Effects of vocabulary interventions on the comprehension in the science content area

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The Effects of Vocabulary Interventions on Comprehension

In the Science Content Area

By

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Abstract

The purpose of this case study was to determine if the use of specific vocabulary interventions increase comprehension in the science content area. This was a comparison study which compared the effects of two vocabulary interventions. Half of the study used the Frayer model, while the other half used Learning vocabulary in context reading strategy. The hypothesis was that both learning interventions will increase comprehension, but the Frayer Model will be the more effective intervention for increasing comprehension. The intervention plan and procedure were connected to with current research on comprehension in the content areas. The student received 15 intervention sessions, each of which was 60 minutes long over a four-week period. Analysis of pre and post test results showed improvement of comprehension skills from both interventions types, but the Frayer Model was the more effective intervention.
Table of Contents

Chapter One- Introduction
  Introduction to the Student.................................................................4
  Connection to the Law.................................................................6
  Connecting to Wisconsin State Standards........................................7
  Conclusion.........................................................................................7

Chapter Two- Review of Literature
  Overview of Literacy Interventions.................................................9
  General Vocabulary Interventions....................................................20
  Vocabulary Acquisition......................................................................41
  Conclusion.........................................................................................46

Chapter Three- Procedures for the Study
  Introduction.........................................................................................48
  Sample...............................................................................................48
  Procedure............................................................................................50
  Learning Vocabulary Words in Context..............................................51
  Frayer Model.......................................................................................52
  Data Collection.....................................................................................53
  Conclusion............................................................................................54

Chapter Four- Results
  Introduction........................................................................................55
  Effects of Vocabulary Interventions on Reading Comprehension...........55
  Effectiveness of Learning Words in Context vs. Frayer Model..............56
  Results for Learning Words in Context Intervention..........................57
  Results for Frayer Model Intervention...............................................58
  Comparison Data................................................................................59
  Conclusion...........................................................................................60

Chapter Five- Conclusions
  Introduction........................................................................................61
  Connections to Research......................................................................61
  Connections to State Standards........................................................65
  Discussion of Results..........................................................................66
  Strengths and Limitations....................................................................71
  Recommendations................................................................................73
  Conclusion............................................................................................74

References............................................................................................76
  Appendix A..........................................................................................79
  Appendix B..........................................................................................82
  Appendix C..........................................................................................83
CHAPTER ONE

The purpose of this study is to determine if the use of specific vocabulary interventions increase comprehension in the science content area. This is a comparison study which compares the effects of two vocabulary interventions. Half of the study will use the Frayer model, while the other half will use Learning vocabulary in context reading strategy. The hypothesis is that both learning interventions will increase comprehension, but the Frayer Model will be the more effective intervention for increasing comprehension. This chapter will provide information about the student at the center of this case study, regarding her academic background and her strengths and weaknesses. This chapter will reference how special education laws affect this particular student and also connect the study to the Common Core Standards. Lastly key terms used in the study will be defined.

Introduction to the Student

The participant in this study, Ericka, was a twelve year old African American student who will be entering the seventh grade in September 2012. She attended a small urban charter school in Southeast Wisconsin during this study. Ericka attended a different school from kindergarten to fifth grade. Ericka was referred for special education services due to her delayed progress in reading and behavioral issues. She began receiving special education services in March of 2012, when she was evaluated and diagnosed with Other Health Impairment by the school Diagnostic Teacher.

Ericka is very strong in math. She received an “A” each quarter in her sixth grade year. She reported that she loves math and it comes easily to her. She reports that her favorite things about school are making friends and math class. Ericka has a
generally positive and optimistic attitude about school. She can be easily angered and will react negatively when she receives a consequence or negative attention. She has difficulty dealing with her anger appropriately and has repeatedly walked out of the classroom without permission without returning. One of Ericka’s Individual Education Plan (IEP) Goals is to use a pass to take timed breaks when she is feeling upset. Ericka struggles in reading and is approximately one grade level below her academic peers. Her special education program is centered on reading; She is pulled out of the classroom for thirty minutes each day to work with the special education teacher. During the sessions Ericka works on reading fluency, decoding, and comprehension skills. Her special education teacher reports that she struggles with uncommon vocabulary words and will often substitute similar sounding known words in place of the vocabulary word. The special education teacher reports that her reading comprehension skills are weaker than her fluency and decoding skills. She struggles with retelling details from passages as well as making connections to events outside of the text. Ericka’s mother reports that when she is doing homework with Ericka, she will often “space out” and “will not be paying attention at all, and will need things repeated many times.” Ericka’s scores on a recent school-wide assessment show that she is approximately one year behind in fluency and approximately two years behind in comprehension. She scored at a sixth grade level for fluency and decoding and at an early fifth grade level in terms of comprehension.

The special education teacher reports that reading comprehension becomes a significant problem when reading nonfiction content related texts, especially in science and social studies. Ericka’s IEP goals for the year are “When given reading materials at Ericka’s independent level, Ericka will correctly answer 80% of literal comprehension
questions” and “Given definitions of words taught in content areas, Ericka will correctly supply the word being defined in 80% of the definitions.” In order for the interventions to be beneficial for Ericka, the case study was crafted around these two IEP goals. The interventions focus on increasing comprehension of science texts by increasing vocabulary acquisition and understanding.

**Connection to Special Education Law**

The school is complying with the Individuals with Disabilities Education Act (IDEA) by placing Ericka in the least restrictive environment, her regular education classroom, and supporting her with specialized services to meet her educational needs. Least restrictive environment (LRE) is a key principle of IDEA; It means that a student who experiences a disability should have the opportunity to be educated with non-disabled peers, to the greatest extent appropriate. They should have access to the general education curriculum, or any other program that non-disabled peers would be able to access. This means the curriculum should be differentiated to meet the student’s needs. The student should be provided with supplementary aids and services necessary to achieve educational goals if placed in a setting with non-disabled peers. The purpose of supplementary aids and services is to help a student who experiences a disability stay on track in the regular education curriculum. Academically, a resource room may be available within the school for specialized instruction, with typically no more than two hours per day of services for a student with learning disabilities. Ericka’s IEP and the case study honor IDEA by 1) placing Ericka in the least restrictive environment, and 2) by providing her with supplementary aids and services in order to be successful in the regular education curriculum.
Connection to Common Core Standards

This case study is aligned with the Common Core Standards for Reading and English Language Arts. Specifically, the case study addresses the Reading Standard for Informational Text 6–12: Key Ideas and Details, which requires students to determine two or more central ideas in a text and analyze their development over the course of the text, and provide an objective summary of the text. The case study addresses this standard because Ericka was asked to identify which vocabulary word/words represented the main idea of the text and to defend her answer while reading the science content text.

The case study also addresses the Language Arts Standard 6-12: Vocabulary Acquisition and Use, since Ericka will, (a) determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, (b) Use context as a clue to the meaning of a word or phrase, (c) Consult general and specialized reference materials to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech, and (d) Verify the preliminary meaning of a word or phrase by checking the inferred meaning in context or in a dictionary. These standards are addressed throughout the chosen methodology, which will be discussed in detail in Chapter Three.

Conclusion

This study involves the participation of Ericka, a twelve-year-old student who receives special education services in reading. During the four-week period, Ericka received two vocabulary interventions; the Frayer Model and Learning words in context. It is anticipated that both learning interventions will increase comprehension in the science content area, with the Frayer Model being more effective than Learning
vocabulary in context. In developing an intervention to effectively address Ericka’s academic need, a thorough review of literature was conducted. This information is presented in Chapter Two.
CHAPTER TWO: REVIEW OF THE LITERATURE

Intervention is the key to helping struggling students become good readers. It is of utmost importance that the interventions that are implemented are research supported and monitored closely. When a quality research based intervention is implemented children who may otherwise have gone unnoticed or been left disadvantaged by their reading difficulties are given the support and help they need. The purpose of this chapter is to study the design and findings of existing research on literacy interventions. The first section will provide a broad overview of literacy interventions implemented in the primary and secondary grades. The second section will focus on one key element of literacy instruction, vocabulary acquisition. This section will explore various vocabulary interventions. The third section will focus on a specific vocabulary intervention that has had positive effects on vocabulary acquisition.

Section 1: Overview of Literacy Interventions

This section will provide an overview of three literacy intervention programs implemented in the primary and secondary grades. The programs addressed the needs of a variety of students and have implications for structuring a successful reading intervention program.

The study conducted by Macdonald and Figueredo (2010) explored the effects of a language-intervention program called Kindergarten Early Literacy Tutoring (KELT), on a group of at-risk kindergarteners. The researchers worked with at-risk students attending urban schools from socioeconomically disadvantaged backgrounds; the students they worked with generally have a lower rate of literacy achievement. The researchers chose to study a language intervention program because of research that
showed that oral language is the foundation of literacy development and leads to progress in phonemic awareness (Adams, 1990).

The sample consisted of students from four schools. All four schools performed below average on province wide assessments given in grades three and six. All four schools were identified as at-risk schools and were to receive intensive interventions. The schools would begin implementing various interventions, one being the KELT program in the kindergarten classrooms. For the purpose of this study a comparison group was made, these students would not be receiving the KELT program intervention, and would attend the regular kindergarten classes.

Students receiving the intervention and students in the comparison group took pre and post-tests in six areas: oral language, concepts of print, phonemic awareness, letter sound knowledge, letter-sound correspondence, and word knowledge. Students were also assessed in their reading ability at the end of kindergarten. Students in the intervention group attended the KELT program five days a week for an entire school year. Students attended the KELT program for half the day and a regular kindergarten program for the remainder of the day. Students in the comparison group attended a regular kindergarten program for a full day. KELT tutors received intensive and on-going training throughout the school year. The KELT program consisted of four main components: oral language, phonemic awareness, print awareness, and alphabet knowledge. The program respected the working philosophy many Canadian public kindergarten classes have of teaching through themes. The KELT program kept the idea of teaching through themes intact. However the program recognized the need to develop background knowledge, thus each theme unit is developed around a field trip or experiential experience. After students
have a primary experience, such as a trip to a pumpkin farm, this experience would be followed with talking, reading, and writing about the experience. Each unit focused on specific concepts and skills and the teachers are provided with the appropriate resources.

At the beginning of each unit the instructor engaged the students in a pre-telling activity in which the students recalled the procedures for going on a field trip. According to the authors this activity encouraged students to think of sequential order and improves retelling abilities. While on the trip the instructor kept a log of vocabulary words to teach based on the experience. On the trip the instructor asked the students thought provoking questions to engage student learning. The instructor also took pictures to use in upcoming lessons. In the instructional days to follow the instructor used this experience to engage the students in discussion, reading, and writing, all the while incorporating literacy skills.

To assess the effectiveness of the program students in the KELT group and comparison group were given pre and post-tests in oral language, concepts of print, phonemic awareness, letter sound knowledge, letter-sound correspondence, and word knowledge. Students in the KELT group outperformed the comparison group on most of the assessments. The results were considered quite remarkable because the intervention group was considered to be at greater risk than the comparison group. The KELT group’s baseline average in the areas of phonemic awareness and letter-sound correspondence assessments is greater than the comparison group’s baseline average. The researchers reported that the KELT group continued to make gains throughout the remainder of the school year based on the instructor’s running records. Most importantly the KELT group had either met or surpassed the targets for end of kindergarten on the
province wide assessments by spring. This is significant because the KELT program was enacted to help rectify the poor scores on the province wide assessments. Thus the program achieved what it set out to do.

