HOW DO GRAPHIC ORGANIZERS AND MULTIPLE RESPONSE STRATEGIES HELP ELL STUDENTS COMPREHEND TEXT

Submitted in partial fulfillment of the requirements

For the degree of

MASTER OF EDUCATION

IN CURRICULUM AND LEARNING

BILINGUAL AND ESL EDUCATION

By

Jaddy S. Muniz

William Paterson University

Wayne, NJ

January 2015

This is a research paper submitted for ELCL629-630, Research in Education I & II, in partial fulfillment of the requirements for the Degree of Master's in Education in Curriculum and Learning at William Paterson University

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

WILLIAM PATERSON UNIVERSITY OF NEW JERSEY

How Graphic Organizers and Multiple Response Strategies help ELL Students Comprehend Text

by

Jaddy S. Muniz

A Master's Thesis Submitted to the Faculty of

William Paterson University of New Jersey

In Partial Fulfillment of the Requirements

For the Degree of MASTER OF EDUCATION

(January 2015)

College/School: College of Education

Program: Curriculum & Learning

Concentration: Bilingual & ESL Education

Thesis Supervisor:

_____

Dr. Holly Seplocha

Abstract

HOW GRAPHIC ORGANIZERS AND MULTIPLE RESPONSE STRATEGIES HELP ELL STUDENTS COMPREHEND TEXT

by

Jaddy S. Muniz

Thesis Advisor: Dr. Holly Seplocha

This study reports findings from research conducted which assessed ELL students' comprehension of text through the use of graphic organizers and multiple response strategies. The research consisted of explicit instruction on how to utilize graphic organizers and multiple response strategy tools to help retain information. The teacher-researcher modeled how to use and create these tools and strategies and provided practice time after the demonstration.

The participants included 13, sixth grade students in a Bilingual science class, in Passaic, New Jersey. In this study a variety of different methods were used to gather the data. Pre and Post Assessments, Anecdotal notes, Journal entries, and Graphic Organizers were used. The findings indicated that ELL students are able to comprehend text better if they have appropriate strategies and tools to use. There was no specific evidence that determined whether students preferred one over the other. The results showed that there were improvements in their scores than they had before the study.

ACKNOWLEDGEMENTS

First I would like to take this opportunity to thank my wonderful and most amazing partner Corey Sorge, who inevitably stood by me through all my ups and downs in this journey. I know that I have driven you crazy with all the mood swings, as I was trying to sit a write this very important paper, which will put me closer to my goals. Thank you for always tending to the kids, helping with homework, making dinner and washing the dishes. If it weren't for you I probably would have lost it. You are my rock, my soul and I love you more than you will ever know. I also would like to share this moment with my children Faith and Isaiah; everything mommy does is for you guys. You are the best thing that has ever happened to me; Love you with all my heart and soul.

I would also like to extend my gratitude and immense thank you to my BEST FRIEND Danielle Haft. Thank you for always pushing me to continue and never give up. For staying with me on the phone while I cried because I thought I would not be able to do this. You are stronger than you know and you give me hope and motivation to continue moving forward.

I would also love to thank my family. Thank you for always pushing me to keep going to school even when I said I hated it. Mom and Dad thank you so much for all the support and help you have given me, especially with the kids and watching them for me and a special thank you to my brother Winder Perez for editing my thesis before the final submission.

Last but not least, I would like to take this opportunity to thank Dr. Holly Seplocha, if it weren't for your patience and dedication to helping me get through this I would have probably quit. You were there for every revision, every question and even

for support when I would come to you and say I don't think I can do this. You have helped me move forward and achieve a goal I thought was too far to reach, for that and all you have done a huge THANK YOU.

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

Introduction

Overview

Bilingual/ESL education has been around for many years. Since 1968, when Congress passed the Bilingual Education Act, many approaches have been employed with the goal to help students achieve English language proficiency and understanding. One main issue today with the educational system is that there are still many gaps in achieving this goal. Based on my understanding and graduate work, many schools do not possess a functional Bilingual/ESL program that benefits the ELL students, along with providing these students' with the proper tools to guide them through this process.

