattern of weather conditions in an area or region)
6. bacteria n. (small single-celled organisms)
7. fungus n. (plants that grow without leaves, flowers, or seeds coloring)
8. fungi n. (plants that grow without leaves, flowers, or seeds coloring)
9. protist n. (small single-celled organisms that have both plant and animal characteristics)

List 2: Strategy Practice

1. scientists n. (people with expert knowledge of science)
2. universe n. (all things that exist, including all stars, planets, and living things)
3. organisms n. (all living things, including all plants and animals)
4. ecosystem n. (living community of organisms and their physical environment)
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6. bacteria n. (small single-celled organisms)
7. fungus n. (plants that grow without leaves, flowers, or seeds coloring)
8. fungi n. (plants that grow without leaves, flowers, or seeds coloring)
9. protist n. (small single-celled organisms that have both plant and animal characteristics)

Use Overhead 1: Activity A

List 2: Strategy Practice

1. Find List 2. For each word, circle the prefixes and suffixes, and underline the vowels. Look up when you are done...
2. (Show the bottom half of Overhead 1.) Now, check and fix any mistakes...
3. Go back to the first word... Sound out the word to yourself. Put your thumb up when you can read the word. Be sure that it is a real word... What word? Now, read the definition...
4. (Continue Step 3 with all remaining words in List 2.)

Note A.2-4: You may wish to provide additional practice by having students read words to a partner.

60 - REWARDS Plus: Reading Strategies Applied to Science Passages
APPENDIX O: EXAMPLE DIRECT INSTRUCTION LESSON FROM REWARDS PLUS STUDENT WORKBOOK
### ACTIVITY A Vocabulary

#### List 1: Tell

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. scientists</td>
<td>n.</td>
<td>(people with expert knowledge of science)</td>
</tr>
<tr>
<td>2. universe</td>
<td>n.</td>
<td>(all things that exist, including our solar system and beyond)</td>
</tr>
<tr>
<td>3. organisms</td>
<td>n.</td>
<td>(all living things, including all plants and animals)</td>
</tr>
<tr>
<td>4. ecosystem</td>
<td>n.</td>
<td>(a living community of organisms and their physical environment)</td>
</tr>
<tr>
<td>5. climate</td>
<td>n.</td>
<td>(the pattern of weather conditions in an area or region)</td>
</tr>
<tr>
<td>6. bacteria</td>
<td>n.</td>
<td>(very tiny single-celled organisms)</td>
</tr>
<tr>
<td>7. fungus</td>
<td>n.</td>
<td>(a plant-like organism without leaves, flowers, or green coloring)</td>
</tr>
<tr>
<td>8. fungi</td>
<td>n.</td>
<td>(more than one fungus; the plural of fungus)</td>
</tr>
<tr>
<td>9. protists</td>
<td>n.</td>
<td>(usually single-celled organisms that have both plant and animal characteristics)</td>
</tr>
</tbody>
</table>

#### List 2: Strategy Practice

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. interactions</td>
<td>n.</td>
<td>(actions or influences on each other)</td>
</tr>
<tr>
<td>2. population</td>
<td>n.</td>
<td>(the number of organisms living in an area)</td>
</tr>
<tr>
<td>3. function</td>
<td>v.</td>
<td>(to act or operate normally; to perform)</td>
</tr>
<tr>
<td>4. tropical</td>
<td>adj.</td>
<td>(very humid and hot or having to do with the tropics)</td>
</tr>
<tr>
<td>5. available</td>
<td>adj.</td>
<td>(ready to be used)</td>
</tr>
<tr>
<td>6. requirements</td>
<td>n.</td>
<td>(things that are needed or depended upon)</td>
</tr>
<tr>
<td>7. nutrients</td>
<td>n.</td>
<td>(matter needed by plants and animals so they can live)</td>
</tr>
<tr>
<td>8. predator</td>
<td>n.</td>
<td>(an animal that hunts or kills another for food)</td>
</tr>
<tr>
<td>9. eventually</td>
<td>adv.</td>
<td>(finally)</td>
</tr>
<tr>
<td>10. extinction</td>
<td>n.</td>
<td>(the end of or the dying out of a type of plant or animal)</td>
</tr>
</tbody>
</table>
APPENDIX P: TRADITIONAL INSTRUCTION CHECKLIST
Name: ___________________________ Date: ___________________________

Topic for today: ___________________________

Tasks: *(Check the box when you have completed the step)*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1.)</td>
<td>Read the passage</td>
</tr>
<tr>
<td>2.)</td>
<td>Write the words you do not know the meaning of in your journal</td>
</tr>
<tr>
<td>3.)</td>
<td>Use the sentence to figure out the definition of the words</td>
</tr>
<tr>
<td>4.)</td>
<td>If you need extra help, use the dictionary</td>
</tr>
<tr>
<td>5.)</td>
<td>Make sure you have written a definition for every unknown word</td>
</tr>
<tr>
<td>6.)</td>
<td>Use the internet to look up more information on your topic</td>
</tr>
<tr>
<td>7.)</td>
<td>Show your work to Mrs. Day to make sure you are done</td>
</tr>
</tbody>
</table>
APPENDIX Q: SOCIAL VALIDITY SURVEY FOR PARTICIPANTS
Social Validity Questionnaire for Students

Please give your honest opinion regarding the traditional instruction of vocabulary and the direct instruction of vocabulary (REWARDS program) by circling which method you preferred, or NO OPINION if you are unsure.

Thank you for your time and opinion.

1.) Which method of instruction helped you learn science vocabulary the best?

   Traditional Instruction  Direct Instruction (REWARDS)  NO OPINION

2.) Which method of instruction did you enjoy the most? (Which one was more fun?)

   Traditional Instruction  Direct Instruction (REWARDS)  NO OPINION

3.) Which method of instruction would you prefer in the future?

   Traditional Instruction  Direct Instruction (REWARDS)  NO OPINION

4.) Is there anything you would change about the traditional instruction activities?

5.) Is there anything you would change about the direct instruction (REWARDS) program?
6.) Please write any additional comments, criticisms, questions, or suggestions:

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