One key point that can be taken from this study is the importance of building background knowledge for students. This study shows that students are more able to engage in oral communication and the reading and writing process when they have a solid base of background knowledge to work from. The study shows the importance of providing students with authentic learning experiences. When students have authentic learning experiences they are able to use the knowledge they have gained as a base for growth in literacy. Another key take away from this study is the importance of early intervention. Through implementing the KELT program in kindergarten most students were able to enter the first grade on pace. When students enter the first grade on pace they are much more likely to be successful. Lastly the instructors of the KELT program were highly trained. The instructors received constant feedback and continuing training throughout the program, along with all materials needed for the program. The instructors received a research based intervention to teach to children and were given the proper support to do so.

In summary, the KELT Program achieved success with a group of Canadian kindergarten students. The program gave students background knowledge through an experiential experience, and then used this experience to aid in discussion, writing, and reading. The students showed significant improvement in concepts of print, phonemic awareness, letter sound knowledge, letter-sound correspondence, and word knowledge.
The findings of Macdonald and Figueredo (2010) showed the importance of building student’s background knowledge through primary experiences and discussion. This background knowledge is the foundation for building literacy skills. The next study by Hempill and Tivnan (2008) also supports the use of early interventions. Hemphill and Tivian also are working with at-risk students in high poverty schools.

The study conducted by Hemphill and Tivnan, *The Importance of Early Vocabulary for Literacy Achievement in High-Poverty Schools* (2008), focuses on first grade student’s literacy skills and their subsequent reading achievement in third grade, with special attention to reading comprehension. The authors’ state that in first grade decoding skills such as letter and word identification are the strongest predictors of reading comprehension. As the student progresses to the second and third grade vocabulary is the strongest predictor of reading comprehension. The author’s focus on high poverty schools because high poverty schools generally have lower test scores. The author’s assert that there are a variety of reasons for lower test scores of students from an impoverished background. These factors include lower rates of student’s attending educational pre-schools, low-income students are more likely to live in communities with less access to print, and controversially the article asserts that low income students are less likely to be engaged in focused conversations that promote literacy and have book reading routines. The authors test the student’s skills in the beginning of first grade and see how these skills contribute to the students reading ability in third grade.

The study focused on students at risk of “reading failure” who attended low-income schools. The sample consists of students beginning first grade from 16 Boston elementary schools. Students in fifteen of the schools continued to participate through
the spring of third grade. There were a small percentage of students who did not finish the study due to changing schools; however the majority of students completed the study.

Students were given the following pre-tests: Peabody Picture Vocabulary Test (PPVT-III Dunn and Dunn 1997), Yopp–Singer Phonemic Awareness Test, Woodcock–Johnson Diagnostic Reading Battery (WDRB): sub-tests, word and letter identification test and word attack test, and their oral abilities were tested with School-Home Early Language and Literacy (SHELL). These tests were repeated at the end of first and second grade. At the end of first grade the students were also given the Gates–MacGinitie Primary 1 Comprehension Subtest (GMRT.) At the end of second grade the students were given the GMRT Primary 2 Comprehension Subtest, and at the end of third grade the GMRT Primary 3 Comprehension Subtest. The results of the tests were used to see the connection between first grade and third grade literacy skills.

In first grade standard scores on vocabulary (PPVT-III) were low, averaging only 87, with students scoring in the 19th percentile. The first graders scored above grade-level expectations on the two subtests of the WDRB. Student’s performance on the Yopp–Singer was less strong than the WDRB, due to the fact that students struggled with segmenting two-three syllable words. The student’s scores on the SHELL were weak, although this test had the largest range of scores. Students continued to perform below age expectations in vocabulary, but scored above grade level, on average, in word reading and word attack at the end of first and second grade. Student performance on the Gates–MacGinitie reading comprehension assessments were fairly weak in first grade and declined relative to grade-level expectations as children moved from first grade through second and third grade. Researchers studied the correlations between first, second, and
third grade reading skills. First graders with a fairly strong performance in letter-word identification and word attack tended to do have stronger reading comprehension skills at the end of first grade. Researchers found a link between strong decoding skills at the end of first grade and higher reading comprehension in second grade. There was a weak correlation between end of first grade performance in phonemic awareness and end of second grade reading comprehension. There was a strong correlation between end of first grade vocabulary and end of second grade reading comprehension. This trend continued, with end of second grade vocabulary skills predicting third grade reading comprehension. Other correlations lost their strength, while the vocabulary and reading comprehension correlation continued to have a strong relationship. The researchers concluded that student’s vocabulary skills at the beginning of first grade made an important contribution to student’s later achievement in reading comprehension.

The implications of this study are very clear. Vocabulary is linked to reading comprehension. The students in this sample, at-risk readers in low-income schools, who had strong vocabulary skills in first grade, lead to stronger reading comprehension in second and third grade. Therefore vocabulary interventions taught in the first grade will have lasting effects on student reading comprehension. Thus early interventions are key.

In summary the researchers found a connection between early vocabulary skills and later reading comprehension skills. Both studies have focused on early interventions in the primary grades. The next study will focus on reading in the secondary grades. Alfassi (2004) demonstrated the importance of teaching strategies that foster reflective and engaged reading to lead to heightened comprehension.
Alfassi’s (2004) study, *Reading to Learn: Effects of Combined Strategy Instruction on High School Students* (2004) is interested in how reading comprehension is taught in high schools. He states that instruction in most high schools includes content only skills and not enough attention is being paid to teaching strategies that foster reflective reading. The author believes that reading strategies are best learned and used by students when they are taught through the curriculum. This means teachers are teaching reading strategies in all content areas, whenever text is encountered. In this study the researcher explored the efficacy of a reading comprehension intervention that is embedded in the regular curriculum and delivered by teachers (Alfassi 2004). Two strategies were used in the intervention, the reciprocal teaching model and direct explanation model. The researcher’s hypothesis is, by employing reciprocal teaching and the direct explanation model; student’s reading comprehension will increase.

Reciprocal teaching is an instructional method in which reading comprehension is viewed as a problem solving activity. While students are reading they are taught to do four things: 1) generate questions, 2) summarize, 3) attempt to understand word meanings or confusing text, and 4) predict what might appear in the following paragraph. At first the teacher models the process and later students are asked to take turns leading the group and using the strategies. As students become more proficient in the strategy the teacher no longer leads discussions, but becomes a mediator and offers guidance, thus the teachers role is reduced as the students become more proficient. The direct comprehension model has the teacher clearly explaining the reasoning and mental processes involved in reading comprehension. While the teacher is reading they would stop and state which strategy he or she is using to understand the text. This is often
referred to as the “think aloud” model. This procedure is followed by guided student practice.

The sample consisted of 49 freshman students enrolled in two sections of the same English language arts class. The students were from a Mid-western suburban school. The composition of the students with regard to sex and ethnic origin was similar. The students were all regular education students.

One section of the English classes was the control group, and the other the treatment group. The treatment group consisted of 29 students, and the control group included 20 students. All students were pretested using the Gates- MacGinitie Reading Comprehension Test (2000) and given four reading assessment passages. Students in the control group continued with their regularly programmed English class, and were not taught the comprehension strategies. Students in the treatment group participated in 20 minutes sessions where they learned the two strategies, reciprocal teaching and the direct comprehension model. The teacher continued to model the strategies for the 60 minutes of remaining class time. It is important to point out that the students in both groups were reading the same material; the curriculum was not changed in any way. Rather the way the students were being asked to approach the curriculum was adjusted in the treatment group. The students received the intervention for 20 consecutive school days. At the end of the intervention students in both groups took post-tests. The tests were parallel versions of the pre-test.

The researcher’s main objective was to test the usefulness of a reading comprehension intervention that was embedded in the regular curriculum. The researcher found that there was a significant difference between the treatment group and control
group on both the Gates- MacGinitie Reading Comprehension Test (2000) and four reading assessment passages. The treatment group improved its performance on the standardized measure (Gates- MacGinitie Reading Comprehension Test (2000)), whereas the control group did not improve and even tested lower on the post-test. On the four reading assessment passages both groups showed improvement, however the treatment group increased their scores from the pre-test to the post-test at a greater rate than the control group. The researchers findings support the hypotheses, students who are given combined strategy instruction embedded in the curriculum will show an improvement in reading comprehension over students who were not instructed in the strategies.

One of the implications of this study is that the teaching of comprehension strategies is more successful when they are embedded in the curriculum and taught as part of an actual academic task. Students will be more likely to use reading strategies if the strategies are incorporated in the curriculum and are consistently modeled by teachers. It is important to implicitly teach comprehension strategies because they help students learn to organize information from the text in a way that makes sense to them and fits into their knowledge base. Another implication of the study is the importance of teacher modeling and then slowly relinquishing control of the group and allowing students to lead discussion. When students are employing the strategies independently they are truly making sense of the text.

In summary, the study tested the effects of employing two reading interventions: a reciprocal teaching model and direct explanation model. The students who were instructed in the intervention out preformed the control group. The study supports the use of a combined strategy instruction model that is embedded in the curriculum.
In this section three studies were reviewed with implications for the structure of primary and secondary reading interventions. McDonald & Figueredo (2010) state that “Kindergarten remains a critical year for putting interventions in place, as students’ emergent-literacy skills develop significantly over the course of the school year and these skills are early indicators of later reading achievement.” The KELT program results provide evidence that early intervention can help build students’ oral language and emergent-literacy skills, and that these skills prepare students to be more successful in the upcoming grades. In the second study Hemphill and Tivnan (2008) show that vocabulary knowledge is the best predictor of reading comprehension at the end of 2nd and 3rd grades. In the final study in this section, Alfassi (2004) showed by employing reciprocal teaching and the direct explanation model in the curriculum, student’s reading comprehension increased on assessments. Through these three studies it is clear that early interventions have a great benefit to student learning. Early interventions should provide students with opportunities to gain background knowledge and focus on vocabulary. In the secondary grades teaching reading comprehension strategies in the curriculum are important aspects of teaching students to be thoughtful and reflective readers.

Section Two: General Vocabulary Interventions

The previous section examined general literacy interventions; this section focuses in on a key component of literacy, vocabulary acquisition. Research will be provided that will expand upon Hemphill and Tivian’s (2008) link between vocabulary interventions and reading comprehension. The studies will look at how vocabulary acquisition affects reading comprehension in the content areas as well as in fictional texts. The following
studies explore the merits of various vocabulary interventions. Some of the interventions will prove to be successful while other interventions do not show significant results. Regardless, each of the studies provides important insights for how to craft a vocabulary intervention.

The study conducted by Feng and Horn (2012) explored the effects of direct vocabulary instruction within a seventh grade literacy program. The researchers were looking to determine if direct vocabulary instruction had a positive effect on student’s reading comprehension. Specifically, the study is attempting to determine if the seventh graders who received direct content vocabulary instruction prior to and while reading content text would have improved reading comprehension over the students who did not receive the instruction.

The sample consisted of two seventh grade classes. The students were on level and meeting grade level expectations. Each class had 29 students. Economically disadvantaged students made up 18% of the total population, students with disabilities made up 11%, and English Language Learners make up one percent of the population.

One of the seventh grade classes was chosen to be the treatment group; this group received the vocabulary intervention. The control group was asked to take a vocabulary pre-test comprised of all the vocabulary words they would encounter in the upcoming reading selection. After completing the test the group was asked to read the selection and discuss the selection in a small group. Following the discussion students were asked to take a comprehension and mixed-response post test. The control group received no special instruction for the experiment and completed the pre-test, reading, and post-test within one week. The treatment group was given the same pre-test and post-test as the
control group. Before and during reading the text the treatment group was provided with vocabulary acquisition interventions. The interventions consisted of the following strategies: (a) Before Reading Strategies (Activating prior knowledge, Focusing on a small number of words), (b) During Reading Strategies (Encouraging the use of context clues to identify meaning of unknown words, Using graphic organizers to provide opportunities for multiple exposures to and development of word knowledge), (c) After Reading Strategies (Encourage deep processing to integrate new words into their working vocabularies.)