Due to an increasing influx of immigrants to the United States, our schools populations have shifted from mainstream English classrooms to Bilingual/ESL classrooms. According to statistics from the Census Bureau, it is expected that the immigrant population would be a 34 % increase by the year 2060 (Cohen, 2012). In order to accommodate for this increase in immigrant population, educators have had to be prepared to support these students. The role of the educator is to ensure that students are capable of functioning in society. By this we mean that students need to be able to fill out a job application, college application as well as to perform job duties which require a higher level of understanding. As teachers provide this type of education students will then be to properly equip to handle text in order to elicit comprehension.

It will not be sufficient, for teachers to assist students in comprehension of text which is pertinent for academic success as well as for career success but they will also have to ensure that these ELL students pass the required standardized tests given by the state. Not

only do they have to pass these tests but the ELL students are also expected to perform at the same level as a native speaker of English. In order for ELL students to better comprehend text, students must be given a variety of organizers and response strategies that they can use to manipulate the text. According to a study conducted by Proveem and Rajan (2013), the results confirm that the use of graphic organizers improves a student's ability to comprehend texts they are reading.

Because comprehension is such a vital tool in learning, a teacher that provides different methods and materials in their classroom for understanding enables the students' to choose the best way that will assist them with their learning. Providing a variety of different graphic organizers and multiple response strategies that students can engage with gives them the confidence to go into more difficult text. Students that are given freedom and choice are apt to engage in their own learning.

Statement of the Problem

I believe that there is no real progression without true comprehension. The main purpose of reading is reading comprehension, defined as the ability to make meaning from written text (Burt, Peyton, & Van Duzer, 2005). As educators we take for granted what our students know and do not know. It is assumed that if a student can read a story, article, or a chapter then the student actually is able to then understand what they are reading. Based on my experiences this is not the case for everyone, especially those students for whom English is not their first language.

One major problem that students have in general is deriving from being so worried about understanding every single word of a text they are reading that they do not get the general idea from the passage (Osborne, 2010). Based my experience, students are eager to

read for the teacher, to show off to their friends that they can read that they do not stop and take the time to actually understand the text they are reading. Based on my working with English language learners, they are very good at identifying vocabulary even pronouncing the terms but lack the ability to make connections, and how to identify the main idea within the text.

A method that ELL students may utilize in order to comprehend text is by mentally translating the content into their first language. Utilizing this method enables the students' to answer comprehension questions but it takes them a long time because it is a time consuming process. Along with this process being time consuming, ELL students cannot ascertain that the translation is accurate and relevant to what they are working with. Therefore, since comprehension is important not just for native speakers but for ELL students, it is imperative in order to compete with the English speakers. While comprehension is important for all students, I have found that it is especially problematic for Ells. The strategies to build comprehension skills in native speakers may or may not work effectively with ELL, so strategies for ELL comprehension are needed.

Purpose of the Study

The purpose of this study was to explore the relationship between ELL students' performance on comprehension of text by utilizing different types of graphic organizers as well as multiple response strategies in order to determine which are more effective. According to Kintsch and Rawson (2005), comprehension skills aided by graphic organizers help a reader develop their reading abilities. According to previous studies cognitively based bias on reading emphasizes that good 'comprehenders' did more than just word, phrase, or sentence-level processing; they used a flexible repertoire of comprehension- fostering and

monitoring of activities (Dole, Duffy, Roehler, & Pearson, 1991; Palincsar, & Brown, 1984). By utilizing graphic organizers and multiple response strategies, the aim is to have students develop skills necessary in order to comprehend text, such as being able to abstract the main idea, locate the supporting details, topic sentences, fact, opinion, etc. In this manner they can be able to move from a place of having little understanding to a place where they can logically comprehend information.

The focus of this research was on Bilingual/ESL sixth grade language learners' ability to use graphic organizers and multiple response strategies to organize their thoughts to better understand the second language text. This research examined and proposed the use of graphic organizers and multiple response strategies with the purpose to help break down the text for comprehension.

The Research Questions

1. What affect does using graphic organizers have on ELL students' comprehension of text?
2. What affect does using multiple response strategies have on ELL students' comprehension of text?
3. What is the difference between the two methods on students' comprehension of text?

Definition of Variables

Graphic Organizers

A graphic organizer in this study refers to representations, pictures or models used for processing textual information. They facilitate understanding of knowledge when there is a

large amount of information to work with, in a given limited time (Liliana, 2009). For this study, students used a Know Want Learn chart (KWL).

Multiple Response Strategies

In this study multiple response strategy refers to the ability to enhance a students' academic performance, in this case comprehension of text. Learning happens at different levels, at different times and in many different ways. Therefore the use of think-pair-share was one of the strategies that were used during this study.