The treatment group received eight lessons on vocabulary meaning and identifying vocabulary words in context. At the end of the sessions students took the post-test. The intervention was implemented for one month.

The researcher’s hypothesis was that the vocabulary interventions would have a positive effect on student’s reading comprehension. The research indicated that there was no significant difference in the performance on post-tests of the treatment group and control group. The direct vocabulary instruction only lead to mean test score increase of 3.93 percentage points over the control group on the post test. This increase was not significant and thus the researchers accepted the null hypothesis: The vocabulary interventions will not have a positive effect on student’s reading comprehension.

The structure and findings of this study raise many questions about how to structure a vocabulary intervention program. An issue that appears problematic is the duration of the study verse the amount of instruction. The study only occurred for one month, with the students receiving eight instruction sessions. During the sessions the students were taught five different strategies. Perhaps one of the reasons for the
study’s lack of success is that there were too many intervention strategies introduced during the short time period. Thus the students were not able to completely master a strategy. Research shows that for students to master a reading strategy they need to go through four stages (Wright 2007). The students must be explicitly taught how to use the skill or strategy, students should practice the skill under supervision with teacher feedback, students should use the skill independently in real academic situations, and students should use the skill in a variety of other settings or situations. An implication of this study would be to spend time teaching one or two interventions, so students can master the skill, rather than teaching a larger number of interventions.

In summary, the five interventions implemented by Feng and Horn (2012) did not achieve a significant increase in student performance. In the next study by Espin, Shin, & Busch (2005), the authors question if vocabulary knowledge is an indicator of student understanding in the content areas. They also study the effectiveness of curriculum based assessment measures.

The authors of the study, Curriculum-Based Measurement in the Content Areas: Vocabulary Matching as an Indicator of Progress in Social Studies Learning (2005), begin their study by calling attention to assessment tools. They assert that one of the most difficult components of education is measuring student growth, the student’s performance change. They assert that often student’s performance is measured at a single point in time with no comparison data. The authors support a measurement system designed to measure student growth and change in performance by repeating assessments and measures within short time periods. The system is called Curriculum-Based Measurement (CBM); this is an ongoing data collection system with the purpose of
providing teachers with information on student progress as well as the effectiveness of interventions. In this study the researchers will be CBM to collect their data.

The study aims to answer the question, “Would vocabulary matching prove to be a reliable and valid indicator of student progress?” (Espin, Shin, Busch, 2005). More specifically, would student growth data collected by CBM in the area of social studies content vocabulary matching, adequately model student growth and learning in social studies. Also the study works to identify which of two assessments is more valid: a student read assessment or an administrator read assessment.

The sample consisted of 58 seventh-grade students. There were 32 boys and 26 girls, and the mean age was 13.6 years. The students were from two social studies classrooms in the Midwest. The participants were 95% Caucasian, with a small percentage of students who were African American and Asian American (5%); twenty-eight percent of the students received free or reduced lunch. Five of the participants in this study were identified as having learning disabilities.

During the winter and spring quarters, students were tested weekly with two types of vocabulary-matching assessments. One assessment was read by the student and the other was read by a test administer. The student-read version consisted of 22 vocabulary terms, and 20 definitions (two of the terms were inserted as distracters.) The terms were chosen from a master list of terms from the seventh grade social studies curriculum. The definitions were modified to that they had fewer than 15 words. Students were asked to match the alphabetically listed vocabulary terms on the left side of the page with the definitions on the right side of the page. The administrator-read version of the vocabulary test was made form the same set of terms. On this assessment the student was
given only the vocabulary terms, while the test administrator read the definitions. Students identified which vocabulary word matched the definition being read. Each student was given both assessments each week. Each student completed eleven student-read and 11 administrator-read assessments during the study. The students were also given a social studies content knowledge pre and post-test exam. The vocabulary word and content exam was teacher created based on information that has been presented to the students.

The researchers used the vocabulary assessment data to study three areas; improvement of student performance over time, sensitivity to interindividual differences in growth rates, and validity of growth rated produced by the measures with respect to criterion measures (Espin, Shin, Busch, 2005). The results of the study showed that both student-read and administrator-read vocabulary assessments both showed significant growth over time. However, only the student-read assessment produced a valid predictor of student performance in social studies. The results also show that the student-read assessment was sensitive to interindividual differences in growth rates. The author’s conclude that the student-read assessment was proved the valid assessment of student performance over time, because this measure incorporated reading and was more sensitive to the students overall learning; where as the administrator-read test removed reading as a factor, and produced less valid results. In conclusion, this study supports the use of student-read vocabulary assessments as a tool for indicating student progress and understanding in the content area.

One point that can be taken from this study is that knowledge of content area vocabulary is highly linked to comprehension and understanding in the content area.
This study shows how students who were proficient in the social studies vocabulary had higher levels of comprehension in the content area. Most importantly what I take away from this study is the importance of setting up valid assessments. Often students are assessed with a pre and post-test only, or are tested at one single point in time. With this type of assessment teachers are unable to measure growth. When the researches set up two assessments for progress monitoring and growth measurement they found that only the student-read model was a valid measurement. Perhaps because the student-read assessment also assesses the student’s reading ability which is also strongly tied to comprehension.

In summary, the researchers conclude that vocabulary knowledge is a valid predictor of subject comprehension. They also showed that an assessment that was read by the student was a more valid indicator of the student’s knowledge. In the next study by Cohen & Johnson (2010) the authors explore the use of images as a way to improve vocabulary knowledge.

The purpose of the study *Improving the Acquisition of Novel Vocabulary Through the Use of Imagery Interventions* (2010) was to investigate the impact of imagery interventions on the vocabulary acquisition abilities of second grade students. The researcher’s hypothesis is that when students are instructed with imagery interventions (they are presented with the vocabulary word and the accompanying image) they would exhibit better mastery of the vocabulary than when presented with only the word.

The sample consisted of fifteen second grade students from a private elementary school in New York. The consisted of six females with the mean age of 7.8 and nine males with the mean age of 7.5. The class was 100% Caucasian.
Students were given a vocabulary pre-test of thirty words dealing with habitats, musical instruments, animals, and science terms. For the pre-test students were given the word and instructed to write the definition. The researchers selected the words that were unfamiliar to the students to use in their intervention. Students also took the *Peabody Picture Vocabulary Test-III, Form B* (PPVT-III Dunn and Dunn 1997) to measure student’s vocabulary background knowledge. The intervention consisted of three methods. The students were split into three groups, each group receiving instruction in a different method. The first method was a Word Only Presentation, the method is as follows: 1) A researcher shows the student a flash card with the word written on it. 2) The researcher pronounced the word. 3) The researcher told the student a sentence containing the word. 4) The researcher gave the definition of the word. 5) The researcher repeated the word again. The second method was a Dual Coding Presentation, the method is as follows: the researcher carried out Steps One through Four, but for Step Five the researcher showed the student an image of the vocabulary word. The third method used was an Image Creation Presentation. The method is as follows: the researcher carried out Step One through Step Four, for Step Five the researcher asked the student to create a mental image of the word and draw the word on a sheet of paper. The next day students were assessed on the words they learned the previous day. The tests consisted of simple stories with blanks for the students to fill in with the vocabulary words they had learned.

The researchers conducted an ANOVA to examine if there were differences between the three intervention groups. They found there was no statistically significant difference between the three intervention groups. The mean of the Dual Coding
Presentation was 4.00 words correct, where as the Image Creation group’s mean was 3.58, and the Word Only group’s mean was 3.50. The differences in means were not significant, thus the researchers accept the null hypothesis: When students are instructed with imagery interventions they will not exhibit better mastery of the vocabulary than when presented with only the word.

When examining this study what immediately comes to mind is that the interventions were not in place long enough to achieve results. The students only encountered the word lists once. When looking at the means, the Word Only group scored the poorest. This could be due to the fact that the students are only processing the word in one way, verbally. Most interesting is that the Image Creation Group’s mean was lower than the Dual Code group. One reason for the lower scores of the Image Creation group could be that they were asked to create an image of a word they do not know, perhaps they created an image that did not represent the word, and this false knowledge became connected with the vocabulary word. Conceivably it stands to reason the Dual Code group scored the highest because they were given correct information to learn when being presented with the vocabulary word for the first time. One possible take away from this study is that when students are learning a vocabulary word for the first time they should be given the correct information in a variety of modalities. Once the students have been presented with the information, then they should be asked to create their own framework.

In summary, the researchers employed three vocabulary interventions: word only, dual coding, and image creation. None of the interventions achieved a significant improvement in student achievement. In the next study by McAdams (2012) the author
explores the effect of direct vocabulary instruction in the content areas and its link to student achievement.

The author of the study, *The Effects of Direct Instruction with Math and Science Content Area Vocabulary on Student Achievement* (2012) states that the lack of vocabulary knowledge causes many challenges to students as they attempt to complete tasks in their content area text books. According to McAdams (2012), “vocabulary development is one of the most important areas within comprehension” (p. 18). She sites research by Chall & Snow (1998) which showed students that struggle with vocabulary as early as fourth grade are at a greater risk of experiencing serious academic issues in secondary school. The purpose of this study was to explore the effect of direct instruction in math and science vocabulary on student achievement. Specifically the researcher questions, will students who are identified as at-risk students from economically disadvantaged backgrounds who receive direct instruction in math and science vocabulary perform better on the fifth grade math and science state standardized assessment?

The sample consists of 114 fifth grade students enrolled in math and science classes. The students ethnic background consisted of 39% African American, 19% Hispanic, 33% Caucasian, 1% Native American, and 8% Asian/Pacific Islander. Twenty-six percent of students qualified for free or reduced lunch and 33% of students were considered at risk.

The students were previously split into two classes before the study. One class became the experimental group, group one and the other class became the control group, group two. The same educational program was taught to both groups; however group
one received direct instruction of content-specific vocabulary during their math and science classes. The intervention took place over the course of one academic year. The intervention consisted of using the Vocabulary Builder graphic organizer (Eeds & Cockrum, 1985). To complete the graphic organizer students were asked to write the word three times, write the dictionary definition of the word, rewrite the definition in your own words, draw a picture of the word, list the synonyms and antonyms, and give an example and non-example of the word. During the course of the year as content-specific vocabulary words arose students completed the Vocabulary Builder graphic organizer on index cards. Students were asked to group the cards according to the unit of study. Students were able to complete the Vocabulary Builders independently but were encourages to work together and engage in peer conversations. Students were encouraged to review the cards when preparing for tests or when new information connected to the previously taught material.

The experimental group did not perform significantly better on the math standardized state test than the control group. The experimental group did perform significantly better on the science standardized state test over the control group.

A question that arises from the study is did the measures the researcher used adequately measure the intervention? According to the study, the students did not show significant improvement on the state math assessment. It would be helpful to know if the assessment was word problem intensive. If the test was the vocabulary learning would have obvious benefits. However if the test consisted of more calculations the effects of the interventions would not be evident. When looking at the significant improvement in science assessment, the benefit of repeated exposure to content-specific vocabulary is
evident. When students used the Vocabulary Builder, they built a deeper understanding of the term because they had to understand the definitional information, contextual information, and a pictorial representation for each term. Based on the results from this study, students benefit from direct vocabulary instruction in science.

In summary the author found that the intervention of using the Vocabulary Builder graphic organizer showed a significant increase in student achievement on science standardized tests. In the next study, Bos, Anders, Filip, and Jaffe (1989) create an intervention concentrating on content-area vocabulary instruction to facilitate improved reading comprehension.