Comprehension of Text

"Comprehension of test is the ability to apply meaning to what is read" (Ellery, 2005, p. 5). For the purpose of this study comprehension of text is the ability to respond to a story by answering comprehension questions and to create connections between science investigations and stories.

English Language Learners (ELLs)

English-language learners, or ELLs, "are students who are unable to communicate fluently or learn effectively in English, who often come from non-English-speaking homes and backgrounds, and who typically require specialized or modified instruction in both the English language and in their academic courses" (edglossary, 2012). For the purpose of this study ELL students were those students who had limited or no English repertoire, and were not able to complete assignments in the target language.

Hypotheses

It was hypothesized that graphic organizers and multiple response strategies would help students ability to better comprehend text.

Hypothesis I

It was hypothesized that graphic organizers would increase a students' level of comprehension through the development of their own graphic organizers.

Hypothesis II

It was hypothesized that multiple response strategies would allow students the opportunity to develop their comprehension skills through a wide range of activities.

Hypothesis III

It was hypothesized that graphic organizer would be a better tool for ELL students to comprehend text than multiple response strategies.

Additional Research Questions

The teacher-researcher was also interested in supplementary research questions in addition to the three formal hypotheses of this study.

1. Which of the two strategies did students prefer?
2. Does the use of graphic organizer and multiple response strategies differ across levels of students?

Chapter II

Review of Literature

It has been hypothesized that children's comprehension of text can be enhanced with the assistance of tools and strategies. The review of the following literature contains studies conducted regarding comprehension and students understanding of the text. To obtain a more precise understanding on how students may utilize graphic organizers and multiple response strategies are also included in this research. In addition, how ELLs learn to comprehend text is also outlined in this review of the literature.

Comprehension

Reading comprehension, a most essential academic skill, continues to challenge a wide number of students (Mason, 2004). It is referred to as a thinking process that requires an active interaction with the text (Rasinsky & Padak, 2000), usually necessitating the use of two independent skills: (1) language knowledge, and (2) identification of key elements in the text and the way the latter are associated together (Grabe, 2004). As a teacher we must ensure that our students have these tools and elements in place in order to be able to develop an in-depth comprehension of the materials they come in contact with, especially ELL learners who are confronted with new ways of learning.

Providing ELL students with exposure to different types of materials and guiding them through the process of what to look for, how to find it and to make the connections with their prior knowledge will definitely assist in the development of comprehension skills. In order for students to be able to understand what they read, they must obtain a variety of different skills and tactics that begin in the very early childhood and that continue to grow as the years pass (Neuman, 2007). As the students go through their schooling years, early

teachers begin to assist them with comprehension strategies. As Newman noted, there are several ways in which children can practice comprehension skills within their everyday world.

Providing students with a language and print-rich materials in which they can learn and become familiar with an array of words would help in developing basic concepts about objects and events around them (Neuman, 2007). According to Neuman, the next step to building comprehension skills was to continually extract from their own experiences. Therefore the primary focus of the teacher should be to provide assistance to developing students such as ELLs to become decisive 'comprehenders' (Rasinsky & Padak, 2000). In order for students to be able to achieve higher-order comprehension skills, teachers need to model the process, show the students the positive affect of reading and interacting with the text, as well as multiple strategies to relate to both content and organizational structure of reading materials (Blachowicz & Fisher, 2006; Grabe, 2004; Hadley, 1993).

Research has shown that students benefit tremendously when they are trained in groups and improve their social and communication skills through peer modeling (Alfassi, 1998; Janney & Snell, 2002). It is believed that a major concern of teachers is the ability to get students to be more independent about their reading. According to Mason (2004), there is a weakness in reading comprehension which is attributed to students' lack of both metacognitive skills and fix-up strategies that promote understanding. In the case of bilingual students, who lack reading comprehension skills in their mother tongue, they are more likely to transfer this weakness to the second language. Therefore, Mason believed that a teacher needs to explicitly teach the strategies to these students in order for them to have the comprehension skills needed to succeed in this new language.

Keene (2010) also emphasized the importance of children drawing on prior knowledge as she worked with fifth graders in a suburban town to increase their comprehension skills. Keene focused on schema, which she defined as "relevant prior knowledge and experience that readers use to comprehend text more deeply" (Oliver, 2013, p. 69).