The authors of the study *The Effects of an Interactive Instructional Strategy for Enhancing Reading Comprehension and Content Area Learning for Students with Learning Disabilities* (1989), concentrate their efforts on interventions that will assist students with learning disabilities achieve higher levels of comprehension. The authors make a case for the importance of implicitly teaching students with learning disabilities effective comprehension strategies. According to Bernice Wong (1979), “elementary-age students with learning disabilities did no spontaneously employ effective comprehension strategies. However, when the students with learning disabilities were prompted to use effective processing strategies, significant differences between groups (students with and without learning disabilities) was no longer evident” (p.27). The authors of the study concentrate on content-area vocabulary instruction to facilitate improved reading comprehension. The researchers employed two vocabulary interventions; a semantic feature analysis and a dictionary method. The purpose of the
study was to see if either or both of these methods would increase student reading comprehension.

The semantic feature analysis intervention involved the student and teacher-researcher discussing and completing a relationship chart on the vocabulary word from the content area, before the student read the content text containing the vocabulary word. The purpose of the relationship chart was to activate student’s prior knowledge of the word and predict relationships between new and old knowledge. The relationship chart consisted of every vocabulary term the student will encounter along with five to six important ideas that relate to the words. For example, if the vocabulary list relates to the Fourth Amendment the ideas would be: citizen’s right to privacy, society needs to keep law and order, etc. Students are asked to make a prediction and decide which important ideas relate to each vocabulary word. Students were also asked to generate a definition, and depending on their understanding, would be aided by the teacher-researcher. Once the chart was completed the student and teacher-researcher read the passage, and then revisited the chart and made corrections if needed.

The dictionary method intervention provided students the opportunities to make connections between the word and the definition. The intervention consists of the following steps: The teacher-researcher introduced and lead a discussion on the reading passage topic, the teacher-researcher wrote the vocabulary list on the board and asked the students to repeat the words. Students were then asked to use the dictionary to write a definition and sentence related to for each word. Lastly the students were asked to read the text and stop when they encounter a word to clarify its meaning.
The sample consists of 50 students with learning disabilities attending a large urban middle-class high school. The students were reading three to seven years below grade level.

Twenty-five students were assigned to the semantic feature analysis group, and 25 students were assigned to the dictionary method group. Students were given the Passage Comprehension subtest of the Woodcock Reading Mastery Tests (Woodcock 1973). Students in both groups showed no significant difference in performance on the test. The students in both groups were also given a prior-knowledge assessment about the topic they would be learning about over the course of the intervention; Fourth Amendment Rights and a comprehension test on the same topic. Students then worked in their intervention groups for 15 periods for 30 minutes a day. At the end of the interventions students were given the same comprehension test again.

Students instructed in the semantic feature analysis intervention significantly out preformed students in the dictionary method group on the comprehension exam. The researchers propose that the semantic feature analysis group scored significantly higher because of the in depth processing needed by the students completing the relationship charts.

This study supports the use of relationship charts. The use of this tool allows students to make connections between old and new information. Students also had to generate their own definitions for the word. However the students in the dictionary group were asked to use a dictionary to find definitions, thus the information was never truly processed by the students. Anecdotal reports included in the research indicated that to complete the relationship charts students had to put forth much more mental effort than
the students completing the dictionary definitions. The students in the semantic feature analysis group had to struggle to make meaning of the words, put them into their own mental framework, and make connections to larger concepts. This work was evident in the higher test scores. A key take away from this study is the more connections students make when learning the word, the more likely they will be to remember the word and have improved comprehension.

In summary, the study indicates that the use of semantic feature analysis intervention significantly improved the reading comprehension of students with learning disabilities. In the next study Lovelace and Stewart (2009) explore a systematic vocabulary instructional technique and its effect on vocabulary acquisition.

The purpose of the study Effects of Robust Vocabulary Instruction and Multicultural Text in the Development of Word Knowledge among African American Children (2009) was to study the effect of a systematic vocabulary instructional technique that was taught to African American second grade children who had below average vocabulary skills. The study also examines the effect of book type and retention of target vocabulary words.

The authors state that early word learning is tied to frequency of exposure, and that children growing up with a varying input of words and frequency will develop vocabularies that differ. Students from socially, culturally, and linguistically diverse backgrounds will often struggle in classrooms that largely operate with a different vocabulary that is outside their experience. Also students from low socioeconomic backgrounds may not have the primary experiences needed to build background knowledge for vocabulary development. The authors' conclude that these factors
contribute to a disadvantage that compounds in the later grades, and requires early interventions to remediate the differences. The study looks at the use of Robust Vocabulary Instruction as an intervention to remediate the early deficits students showed. The researchers believe that the use of Robust Vocabulary Instruction will have a positive effect on student’s vocabulary acquisition. The study also examines the effect of book type. The study uses story books because of the frequency of Tier 2 vocabulary words in this form. The authors’ believe that story books which depict images and experiences similar to the student’s cultural background will be most effective in vocabulary acquisition.

Robust Vocabulary Instruction has been found to be effective for learning word meanings and also improving reading comprehension. In this model students learn how a target word is similar to and different from associated concepts. Students also learn how the word is used in a variety of situations. With this model students have repeated opportunities to encounter the word. To foster a deep level of understanding the model uses a variety of methods such as word networks, word associations, sentence completions, and games that stress the connection between that target word and previously acquired vocabulary.

The participants in the study were African American children in second grade that had vocabulary skills that were one standard deviation below the norm. The students were given the three pre-tests. The Motor-Free Visual Perceptual Test, Third Edition (Colarusso & Hammil, 2003) was given to assess the participant’s visual perceptual ability. The Test of Nonverbal Intelligence, Third Edition (Brown, Sherbenou, & Johnsen, 1997) was given to determine the students’ general intellectual functioning.
Lastly the Expressive One-Word Picture Vocabulary Test, Third Edition (Brownell, 2000) was given to assess student’s expressive vocabulary. Throughout the study students were given a series of probes. The probes were the measure used to determine growth during the study and ultimately the effectiveness of the intervention. The probes consisted of six instructional words, six commonly known words, and six control words. For each of the words the researcher would ask “tell me what you can about what the word ______ means.” For the study student’s participated in small group sessions for 30 minutes twice a week. The sessions lasted for four weeks. Each intervention session a single book was read and a Robust Vocabulary lesson was taught for the book’s word set. Each session the books alternated between books that depict images and experiences similar to the student’s cultural background and books that did not. After the reading students received targeted vocabulary instruction. The book reading sessions started with by asking students a variety of questions to activate prior knowledge. Students were invited to engage with the book in a variety of ways during reading time, such as making predictions, interpreting illustrations, and answering comprehension questions. First the vocabulary word was contextualized; students were asked to locate the vocabulary word in the story and read sentence where it occurred. Students were given a child friendly definition and asked to create a phonological representation of the word. The instructor would also provide examples of the word in a different context. Students then participated in one of the following activities: word networks, word associations, sentence completions, and games that stress the connection between that target word and previously acquired vocabulary.
The results of the study confirm the researcher’s hypothesis in regards to Robust Vocabulary instruction. At the pre-test the group’s word knowledge of instructional words tested at the low level. By Probe Two the group began showing improvement, and continued to show improvement throughout the series of probes. A positive change in level for instructional words was seen for all participants by Probe Four. All participants showed a marginal increase in word knowledge of one or more control words. The data suggests that students showed Stage 2 knowledge of words, whereas at the onset they have no recognition of the control words. The results of the study disprove the researcher’s hypothesis that story books which depict images and experiences similar to the student’s cultural background will be most effective in vocabulary acquisition. There was no significant difference in vocabulary acquisition between the sets of books.

There are many implications that can be gleaned from this study. The author’s site research by Carr (1985) that says explicit vocabulary instruction with diverse exposure to target words is needed for adequate learning to occur and that word learning may be accelerated by more concentrated exposure to target words. In other words, for vocabulary to be learned students need repeated exposure to the word and in a variety of formats. This study provided students with those opportunities. Thus one take away from the study is that a vocabulary word must be introduced repeatedly over a series of days and students need to interact with the word in a variety of ways. When looking at the results of the study it can be seen that students showed greater improvement after Probe Three, perhaps because at this point students were beginning to receive repeated exposures to the words. Another aspect of the intervention that is notable is that along with vocabulary skills the instructors were teaching reading comprehension skills. It may
be that when students have a strong understanding of the text they will be more able to use context clues to understand the meaning of vocabulary words. Thus stronger comprehension leads to better vocabulary acquisition. Lastly it is interesting that book style in regards to cultural background did not affect student’s vocabulary acquisition. Perhaps instructors provided adequate enough background knowledge to compensate for the fact that students may have differing levels of background knowledge for the given books. In closing the article did not truly how Robust Vocabulary Instruction is different from other vocabulary strategies. However what is clear is that Robust Vocabulary Instruction provides multiple and varied opportunities for students to interact with the target words, and that is the vital aspect of vocabulary instruction.

The study by Lovelace and Stewart (2009) shows how a student’s instructional level informs the effectiveness of the intervention. In the following study, Nelson and Stage (2007) study the effectiveness of teaching multiple meanings of words in context.

The purpose of the study *Fostering the Development of Vocabulary Knowledge and Reading Comprehension Through Contextually- Based Multiple Meaning Vocabulary Instruction* (2007) was to assess the effects of contextually- based multiple meaning vocabulary instruction on the vocabulary knowledge and reading comprehension of students (Nelson & Stage 2007). The researcher’s hypothesis was that the intervention would have a positive effect on student’s vocabulary knowledge and reading comprehension.

The study had 283 participants, with 134 third graders, and 149 fifth graders. Sixteen classes participated in the study; the classes were from various schools with in a small Midwestern public school system. Eight of the participating classrooms became
the control group (four third grade classrooms and four fifth grade classrooms) and the other eight classrooms became the experimental group (four third grade classrooms and four fifth grade classrooms). All students in the study were given the Gates- MacGinitie Reading Test (4th edition) as a pre-and post test. The results of the pre and post-test would be used to gauge the effectiveness of the intervention. The intervention took place over a four month time span.

Two types of words were selected as the target words of this intervention. Level 1 words, which consist of words with two meanings, and Level 2 words which are words with three or four meanings. Students in both the control and experimental group would encounter these words within the curriculum during the course of the study. Students in the control group would follow the district’s prescribed language arts curriculum. Students in the experimental group would use the same curriculum but also receive contextually-based multiple meaning vocabulary instruction on the 36 target vocabulary words. The instructors in the experimental group were trained on how to deliver the contextually-based multiple meaning vocabulary instruction. Each target word and its set of related words were taught over two days for 20-30 minutes. On the first day the meaning and related words of each target word was introduced in order to activate student’s prior knowledge, this activity was called “meanings of related words.” For example if the word was accident, the students would be introduced to the definition and related words.

On the second day students learned the word history of the target word, such as its Latin meaning, and prefix and suffixes if applicable. Students created a word meaning map, where students matched the related words that appeared in the “meaning of related
words” activity and the target word. Students completed a definition activity and an “understanding check” activity where they read short passages to see if the target word was used in an expected or unexpected day. Lastly students wrote short stories or scenarios with the target words. The 36 target words all received this two day lesson plan.

The results of the study showed that students with lower skills especially benefited from the intervention. The third and fifth grade students who tested low on the pre-test who received the intervention showed significantly gains in their vocabulary knowledge. Whereas the third and fourth grade students who tested into the higher group on the pre-test did not show significant gains from the intervention.

The results of the study affirm previous research which shows that various ability levels affect the effect of vocabulary instructions. It is not clear exactly why the lower performing students benefited more from the interventions. However one could speculate that because the students entered with very limited vocabulary and comprehension skills any additional instruction would have a positive effect. The program that the researchers implemented seemed well organized and allowed students to experience the words in a variety of ways. Due to the results of the study I would conclude that this style of intervention would be best suited for younger grades.