A study was conducted by Bishop, Reyes, and Pflaum (2006), which demonstrated that there was a need for strategy to be explicitly taught, especially for poor comprehenders. The study was conducted over a few years with students from five different middle schools who were chosen to explore questions by depicting responses to challenging text. The group represented a balance of gender, a vast range of academic achievement, and broad differences in social class. The students resided in communities that ranged from a rural town with median household income of $30, 000 to an affluent suburb that ranged from a rural town with a median household income above $60, 000.

Two particular cases that were depicted from the study regarding students Rosalie and Tobias illustrated that students' drawings showed a great variety in the way the utilized comprehension strategies. Mokhtari and Reichard (2002) offered three helpful categories of such strategies: Problem solving, which comprises paying attention of reading, adjusting reading rate, reading slowly, visualizing information, reading text out loud, and guessing the meaning of unknown words; Support reading, which comprises paraphrasing text information, taking notes while reading, asking oneself questions, discussing reading with others, using reference materials as aids, and revisiting previously read information; and Global reading, which comprises activating prior knowledge, making text predictions, skimming text, using context clues, and using text structure and textual features (p. 94, 249-

259). Mokhtari and Reichard noted that the problem was that students lacked the required strategies to be able to move toward the third category of comprehension.

The study showed that teachers needed to teach students to ask themselves questions about unfamiliar words, and teach students to explore texts at the start of a new reading assignment for clues on the content. The results of the study showed that the students demonstrated a great variety in comprehension strategies. The study also concluded that while the students demonstrated a range of comprehension strategies, they still needed explicitly demonstration of the strategies they utilized in order to make sense of the text. The teachers needed to model for students how to activate prior knowledge before reading texts, to skim text strategically and most importantly to build on students' existing strategies in order to make them stronger readers and comprehenders' (Mokhtari & Reichard, 2002, p. 69).

In order to explore how students comprehended content based reading materials studies were conducted that focused on science content. Mason and Hedin (2011) discussed four specific characteristics of expository text that make comprehension particularly challenging for struggling readers. These areas included: complexity of the text structure, conceptual density, technical vocabulary and necessity of prior knowledge to comprehend new material. The researchers felt that due to the complexity of the material students were often turned off and found the material boring and therefore refused to engage with it.

The purpose of Mason and Hedin's (2011) study was to implement a new web-based program called Readorium in order to increase struggling middle school students' comprehension of nonfiction text in the area of science. The study followed a two phase method of utilizing two different samples of teachers and students. The purpose of the first

phase was to develop a prototype of the software and to collect feedback on its effectiveness. The main goal of the second phase was to see how useful and beneficial it would be in order to assist students in the development of comprehension. There were 280 participants (80 middle school students from four classrooms in four New Jersey school districts in phase one and 200 sixth grade students from fifteen classrooms in six school districts in New Jersey and Connecticut) which varied between race, lunch status and limited English proficiency.

The study also followed a basic procedure in which the participants were asked to select a specific topic and were asked to share their opinions through individual and small group interviews through web-based internet reflection sheets. The study also utilized pre- and post-surveys for teachers regarding their students' reading competence, use of strategies, and reading behaviors. The study concluded that the majority of the students improved in their reading comprehension scores. The program even increased the students' motivational level regarding reading nonfiction text (Mason & Hedin, 2011).

McKeown, Beck, and Blake (2009) found that comprehension instruction has been focused on content or strategies. Research has come to focus on teaching explicit comprehension strategies. A strategies approach was prominent in the literature of comprehension, but even though there was a large body of research on strategies instruction, a great deal remained to be explained. "One reason that much is still unknown is that the studies have varied so widely in the kind of instruction offered, and little appears in the reports of studies about actual interactions with text (p. 28)." Pearson and Fielding (1991) stated that strategies instruction might not be needed if student attention could simply be focused on understanding text content.

McKeown, Beck, and Blake's (2008) study was developed based on a set of standardized lesson for strategies and content around a common set of texts for fifth grade. The study ran for two consecutive years, including all fifth graders from one low-performing urban district. It involved six classrooms and their teachers: two classrooms in which teachers taught strategies lessons, two classrooms in which teachers taught content lessons, and two classrooms in which lessons were taught using basal reader materials serving as the comparison.

Data were collected for the two years through different methods. Such methods included strategies in summarizing, predicting, drawing inferences, and monitoring. For the content aspect it focused mainly on a similar format where teachers were told where to stop in order to develop the appropriate questions for the students. The results of the study suggested that there were no differences between students in the content based group versus the strategy group. Therefore, it was discovered that there were similar patterns in that the strategies class focused on aspects of strategy application while the content class focused on text ideas and how they fit together, suggesting that one aspect aided in the other in order for comprehension of text to take place. Therefore, the study (McKeown, Beck, & Blake, 2008) concluded that getting students to actively build meaning while reading does not necessitate knowledge of and focus on specific strategies, but rather it may simply require attention to the text content in ways that promote selecting important ideas and establishing connections between them.

Graphic Organizers

"A picture is worth a thousand words" (Sam & Rajan, 2013). In a modern-day classroom, students are surrounded by visual imagery through textbooks, notice boards,

television, videos, or computers (Sam & Rajan, 2013). Daniel Willingham (2008) classifieds learners into three different types: those who learn by looking, those who learn by listening, and those who learn by manipulating things – or visual, auditory, or kinesthetic learners. Willingham believed that in order for a teacher to optimize a child's learning, they must first understand the type of learner the students are in order to be able to present material that is appropriate for them.

According to Osborne (2010), students' major reading problem arose when they were so worried about understanding every single word of a text they were reading that they did not get the general idea from the passage. Based on this thought, if native speakers of English struggle with comprehending a passage, it can be expected that ELL learners would have a harder time with comprehension. Osborne further stated that while students might be able to recognize words and pronounce them, they lack the understanding of the main theme of the passage; therefore their learning is fragmented as cited in (2010).

Sam and Rajan's (2013) study was conducted at a school in the western part of Tamil Nadu, India where English was being taught as a second language. The study consisted of eight middle school children who were separated into two sections group A and B. One of the sections consisted of the control group and were taught using the traditional reading approach; while the other section consisted of the experimental group trained with using graphic organizers to decode information from reading passages. The study lasted for two weeks. The total number of participants was 70 (35 in each section). Students in group A were trained to read and reread the passages for comprehension and then answer comprehension questions, whereas group B were trained using graphic organizers in comprehending passages. They used expository and narrative texts for the middle school

ELL students which were based on parameters or complexity level, variety of topics and lexical count.

The result of the study based on the pre test and post test showed that there was a significant increase with the experimental group versus the controlled group. The experimental group increased with a +17% from pre test to post test, while the controlled group increased by +1.2%. Sam and Rajan (2013) concluded that using graphic organizers were an effective tool. The result of the post test showed that the experimental group of students had improved in all the five types of reading questions compared to the controlled group students. The researchers indicated, that using graphic organizers was effective in reading questions like identifying the main idea, finding supporting details, dealing with vocabulary and fact and opinion, and making inferences (Sam & Rajan, 2013).

Shaw, Nihalani, Mayrath, and Robinson (2012) conducted research about graphic organizers overviews. They noted that graphic organizers should be presented to students following text as an organizer, rather than preceding text as an overview. The study focused on examining the separate and combined effects of graphic organizers placement and text mode in a fully crossed design to identify an optimal instructional response. The study specifically utilized 111 undergraduate students enrolled in an educational psychology course at a large southwestern university (21 males and 90 females, ranging in age from 18 to 47 years old). Participants were randomly assigned to one cell of a 2 by 2 factorial design with presentation order and text mode as the two between-subjects factors. This arrangement resulted in four conditions: read text, view graphic organizer; listen to spoken text, view graphic organizer; view graphic organizer, read text; view graphic organizer, listen to spoken

text. The sessions took place in groups of 20-30 students, mixed with respect to conditions, in a university computer lab.

When the data were analyzed, Shaw et al. (2012) found no evidence of an advantage for overviews over organizers. Rather, evidence was found that an advantage for organizers over overviews, where students who viewed graphic organizers after the text outperformed those who viewed them before the text on the transfer of test, but not on the retention test. Therefore, the findings concluded that graphic organizers are more beneficial when presented after the text. Similarly, Moor and Readence (1984) conducted a study over 25 years ago, which reported that in studies where graphic organizers were present prior to the text, they were less effective than in studies where they were presented after text.