This section presented many variations of vocabulary interventions, some successful and some not. Feng and Horn’s (2012) five reading strategies to improve content area vocabulary understanding were not successful. Perhaps due to the short duration of the program and the amount of strategies taught. Espin, Shin, & Busch (2005) conclude that vocabulary knowledge is a valid predictor of subject
comprehension. They also showed that an assessment that was read by the student was a
more valid indicator of the student’s knowledge of the content. Cohen & Johnson (2010)
imagery interventions did not significantly improve student’s achievement. McAdams
(2012) explores the effect of direct vocabulary instruction in the content areas and its link
to student achievement. McAdams found that using the Vocabulary Builder graphic
organizer showed a significant increase in student achievement on science standardized
tests. Lastly Bos, Anders, Filip, and Jaffe (1989), create an intervention concentrating on
content-area vocabulary instruction to facilitate improved reading comprehension. The
authors make a case for the importance of implicitly teaching students with learning
disabilities effective comprehension strategies. Their research shows that the use of a
semantic feature analysis intervention significantly improved the reading comprehension
of students with learning disabilities. Lovelace and Stewart (2009) explain how a
vocabulary word must be introduced repeatedly over a series of days and students need to
interact with the word in a variety of ways for the instruction to be effective. Nelson &
Stage (2007) show how creating multiple meaning maps can be an effective intervention
for students, especially students with below average vocabulary knowledge. Throughout
the eight studies and various interventions a few themes became apparent. Students need
to encounter vocabulary words multiple times in a variety of ways. The most successful
vocabulary interventions were focused and taught the student fewer strategies (rather than
a multitude of strategies) for the student to employ. Lastly many of the studies stressed
the importance of using a graphic organizer as a tool for students to create a schema in
order to comprehend the vocabulary word.
Section Three: Vocabulary Acquisition

In this section the following studies will explore the effects of a specific vocabulary intervention, the use of the Frayer Model graphic organizer. The Frayer Model graphic organizer may help students develop a deeper understanding of concepts because the organizer builds a strong relationship between the word and its meaning. When students use the model they have to analyze the word by using its definition and characteristics. The word becomes further synthesized as students find examples and non-examples of the word. The following studies will explore the effectiveness of the Frayer Model. First Monroe and Pendergrass (1997) will explore the effects of the Frayer Model on the acquisition of math content vocabulary words. Then, Enge (2005) will explore the effects of the Frayer Model with second grade students in a Language Arts program.

The purpose of the study, *Effects of Mathematical Vocabulary Instruction on Fourth Grade Students* (1997) compares the effects of two models of vocabulary instruction. One model is a definition only model and the other is a combination of the Frayer Model graphic organizer and the Concept of Definition graphic organizer. The author’s hypothesize that the use of the Frayer Model and Concept of Definition graphic organizer will have a positive aspect student’s understanding of mathematical concepts.

The Frayer Model graphic organizer consists of the term, definition, characteristics, examples, and non examples. The Concept of Definition graphic organizer consists of the term, category, properties, examples, and a comparison term. The graphic organizer the researcher used combined the properties of these graphic organizers, but ultimately modeled the Frayer Model more closely. All aspects of the
Frayer Model were included; the aspects from the Concept of Definition graphic organizer that were included were category and properties. The researchers combined these models to ensure both visual and discussion components were included. The other model that was used was a definition-only model, where students obtain the definition of a word from a dictionary or the teacher, write the definition, and memorize it.

The sample consisted of two classes of fourth grade students, with 59 students total. The student population was primarily middle class and Caucasian. The students were randomly assigned to one of two groups. One group used the definition-only model, and the other group used the CD-Frayer model. The length of the study was 10 days. Both groups were taught an identical lesson on measurement; neither group had any previous experience on measurement. After the lesson the CD-Frayer model group students were guided in using the CD-Frayer model graphic organizer. Sometimes the class participated in whole group discussions of the words, while other times students worked in small groups with the researcher. At the end of the session the students discussed and shared their completed graphic organizers. The vocabulary lesson was 10-15 minutes long. The definition-only group was instructed to copy the vocabulary word and its definition into a vocabulary journal. The definition was mostly teacher generated. The vocabulary lesson lasted for 5-10 minutes. During the study both groups were required to write in a journal about the mathematical concepts that had been taught during the vocabulary lesson. The writing prompts consisted of simple questions in which students needed to describe what they knew about the specific concept. An example of a prompt would be “what are liters and milliliters?” Previously students would have learned both these terms in a vocabulary lesson. The journals were used as the
assessment tool for the study. The entries were scored according to a rubric. The rubric included: number of measurement concepts mentioned, number of concepts with measurement content, number of accurate concepts, number of measurement applications, and number of additional concepts mentioned but not taught explicitly during instruction (Monroe, Pendergrass 1997).

When the journals for the two groups were scored the CD-Frayer group scored significantly better in the area of “number of concepts with measurement content.” For this area of the rubric the CD-Frayer group’s mean was 12.857, the definition-only group’s mean was 8.44. The other variable that showed a significant difference was “number of measurement concepts mentioned” with the CD-Frayer group receiving a mean score of 12.893 and the definition-only group receiving a mean of 8.481. On all other areas of the rubric there was no significant difference in scores between the two groups.

The results of the study support the use of the CD-Frayer model. The CD-Frayer model group’s high scores in the “number of concepts with measurement content” show that the vocabulary instruction they received was effective in increasing student’s use of mathematical vocabulary. When students use the mathematical vocabulary correctly it can be assumed that their conceptual understanding of the content matter is correct as well. In math and in other content areas the language is specific and complex. For students to understand the concepts they must understand the mathematical language or mathematical vocabulary. The CD-Frayer model allowed students to create a schema, and integrate new information with existing information. Thus the model taught students a way to analyze and acquire new concepts. The definition-only group did not create a
schema. They were given a definition by a teacher and this definition was never integrated into the student’s prior knowledge, the students did not have to think about word relationships, nor was it translated into language that was approachable. The CD-Frayer model was shown to be a good tool to use because it made the words relevant to the students, and the students who used the CD-Frayer model applied the vocabulary words.

The purpose of the study, *The Impact of the Frayer Model on Vocabulary* (2005) was to determine if the Frayer Model would increase student’s vocabulary acquisition. The researcher’s specific question was “What impact does the Frayer Model have on the acquisition of Open Court vocabulary?” (Enge 2005). Enge’s hypothesis was “By using the Frayer Model, on Open Court Vocabulary Assessments, it is predicted that students will have a higher percentage of correct answer in 2004 than it 2003. There will be an increase of 20% (Enge 2005).

The participants in the study were 25 second graders. The students continued with the district assigned Language Arts curriculum, Open Court, and all variables remained the same except for the use of the Frayer Model. The Frayer Model was used to teach the Open Court vocabulary words. The Frayer Model is a vocabulary graphic organizer that has four components: definition, characteristics, examples, and non-examples. Students were introduced to new Open Court vocabulary words weekly using the Frayer Model. The instructor introduced the word when the word appeared in context. The teacher then generated a definition with the class, instructing the class to use context clues to determine the meaning of the word. Students then completed a Frayer Model graphic organizer for each word. The students were given the Open Court
Vocabulary Assessment and were assessed weekly. The results of this assessment were used to gauge the effectiveness of the intervention. The study is broken into four 6 week sessions, with each session focusing on a different set of vocabulary words.

The results of the study prove the researcher’s hypothesis. The student’s mean scores show continual growth on the Open Court Assessments. In the first six week session the assessment average was 80%, by the fourth six week session the assessment average was 90%. Fifty-six percent of the students increased more than 50% from the pretest to the post test and only 22% had less than 20% growth from the pretest to the post test. It is noted that several students in this category scored higher on the pretest therefore did not show significant gains. The study shows that the use of the Frayer Model had positive effects on the second grade students.

This study shows the potential positive impact the Frayer Model can have on student learning. In this study and in previous research it has been shown that a student will develop a stronger understanding of a vocabulary word when a relationship between the word and its meaning are developed. There are many ways to develop these relationships. The Frayer model is a tool that will help students develop the connections between prior knowledge and the new information.

In conclusion both studies show that the Frayer Model had positive effects on student’s vocabulary acquisition. In the study conducted by Monroe and Pendergrass (1997), they show that the use of the tool increased student’s correct usage of math vocabulary words. In Enge’s (2005) study, 56% of second grade students increased their scores on the vocabulary assessments. The results of these two studies and the strong
basis for use of graphic organizers from previous research has lead me to believe that the Frayer Model is an effective tool for teaching vocabulary.
CHAPTER THREE: PROCEDURES FOR THE STUDY

Knowledge of content area vocabulary is highly linked to comprehension and understanding in the content area (Hempill and Tivnan, 2008). Based on the importance of content area vocabulary and its link to comprehension, the purpose of this study was twofold: 1) to determine if the use of specific vocabulary interventions increase comprehension in the science content area, and 2) if use of the Frayer Model is a more effective intervention for increasing comprehension than just learning the vocabulary words in context using context clues. During this comparison study, half of the study used the Frayer model, while the other half used Learning vocabulary in context reading strategy. The hypothesis is that both groups will make gains, but the Frayer Model will be the more effective intervention for increasing comprehension.

This chapter contains the information necessary to understand the case study intervention. The chapter begins with background information about the subject of the case study, Ericka. Then, an explanation of the procedures of the intervention is given and the assessment tools are described. Finally, this chapter will describe the data collection in this study.

Sample

The participant in this study, Ericka, was a twelve year old African American student who will be entering the seventh grade in September 2012. She attended a small urban charter school in Southeast Wisconsin. Ericka attended a different school from kindergarten to fifth grade. Ericka began receiving special education services in March of 2012, when she was evaluated and was diagnosed with Other Health Impairment by the school Diagnostic Teacher.
Ericka’s struggles in reading and is approximately one grade level below her academic peers. Her special education program is centered on reading; she is pulled out of the classroom for thirty minutes each day to work with the special education teacher. During the sessions Ericka works on reading fluency, decoding, and comprehension skills. Her special education teacher reports that she struggles with uncommon vocabulary words and will often substitute similar sounding known words in place of the vocabulary word. Her special education teacher reports that her reading comprehension skills are weaker than her fluency and decoding skills. She struggles with retelling details from passages as well as making connections to events outside of the text. Ericka’s mother reports that when she is doing homework with Ericka she will often “space out” and “will not be paying attention at all, and will need things repeated many times.”

The special education teacher reports that reading comprehension becomes a significant problem when reading nonfiction content related texts, especially in science and social studies. Ericka’s Individual Education Program (IEP) Goals for the year are “When given reading materials at Ericka’s independent level, Ericka will correctly answer 80% of literal comprehension questions” and “Given definitions of words taught in content areas, Ericka will correctly supply the word being defined in 80% of the definitions.” In order for the case study to be beneficial for Ericka, the case study was crafted around these two goals. The interventions focus on increasing comprehension of science texts by increasing vocabulary acquisition and understanding.
Procedures

The case study uses two types of interventions; Learning vocabulary words in context and use of the Frayer Model. Learning vocabulary words in context is a reading strategy in which the student stops reading when a vocabulary word is encountered, the student looks for the definition of the word within the text and underlines it. The Frayer Model consists of completing a graphic organizer for each word and once a graphic organizer is completed for all the unit vocabulary words, the unit vocabulary words are synthesized in a concept map.

During the first session Ericka was given a survey to learn about her interests, and as an opportunity to build rapport and have a conversation. I explained the purpose and benefit of the intervention; which was to address Ericka’s IEP goals and improve her comprehension of content specific texts by focusing on content area vocabulary. Ericka was asked to read a small passage of the instructional text that would be used in the case study. The purpose of this was to verify that the text was at her instructional level (instructional level was ascertained from the Individual Education Plan). The text was proven to be at her instructional level.

The intervention was broken into four units: A, B, C, and D. Each unit covered a different science topic. Unit A was “Inside Living Things,” Unit B was “Food Chains,” Unit C was “The Solar System,” and Unit D was “Food and Nutrition.” The units were divided, half the units used the Learning vocabulary words in context and the other half used the Frayer Model.
Learning Vocabulary Words in Context

The intervention for Units A and C was Learning vocabulary words in context. These two units used the following format. For the first session of the unit Ericka was given a pre-test which was a unit comprehension test. The comprehension tests covered all the material in the chapter. The tests consisted of four types of questions: inferential, vocabulary, literal/recall, and data analysis. After the pre-test was given, each of the following instructional sessions for Units A and C consisted of five steps: 1) Ericka was shown the vocabulary words that would be encountered in the reading that day; there were usually three-five words; 2) To activate prior knowledge Ericka was asked if she had ever heard of, or knew anything about the word; 3) Before reading she was instructed to stop when a vocabulary word was encountered and circle the word, then look for the definition within the text and underline it; 4) During reading she was encouraged to explain the meaning of the word by using the text definition and context clues; 5) At the end of the session the words of the day were reviewed by a definition matching activity. When the text was completed Ericka was given the same unit comprehension test as a post-test.

Learning vocabulary words in context was chosen as an intervention because of research by Alfassi (2004) which shows that comprehension strategies are more successful when they are embedded in the curriculum and taught as part of an actual academic task. The study shows students are more likely to use reading strategies when they are incorporated in the curriculum. Learning vocabulary words in context is an intervention that is used as part of an authentic academic task.
Frayer Model

The Frayer Model was chosen because it helps students create a schema by integrating new information with existing information (Monroe and Pendergrass, 1997). Also research by Enge (2005) concluded that the Frayer Model graphic organizer helped students develop stronger understanding of vocabulary words because the model builds relationships between the word and various meanings. The graphic organizer consisted of four components; defining the term, characteristics of the term, examples, and non-examples. The use of the Frayer Model is also supported by the research of McAdams (2012) that shows the positive effects of graphic organizers that build make connections between old and new information. When using the Frayer model a student has to generate their own definitions for the word, struggle to make meaning of the words, put them into their own mental framework, and make connections to larger concepts.

The intervention for Units B and D was use of the Frayer Model along with Learning vocabulary words in context. Units B and D consisted of the following format. For the first instructional session of the unit Ericka was given a pre-test, which was a unit comprehension test. For the following sessions steps one-five from Learning vocabulary words in context were completed. After reading, Ericka completed a Frayer Model graphic organizer. When completing the graphic organizer, Ericka was instructed to go back to the text to find the word and reread the section. She was also provided with internet access and could search for more information about the term in order to complete the graphic organizer. After all the unit vocabulary was covered and Frayer Model graphic organizers were completed for each term, a concept map was created with all the
vocabulary words in the unit. When making the concept map Ericka was shown all the vocabulary words on cards and asked if they could be grouped in any way. Ericka grouped the words in various ways, and she was asked to explain her choices. Then she was asked to make as many connections as she could between the words and explain how various words relate. Making connections between key words is an important aspect of vocabulary instruction and is supported by the research of Lovelace and Stewart (2009) who conclude that students need to be provided with multiple and varied opportunities to interact with target words and build connections between words. When making the concept map Ericka was instructed to revisit the Frayer Model graphic organizers and pull out any pertinent information. After the concept map was completed Ericka took a post-test (the same unit comprehension test used for the pre-test.)

**Data Collection**

The purpose of this study was to determine if the use of specific vocabulary interventions increase comprehension in the science content area. The study compares the effects of two vocabulary interventions; Learning vocabulary words in context and the Frayer model. The hypothesis is that the Frayer Model graphic organizer and concept mapping will be the more effective intervention for increasing comprehension. Data was collected throughout the study to show the effects of the two interventions.

During each session, notes were taken about the session’s instructional plan and observations from the lesson were recorded. These notes are available in Appendices A. During the course of the study each completed graphic organizer was kept in a file folder and reviewed to determine how many details Ericka was able to fill in.
The main source of data collection for this study was the unit comprehension pre and post-tests. The tests consisted of four types of questions: inferential, vocabulary, literal/recall, and data analysis. Each unit began and ended with the unit comprehension test. During the course of the study, Ericka was given the Inside Living Things Unit Comprehension Test (pre and post-tested), Food Chains Unit Comprehension Test (pre and post-tested), The Solar System Unit Comprehension Test (pre and post-tested), and Food and Nutrition Unit Comprehension Test (pre and post-tested.) This data will be used to compare the effectiveness of the two interventions.

**Conclusion**

Ericka, a student entering seventh grade who receives special education services for reading delays, was chosen to participate in a case study to determine if the use of vocabulary interventions would increase comprehension in the science content area. The case study was created to address her IEP goals. Ericka was given science unit comprehension pre and post-tests and then participated in two types of interventions, Learning vocabulary words in context and the Frayer model. In the next chapter I will discuss the results of the two intervention types.
CHAPTER FOUR: RESULTS

The purpose of this study was twofold: 1) to determine if the use of specific vocabulary interventions increase comprehension in the science content area, and 2) if use of the Frayer Model is a more effective intervention for increasing comprehension than just learning the vocabulary words in context using context clues. The previous chapter presented the procedures for the case study intervention. This chapter will present the data gathered to measure the effectiveness of the intervention. The chapter will begin by discussing the pre-test and post-test results of the Learning vocabulary words in context intervention. Next the chapter will discuss the pre-test and post-test results of the Frayer model intervention. Lastly the chapter will discuss information derived from the graphic organizers and field notes.

Effects of Vocabulary Interventions on Reading Comprehension

This section addresses the first purpose of the study: to determine if the use of specific vocabulary interventions increase comprehension in the science content area. Ericka was given four pre-tests before receiving instruction for each of the four Science units. The vocabulary interventions consisted of two models: Learning words in context and the Frayer Model. The Learning words in context intervention is a strategy in which the student is taught how to look for context clues to understand the meaning of a vocabulary word (the steps of the strategy are described fully in Chapter Three.) The Frayer Model intervention combined the Learning words in context strategy and the Frayer Model graphic organizer, as well as creating a concept map (the steps of the strategy are described in full in Chapter Three.) Following instruction on each unit a post-test was given. The pre and post-test results from both interventions (all units) was
combined to see if the vocabulary interventions had an effect on the student’s reading comprehension. The pre-test score was 46% and the post-test score was 76%. The post-test score improved by 30 points. A dependent T-Test was run to determine if the results were statistically significant. The difference between the mean is statistically significant at the $P < 0.001$ level and higher. The data can be seen in Figure 4.1.

**Figure 4.1- Comprehension Pre and Post-test Scores**

![Bar chart showing pre-test and post-test scores](image)

**Effectiveness of Learning Words in Context vs. Frayer Model**

This section addressed the second purpose of this study: To learn if the use of the Frayer Model is a more effective intervention for increasing comprehension than just learning the vocabulary words in context using context clues. Half of the case study utilized the Learning words in context intervention, two units were taught with this intervention. The other half of the case study utilized the Learning words in context intervention with the Frayer Model, two units were taught with this intervention. Pre and post-tests were derived for each unit. The Learning words in context intervention’s pre
and post-test results were combined, as well as the Frayer Model pre and post-test results. The results will be presented in this section.

**Results for Learning Vocabulary Words in Context Intervention.**

The Learning vocabulary words in context intervention was used for two science units; Unit A was “Inside Living Things,” and Unit C was “The Solar System.” A pre-test was given at the beginning of both units, and a post-test was given after completion of the unit, each test was 14 questions.

For the Unit A pre-test Ericka received a 29%. After the intervention Ericka took the Unit A post-test and received a 50%. Her score increased by 21 points from the pre-test to post-test. For the Unit C pre-test Ericka received 50%. After the intervention Ericka took the Unit C post-test and received a 79%. Her score increased by 29 points from the pre-test to post-test.

Figure 4.2 presents the results of the combined pre and post-test results for both units. The combined pre-test score was a 39%, the combined post test score was a 65%. There was an increase of 26 points from the pre-test to post-test. A dependent T-Test was run to determine if the results were statistically significant. The difference between the mean is statistically significant at the $P < 0.001$ level and higher.
Results for Frayer Model Intervention

The Frayer model intervention was used for two science units; Unit B was “Food Chains,” and Unit D was “Food and Nutrition.” A pre-test was given at the beginning of both units, and a post-test was given after completion of the unit. The pre and post-test consisted of a science comprehension test that covered all the material in the chapter, each test was 14 questions.

For the Unit B pre-test Ericka received a 50%. After the intervention Ericka took the Unit B post-test and received an 86%. Her score increased by 36 points from the pre-test to the post-test. The Unit B data can be seen in figure 4.3. For the Unit D pre-test Ericka received a 57%. After the intervention Ericka took the Unit D post-test and received a 93%. Her score increased by 36 points from the pre-test to the post-test.

Figure 4.3 presents the results of combined pre-test results for Unit B and Unit D, as well as post test results following instruction using the Frayer Model intervention. For the combined pre-test Ericka scored a 53% and for the combined post-test she received a
90%. There was a 37 point increase from pre to post-test. A dependent T-Test was run to determine if the results were statistically significant. The difference between the mean is statistically significant at the $P < 0.001$ level and higher.

**Comparison Data of Words in Context and Frayer Model**

The data from the Learning words in context intervention and the Frayer Model intervention were compared by averaging the pre-and-post tests from Units A and C (the Learning words in context units) with the pre-and-post-tests from Units B and D (Frayer Model.) For the Learning words in context intervention Ericka’s average score improved by 27 points. For the Frayer Model intervention Ericka’s average score improved by 37 points. The data can be seen in Figure 4.4. The post-test scores from the Frayer Model intervention were higher than the post-test scores from the Words in context intervention. A dependent T-Test was run to determine if the results were statistically significant. The difference between the mean is statistically significant at the $P < 0.001$ level and higher.
Conclusion

Post-test results indicate that both interventions showed a positive increase in scores. For the Learning words in context intervention Ericka’s average score improved by 27 points, which was statistically significant. For the Frayer Model intervention Ericka’s average score improved by 37 points, which was statistically significant. The Frayer Model appears to be the more effective intervention. Throughout the course of the case study Ericka improved in her ability to use context clues to determine the meaning of vocabulary words. Her ability to correctly and independently complete the graphic organizer improved as well. The next chapter will discuss conclusions that can be drawn from this study, as well as recommendations for Ericka’s continued improvement.
CHAPTER FIVE: CONCLUSIONS

The purpose of this study was twofold: 1) to determine if the use of specific vocabulary interventions increase comprehension in the science content area, and 2) if use of the Frayer Model is a more effective intervention for increasing comprehension than just learning the vocabulary words in context. Data was collected over a four week session. The data was from pre and post-tests as well as ongoing informal assessments. In the previous chapter the results of the study were given. The purpose of this chapter is to synthesize the information from previous chapters by: 1) connecting the case study to existing research, 2) connecting the case study to the Common Core Standards, 3) discussion of the results, 4) offering strengths and limitations of the study, and 5) giving recommendations for student learning and for further research on the topic.