Although graphic organizers have been strongly recommended and widely practiced by reading experts and classroom instructors, more consistent definitions and procedural descriptions of graphic organizers are essential. Moreover, observations by Koda (2007) suggested that the goal of reading was to construct text meaning based on visually decoded information. Koda (2007) also believed that graphic organizers helped readers identifying the required information from material, classifying or arranging them in templates which were creatively constructed by the readers themselves and they also guided readers in drafting similar information in a different context. According to Barron (1979), graphic organizers were effective in reading comprehension whereas, providing students with readymade graphic organizers would not motivate them. Barron furthered explained that readymade graphic organizers would be viewed by students as another template where they have to fill in with information. Therefore, when students come out with their own graphic organizers, they develop their own thinking skills.

However, according to Sam and Rajan (2013) more research studies with ELL students should be conducted to further investigate the effectiveness of graphic organizers on L2 reading comprehension. They furthered concluded that the use of graphic organizers in L2 reading classrooms should be utilized for a better learning process and better output.

Multiple Response Strategies

Cooperative learning is an instructional technique that is used by many classroom teachers. The common goal of this strategy is to promote academic development and improvement. A great deal of research has been conducted in order to determine how many teachers use cooperative learning in their classrooms and how many teachers are using appropriate and current models. Many researchers felt that it was important for teachers to understand and use cooperative learning in a structured form.

Vaughan (2002) explained that four basic elements of cooperative learning exist. These elements were currently being used as a guideline to effectively use cooperative learning in the classroom. The first element was positive interdependence. This approach was viewed as the most important one out of the four elements. The next element was individual and group accountability. A face to face interaction was an important element because it allowed the students to respond directly to each other, which led to the group process being valued and discussed. Classroom discourse also played a role in the way students interacted and learned. Cunningham and Allington (1999) explained in their book that cooperative learning was an excellent way to support children who were acquiring a second language.

Utilizing these strategies would help lower a student's affective filter as well as further develop language skills. ELLs can benefit from specific strategies such as

paraphrasing. In an activity conducted by Cunningham and Allington (1999), students were asked to paraphrase a passage before given a new one. Based on the results it was concluded that students were able to properly provide the new idea after being prompted and facilitated with the skill.

Smart and Marshall (2012) conducted a study in which they examined interactions between classroom discourse, specifically teacher questioning, and related student cognitive engagement in middle school science. The study aimed to demonstrate that teacher-student discourse often guided the students in making meaning of science concepts, therefore comprehension of the content material.

The study included 10 middle schools science teachers; they were from two different middle schools (school A and school B). The teachers were participating in a professional development program focused on improving students inquiry based skills in order to comprehend science content. The participants were all female and their teaching experience ranged from 1 year to 35 years. The study ran for two weeks, with follow-up meetings throughout the school year, and frequent classroom support (at least once a month) from the research team.

The study followed a basic procedure in which the teachers utilized a 4Ex2 model, which helped plan and implement content-embedded inquiry based lessons. Formal observations were conducted, as well as a program called electronic quality of inquiry protocol (EQUIP) were used to obtain valid and highly reliable measures of the quantity and quality of the inquiry based lesson. Field notes along with audio recordings of classroom observations were collected for analysis.

After all the data were gathered and analyzed, it was determined that teachers had the unique opportunity to facilitate higher cognitive levels in their students by the types of questions that they asked during instruction and the communication patterns they established in their classrooms. Based on the study, it led to the connection of other studies which reflected back on collaboration. Smart and Marshall (2012) also concluded that having classroom discourse, the ability to collaborate with your peers to solve problems, helped in the ability of the students in becoming part of their own active learning experience.

Consequently another study conducted by Alozie, Grueber, and Dereski (2012) also fostered the students understanding of science content through inquiry based learning. This study focused on guiding the students to use skills associated with inquiry, such as problem solving and communication. The purpose of the study was to enable students to engage in inquiry based learning as well as to utilize 21st century learning skills. Like previously conducted studies, this study required the activation of prior knowledge, working collaboratively, and the use of graphic organizers in order to engage students in the thinking process.

The participants of the study were pre-service and in-service teachers serving as students in order for them to be able to understand student experiences, so that they were able to plan instruction for student learning. Alozie et al. (2012) concluded that depending on the teaching strategies that teachers used, determined how well students comprehended the content. The researchers also concluded that while using inquiry based science had its challenges, teachers who had enacted this type of teaching and learning had shared how students' achievement had increased. "Therefore, students become lifelong learners and are more prepared for future problem-solving," (Alozie et al., 2013, p. 488).