Connections to Existing Research

This section will draw connections between the studies discussed in Chapter Two and the current study. These connections will highlight similarities and differences between the current study and previous research on vocabulary interventions. The current case study aimed to increase the student’s comprehension by using specific vocabulary instruction. The decision to implement an intervention that focused on vocabulary acquisition in order to increase comprehension was chosen after careful consideration of Ericka’s IEP goals and current research. Ericka’s IEP goals centered on comprehension in the content areas, thus an intervention that focused on comprehension in the content areas was chosen because it addressed her specific needs. The choice of focusing on vocabulary acquisition as a means of increasing comprehension in the content area was chosen due to the research that supported this method. The structure of
the intervention was also based on various research studies. This section will review research studies that support my chosen methodology.

**Connections between Vocabulary and Comprehension**

The main idea of the case study is that if a student understands the vocabulary their reading comprehension will improve. A focus on vocabulary acquisition as a means to improved comprehension has been supported by many research projects. Research conducted by Hemphill and Tivnan (2008), found that as a student progressed from second to third grade, the students vocabulary skills were the strongest predictor of reading comprehension. Students who had very weak vocabulary skill had significantly lower reading comprehension. Students with stronger vocabulary skills had significantly higher reading comprehension. The researchers found that early vocabulary interventions had lasting effects on student’s comprehension abilities. The findings of this study support an intervention that focuses on vocabulary acquisition as a means to improved comprehension. The results of the case study confirm Hemphill and Tivnan’s (2008) findings. As Ericka learned the unit vocabulary words her comprehension test scores improved. Her pre and post-scores reflect this growth, with an overall increase of 30 points.

Research by Espin, Shin, Busch (2005) aimed to find out if vocabulary-matching activities would prove to be a reliable indicator of student progress. In other words, would the student’s ability to correctly match a vocabulary word with its definition be an adequate indicator of the students overall subject matter comprehension? The researchers concluded that vocabulary knowledge was a valid indicator of subject comprehension. The case study integrated practices from Espin, Shin, Busch’s (2005) study. One of these
practices was to have Ericka match the vocabulary words and the definition at the end of each session as a quick assessment, as Espin, Shin, Busch’s (2005) study did. The exercise was useful as a review and this practice was one component of the vocabulary intervention that raised Ericka’s comprehension.

**Learning Vocabulary Words in Context**

Half the case study used the intervention titled, Learning vocabulary words in context. The intervention The Learning vocabulary words in context intervention was crafted partially on research by Alfassi’s (2004). The study showed the effectiveness of the reciprocal teaching method as a means to increase comprehension. The reciprocal teaching model teaches students to do four things: 1) generate questions, 2) summarize, 3) attempt to understand word meanings or confusing text, and 4) predict what might appear in the following paragraph. While the Learning words in context intervention focused more strictly on vocabulary, these skills were taught while Ericka read the text. The intervention relied heavily upon step 3) attempt to understand word meanings or confusing text. The Learning words in context intervention was embedded in the curriculum. Step three, attempt to understand word meanings or confusing text, was an area Ericka struggled with at the beginning of the intervention. She would often skip words she didn’t know, or would be unable to locate context clues or the textual definitions. Over the course of the intervention Ericka showed improvement in her ability to understand the meaning of unknown words. During the first week of the study she averaged four attempts per reading session, by the fourth week of the study she averaged seven attempts per session.
The intervention was not seen as a separate task, but rather the intervention was employed while reading the content text. Alfassi’s (2004) work also supports the idea that the teaching of comprehension strategies is more successful when they are embedded in the curriculum and taught as part of an actual academic task. He states that students will be more likely to use reading strategies if the strategies are incorporated in the curriculum and are consistently modeled by teachers. Alfassi’s (2004) findings were supported by this case study. Ericka’s usage of the reading strategy increased over the course of the intervention.

The Learning words in context strategy was chosen because of the importance of teaching students, especially special needs students, a reading strategy that is simple and easy for the student to employ. Work by Bernice Wong (1979) states that students with learning disabilities do not spontaneously employ effective comprehension strategies. However, when the students with learning disabilities were prompted to use effective processing strategies, significant differences between groups (students with and without learning disabilities) were no longer evident.

**Frayer Model**

Half the case study used the Frayer Model intervention. This intervention was crafted based on the research of many people working in the field of literacy. Research by Bos, Anders, Filip, and Jaffe (1989) supports the use of graphic organizers that are similar to the Frayer Model graphic organizer. They state the use of such graphic organizers allow students to make connections between old and new information. Their research shows that the more connections students make when learning the word, the more likely they will be to remember the word and have improved comprehension. This
was found to be true in the case study because the Frayer Model intervention was the more successful intervention. This intervention involved the student making connections to prior learning and previously learned words, through completing the graphic organizer.

Research by Monroe and Pendergrass (1997) showed that use of the Frayer Model graphic organizer had a positive aspect student’s understanding of mathematical concepts. When students learned the unit vocabulary words through the use of the Frayer Model graphic organizer there test scores improved on unit exams. The author’s stated that the Frayer model allowed students to create a schema, and integrate new information with existing information. Thus the model taught students a way to analyze and acquire new concepts. Over the course of the intervention Ericka’s completed graphic organizers were more complex and detailed. Thus showing she was becoming more proficient at integrating information.

Research by Enge (2005) determined that the Frayer Model increased student’s vocabulary acquisition. The author states that use of the Frayer Model aids in developing a stronger understanding of a vocabulary word because a relationship between the vocabulary word and its meaning are developed. The data collected in the case study confirmed Enge’s (2005) findings. In conclusion both studies show that the Frayer Model had positive effects on student’s vocabulary acquisition.

**Connection to Common Core Standards**

This case study is aligned with the Common Core Standards for Reading and English Language Arts. Specifically, the case study addresses the Reading Standard for Informational Text 6–12 : Key Ideas and Details, which requires students to determine two or more central ideas in a text and analyze their development over the course of the
text, and provide an objective summary of the text. The case study addresses this standard because Ericka was asked to identify which vocabulary word/words represented the main idea of the text and to defend her answer while reading the science content text.

The case study also addresses the Language Arts Standard 6-12: Vocabulary Acquisition and Use, since Ericka will, (a) determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 7 reading and content, (b) Use context as a clue to the meaning of a word or phrase, (c) Consult general and specialized reference materials to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech, and (d) Verify the preliminary meaning of a word or phrase by checking the inferred meaning in context or in a dictionary.

**Discussion of the Results**

One of the main ideas of this case study was that scientific knowledge is embedded in vocabulary. If a student’s scientific vocabulary improves, their scientific understanding will improve. Thus this case study looked to prove that vocabulary interventions would increase the student’s comprehension. This section will present the data that was collected in order to determine if the use of specific vocabulary interventions increase comprehension in the science content area. Next, the results of the two types of interventions implemented in the case study will be discussed. Lastly, this section will also present the data that was collected in order to determine if use of the Frayer Model is a more effective intervention for increasing comprehension than just learning the vocabulary words in context using context clues.

**Effects of Vocabulary Interventions on Reading Comprehension**

The study used two types of interventions to teach the unit vocabulary words.
The interventions were Learning words in context and the Frayer Model graphic organizer along with creating a unit concept map. This section looks to see if the vocabulary interventions improved Ericka’s comprehension of the science content. Over the course of the case study Ericka was administered four science comprehension pre and post-tests. The pre-test score was 46% and the post-test score was 76%. The post-test score improved by 30 points. A dependent T-Test was run to determine if the results were statistically significant. The vocabulary interventions had a significant positive effect on Ericka’s comprehension and understanding of the science content knowledge. These results confirm the previous research that showed a connection between increased vocabulary acquisition and increased comprehension in the content area. One would expect an increase from the pre-test to post-test because when a student takes a post-test they have been taught the material. Ericka’s significant improvement from pre-test to post-test leads one to believe that there were other reasons for the positive increase other than just being introduced to the material. The next part of this section explores the possible reasons for the increase.

One of the possible reasons why Ericka’s comprehension increased after the interventions was that at the beginning of the case study Ericka did not use any reading strategy for finding the meaning of unknown words. When reading the sample text at the beginning of the intervention she could not locate the definition of the vocabulary word when it was embedded in the text. Ericka also had difficulty locating the context clues in the text to determine the meaning of the vocabulary word or would often determine incorrect meanings. Through the teaching of the Learning words in context intervention, Ericka’s ability to use context clues to determine the meaning of a vocabulary word
improved throughout the intervention. By the second week of the intervention, Ericka was showing improvement in her ability to determine the correct meaning of vocabulary words through the use of context clues. She continued improving through the fourth week.

Another reason for Ericka’s improved comprehension was the completion of the Frayer Model graphic organizer. For Units B and D Ericka completed Frayer Model graphic organizers for each vocabulary word. Field notes found in appendices one document her ability to complete the graphic organizer. The early graphic organizers show that Ericka would often repeat the same information in different components of the organizer. For example, the same information would be given for the definition of the word and for the characteristics of the word. Over the course of the intervention Ericka’s ability to complete the graphic organizer improved. She was more able to work more independently when completing the graphic organizer. Also the graphic organizers completed during the third and fourth weeks are more thorough and accurate. Field notes also show that Erika more often referenced the content text when completing the graphic organizer in weeks three and four. See Appendix B for a completed graphic organizer from the second week and Appendix B for a completed Frayer Model graphic organizer from the fourth week.

In conclusion, at the beginning of the study Ericka did not employ any reading strategies to decipher the meaning of unknown words. Throughout the course of the study she began employing the Learning words in context strategy proficiently. Ericka also was able to complete the Frayer Model graphic organizer proficiently by the end of
the case study. Thus Ericka began acquiring knowledge of the vocabulary words. This knowledge lead to higher comprehension scores on the post test.

**Results for Learning Vocabulary Words in Context Intervention**

The pre and post-test scores for the two units using the Learning words in context intervention were averaged. The average pre-test score was a 39%, the average post test score was a 65%. There was an increase of 26 points from the pre-test to post-test. A dependent T-Test was run to determine if the results were statistically significant, the results were found to be significant. One of the possible reasons for this increase is that, as stated earlier, this intervention gave Ericka a reading strategy to employ, when previously Ericka did not appear to use and reading strategies. The Learning vocabulary words in context was a very straightforward and natural strategy. Thus, it was easy for Ericka to learn and use. While conducting the literature review I noticed that when strategies were overly complex, the students would not employ them independently. Therefore I felt it was important to use a simple and straightforward intervention. Also the intervention was taught while reading and was embedded in the academic task. This approach is supported by research by Alfassi’s (2004) who showed that students would be more likely to use reading strategies if the strategies were incorporated in the curriculum and were consistently modeled by teachers.

**Results for Frayer Model Intervention.**

The pre and post-test scores for the two units using the Frayer Model intervention were averaged. For the average pre-test Ericka scored a 53% and for the average post-test she received a 90%. There was a 37 point increase from pre to post-test. A dependent T-Test was run to determine if the results were statistically significant. The
results were found to be significant. One of the reasons for the increase is that through completion of the Frayer Model, Ericka was able to synthesize the knowledge and make connections to prior knowledge. Also through completion of the graphic organizer Ericka was having repeated exposure to the word. Research by Nelson & Stage 2007 shows the more connections students make when learning the word, the more likely they will be to remember the word and have improved comprehension. During the course of the intervention Ericka would interact with the word repeatedly over a series of days.

**Comparison Data for Learning Words in Context vs. Frayer Model**

For the Learning words in context intervention, Ericka’s average score improved by 27 points. For the Frayer Model intervention, Ericka’s average score improved by 37 points. The post-test scores from the Frayer Model intervention were higher than the post-test scores from the Words in context intervention. A dependent T-Test was run to determine if the results were statistically significant. The results were found to be statistically significant. Use of the Frayer Model was found to be a more effective intervention for increasing comprehension than just learning the vocabulary words in context.

One of the possible reasons why the Frayer Model was found to be more effective was that this model provided multiple and varied opportunities for Ericka to interact with the target words. The Frayer Model intervention presented the words in modalities. Ericka interacted with the words visually through creating a concept map at the end of the unit. She heard the words through repeated reading. She also interacted with the words tactically by sorting through index cards and grouping the word and the definition and also grouping the words according to similarities. Lastly this intervention was more
successful because this model combined the Learning words in context intervention with
the Frayer Model graphic organizer. Ericka understood the word more thoroughly
through employing the Learning words in context intervention, and then she was able to
interact with the word through completing the Frayer Model graphic organizer.

**Strengths and Limitations of the Study**

One of the most important strengths of the study was that it addressed Ericka’s
needs. In order for the interventions to be beneficial for Ericka, the case study was
crafted around two of her IEP goals: “When given reading materials at Ericka’s
independent level, Ericka will correctly answer 80% of literal comprehension questions”
and “Given definitions of words taught in content areas, Ericka will correctly supply the
word being defined in 80% of the definitions.” The results of the study confirm that
Ericka is making progress towards her goals.

A second strength of the study was that Ericka showed improvement in her
comprehension of science content. During the case study she learned two interventions
that had a positive effect on her comprehension. It was found that graphic organizers and
reading strategies can successfully be used with students with learning disabilities and
can be used as an effective strategy for meeting a student’s IEP goals.

Another strength of the study was its simplicity. When conducting the literature
review, a common theme I encountered with interventions that were not successful was
they had many components and attempted to teach the student many different
interventions. In these studies students were not able to truly master one intervention.
Research shows that for students to master a reading strategy they need to go through
four stages (Wright 2007). The students must be explicitly taught how to use the skill or
strategy, students should practice the skill under supervision with teacher feedback, students should use the skill independently in real academic situations, and students should use the skill in a variety of other settings or situations. Wright’s (2007) research shows the process a student needs to undergo to truly learn a reading invention. This process takes time, and due to the fact that the case study intervention was only in place for four weeks I decided to focus on two interventions. This allowed Ericka to truly learn and use both interventions repeatedly. The hope is that Ericka will continue to use the strategy during the school year.

Lastly, a strength of the case study was that the research questions, the resulting methodology, and intervention choices were firmly rooted in research. The choice of using vocabulary acquisition strategies to increase comprehension was based on the work by Hemphill and Tivnan (2008) and Espin, Shin, Busch (2005). The Learning words in context strategy was supported by the research of Alfassi’s (2004) and Bernice Wong (1979). The Frayer Model intervention was supported by the research of by Bos, Anders, Filip, and Jaffe (1989), Monroe and Pendergrass (1997), and Enge (2005). The work of these researchers helped create a framework for the case study, and influenced the purpose and design of the case study.

A limitation of the study was its length. A four week period is not a very long period of time to conduct research. Due to the time limitation, the case study had to be extremely focused on two interventions. If there was more time, I think it would have been beneficial to see if Ericka continued to use the reading strategy during the academic year. If the study had been longer, Ericka could have been exposed to different types of
graphic organizers. Perhaps she would prefer one type over another. Being able to choose may mean Ericka would be more likely to use a strategy with less prompting.

Another limitation of the study was related to sample size and application to classroom use. This sample consisted of one student as opposed to a larger population. Due to this limitation there was not a control group. Without a control group it is difficult to minimize the effects of other variables other than the independent variables, which in this case study were the two vocabulary interventions. Also the study was conducted in a controlled environment in which there was one teacher and one student, with an environment free of distraction. This type of setting does not reflect the classroom environment that Ericka will be instructed and tested in.

**Recommendations**

Ericka made significant gains over the course of the case study. In this section I will give recommendations on how Ericka could sustain and continue her improvement in comprehension.

One recommendation is having Ericka’s teacher prompt her to use the interventions she was taught in the case study. When Ericka is reading any content area text, the use of the Learning words in context strategy would help Ericka comprehend the text. When Ericka needs to define a vocabulary word, she should be prompted to think of the word’s definition, characteristics, examples and non-examples; as she did when completing the Frayer Model graphic organizer.

Since the results of this study indicate that Ericka will benefit from continued use of graphic organizers to record information and make connections between the word and its meaning, it is recommended that Ericka be taught how to use a variety of graphic
organizers besides the Frayer Model. There are many types of graphic organizers that serve a variety of functions, and Ericka responded positively to a tool that helped her to organize her thinking. The continued use of graphic organizers will help Ericka continue to make progress towards her IEP goals which address vocabulary acquisition and reading comprehension.

A recommendation for future research would be to implement this case study intervention with additional students with learning disabilities to test whether or not the results of this case study can be replicated in an environment that more closely resembles a typical classroom rather than a pull-out intervention. I would also recommend that the case study’s length be extended to determine if the interventions bring about even greater improvements in comprehension for students with learning disabilities.

**Conclusion**

The purpose of this study was to determine if the use of specific vocabulary interventions increased comprehension in the science content area. This was a comparison study, which compared the effects of two vocabulary interventions. Half of the study used the Frayer model, while the other half used a Learning vocabulary in context reading strategy. The hypothesis was that both learning interventions will increase comprehension, but the Frayer Model will be the more effective intervention for increasing comprehension. The final results affirmed both hypotheses. The two learning interventions had a positive impact on Ericka’s comprehension in the science content, with a post-test increase of 30 percentage points. The Frayer Model intervention proved to be the more effective intervention, with a post-test increase of 37 percentage points, whereas the Learning words in context intervention had a post-test increase of 27
percentage points. The results of this study indicate that Ericka will benefit from continued use of graphic organizers to record information and make connections between the word and its meaning.
References


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### Appendix A

#### Instructional Plan

<table>
<thead>
<tr>
<th>Session</th>
<th>Instructional Plan</th>
<th>Specific Observations From Lesson</th>
<th>Concerns/Changes Warranted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Give Ericka a survey to learn about her interests and as an opportunity to build rapport and have a conversation. Explain the purpose of the intervention and its benefits. Give the pre-test for the Food Chain Unit.</td>
<td>To assess Ericka’s prior knowledge I asked her if she has heard the term “food chain” before. She said “it is like when a snake eats a mouse and the mouse eats grass.” So she is somewhat familiar with the concept.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Introduce the vocabulary words: Assess prior knowledge of the words. Explain that we will be encountering these words in the text today. Explain that when we run across the word we will circle the word and search the text for the definition and underline it. We will learn to look for context clues for the word. Model the reading strategy when first word is encountered. After reading complete the Frayer Model graphic organizer for the words. Assess understanding of the words by asking Ericka to match the definition with the word.</td>
<td>The text I chose was at her instructional level (based off information in the IEP.) However Ericka struggled with the text, have six miscues in the first two paragraphs.</td>
<td>The text I am using is available at different reading levels. I will bring a lower level version tomorrow and see if fluency improves.</td>
</tr>
<tr>
<td>3</td>
<td>Review vocab words by matching the definition and the word. Introduce new vocab words. Assess prior knowledge of words. Read instructional text. Cue Ericka to use the reading strategy Complete Frayer Model graphic organizer. Assess Ericka’s knowledge of the new words by asking her to match the definition with word.</td>
<td>Ericka retained knowledge of the vocab words she learned in the previous session and matched all the words correctly. For the new vocab words, competition, is the only word she had prior knowledge of. At the end of the session Ericka was able to provide the definition for each vocab word except for the word ecosystem.</td>
<td>Ericka is struggling with the section of the graphic organizer that asks for characteristics of the word. For the next session we will do an activity about matching characteristics to different nouns. Continue to work on the word “ecosystem.”</td>
</tr>
<tr>
<td>4</td>
<td>Complete characteristic activity where the student matches characteristics with the corresponding noun. Review all vocab words. Create a concept map with the words. Ask Ericka to group words that go together and explain and write the connection. Choose photos that</td>
<td>Ericka was able to group the vocab words and give an explanation of her choices. She made many connections between the words and found corresponding photos for the words.</td>
<td></td>
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<tr>
<td>5</td>
<td>Give Food Chain Unit post-test. Give Inside Living Things Unit pre-test.</td>
<td>With this method it is easy to go too fast and read too much text. For the next session I will make sure to slow down the speed of the text by spending more time on context clues.</td>
<td></td>
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<tr>
<td>6</td>
<td>Explain that for this unit we will not be using the graphic organizer. Continue to read the text, while reading stop and discuss the vocab words and teach Ericka how to look for context clues. Continue to underline definition and context in text. Continue modeling reading strategy and prompting Ericka to use the strategy.</td>
<td>Ericka used reading strategy independently for 4/11 vocab words.</td>
<td></td>
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<tr>
<td>7</td>
<td>Continue to read text, while reading stop and discuss the vocab words and teach Ericka how to look for context clues. Continue to underline definition and context in text. Give post-test for Inside Living Things Unit.</td>
<td>Ericka used the reading strategy independently for 6/11 words.</td>
<td>The post-test scores for this unit were significantly lower than the previous.</td>
</tr>
<tr>
<td>8</td>
<td>Give Food and Nutrition Unit pre-test. Introduce the new words, assess prior knowledge. Read instructional text while using the reading strategy. Complete Frayer Model graphic organizers for each vocab word. Remind Ericka to go back into the text while completing the graphic organizer.</td>
<td>The instructional level of the text is appropriate. Also because these units are related vocab words are reoccurring and Ericka is retaining the knowledge.</td>
<td></td>
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<tr>
<td>9</td>
<td>Student absence</td>
<td></td>
<td></td>
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<tr>
<td>10</td>
<td>Introduce the new words, assess prior knowledge. Read instructional text while using the reading strategy. Complete Frayer Model graphic organizers for each vocab word. Remind Ericka to go back into the text while completing the graphic organizer.</td>
<td>Ericka needs to be prompted less to use the strategy, and the graphic organizer is more complete. She used the strategy independently for 8/10 vocab words.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Introduce the new words, assess prior knowledge. Read instructional text while using the reading strategy. Complete Frayer Model graphic organizers</td>
<td>Ericka enjoys using the computer to find information for the graphic organizer more than the text.</td>
<td></td>
</tr>
</tbody>
</table>

VOCABULARY AND COMPREHENSION

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correspond with the word. Give post test for Food Chain Unit.
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<tbody>
<tr>
<td><strong>12</strong></td>
<td>All the words from the Food and Nutrition unit have been studied by completing the graphic organizer. Today Ericka will create a concept map with the words. Ask Ericka to group words that go together and explain and write the connection. Choose photos that correspond with the word.</td>
</tr>
<tr>
<td><strong>13</strong></td>
<td>Take Food and Nutrition Post-test. Take Solar System Pre-test</td>
</tr>
<tr>
<td><strong>14</strong></td>
<td>Explain that this unit will only use the Learning words in context strategy. Begin reading content text. Continue prompting and modeling strategy. Ericka needs little to no prompting to use the strategy. She used the strategy independently for all 7 words today.</td>
</tr>
<tr>
<td><strong>15</strong></td>
<td>Finish reading content text and give post-test. The scores on the post test are lower than Frayer model units.</td>
</tr>
</tbody>
</table>
Frayer Model Diagram

Name: ____________________ Date: __________

Definitions

Organic nutrients used by the body to grow and repair cells

Characteristics

Examples

Eggs
Cheese
Milk
Meat
Fish

Non-Examples

Protein
Frayer Model Diagram

Definitions

eat both plants & animals.

Characteristics

They maybe in many levels of a food chain
Some hunt the food
Some scavenge

Examples

Bears
Raccoons
Humans

Non-Examples

Animals that only eat plants & animals
That only eat meat
Producers