Another aspect of student response that was explored by Feldman, Feighan, Kirtcheva, and Heeren (2012) was based on whether there was a correlation between literacy strategies, lesson rigor and students' reading achievement. There were 134 teachers (51 teachers implemented literacy strategies in content areas) and 1, 198 students' reading scores were utilized. Data were obtained using field notes, and pre- and post-observation interviews took place. The researchers' study focused on the implementation of the following six practices: introduced a strategy, modeling of the strategy so that students observed an example of its use from start to finish, provided opportunities for guided practice where teachers offered prompts and immediate feedback as students attempted using a strategy with the gradual reduction in teacher support, provided opportunity for students to use the strategy independently, differentiated instruction by attending to the extent to which teachers intentionally selected use of strategies to target a diverse array of individualized learning needs, and revisited the strategy to ensure its use.

Feldman et al. (2012) concluded that the reading levels of students increased based on teachers being fully prepared and engaged in the delivery of such strategies that promoted comprehension. It was also concluded that there was much that middle schools teachers were faced with because of the vast array of reading-related issues in the classroom. Ness (2007) and Nokes (2010) suggested that for struggling adolescent students to succeed, explicit reading instruction was a necessary element. Ness (2007) and Nokes (2010) also attributed success of the students to the use of graphic organizers. Along with Ness and Nokes, Nichols (2007) also concluded that the use of graphic organizers have been independently shown to be useful to middle school teachers providing content area instruction.

Feldman et al. (2012) finalized that there was a correlation between enhancing effective teaching and learning through implementation fidelity, level of cognitive demand, and the potential for leveraging use of literacy strategies in middle school content are instruction. They emphasized the importance of explicit instruction as well as providing students with the tools and strategies to work collaboratively and independently in order to achieve mastery of text and content.

ELLs and Comprehension

According to Lipka and Siegel (2011), ELL students were capable of developing word reading and reading comprehension skills that were as strong as those of native English speakers. Based on Perie, Grigg, and Donahue's (2005) research, the National Assessment of Educational Progress found that 26% of eighth-grade students could not read material essential for daily living, and overall 68% of secondary students scored below the proficiency. Due to these findings, Perie et al. believed that these skills might be of a challenge, especially to the ELL student population.

Lipka and Siegel (2011) conducted a study that investigated the overall achievement of ELL students compared to their native speaker peers and also examined what leads to reading comprehension difficulties. The participants were 674 students (572 native speakers and 102 ELL learners); the students were classified into three reader groups on the basis of their word reading and reading comprehension abilities. The ELL students ranged from a variety of linguistic backgrounds, from a variety of 33 different languages. The predominant native languages for the ELL students included Cantonese, Mandarin, Korean, Farsi, and Spanish.

The participants were tested using four different types of comprehension assessments (Lipka & Siegel, 2011). The first was the WRAT-3 reading subtest, which asked to read as many words as possible from a list containing words of increasing difficulty. Next, students were tested using the Stanford Diagnostic Reading Test, which is a standardized reading comprehension test where students were asked to read short passages from a booklet and respond to multiple-choice questions about each passage within a limited amount of time. The students were also tested using the Working Memory for Word Task; in this test students were presented with sentences in which the final words were missing and each sentence was read out loud by the examiner.

The results of the study showed that there were similar proportions between ELL and native speakers in regards to proportions of reader groups with good comprehension skills. It was determined that reading comprehension is probably a skill that needed to be taught directly and be implemented in the curriculum. Therefore, Lipka and Siegel (2011) concluded that instruction and interventions that target reading comprehension skills should include reading comprehension strategies as well as phonological awareness, working memory, syntactic awareness, and morphological awareness components.

Other studies have been conducted with children who speak English and ELL learners have highlighted some problems with frequently used measures of reading comprehension. One such study was that of Grant, Gottardo, and Geva (2012). The purpose of their study was to compare measures of reading comprehension and examine the skill profiles related to performance on reading comprehension based on commonly used criteria, decoding, and vocabulary knowledge. Grant et al. utilized similar methods of assessing the students as Lipka and Siegel, in which the students were assessed in a variety of categories in order to

determine their comprehension skills at different aspects of learning. There were 195 participants (64 Portuguese, 66 Spanish, and 65 Cantonese), who were tested using the oral proficiency tests, word identification, phonological awareness, gray oral reading test, the Woodcock Language Proficiency Battery-revised Test, and the Matrix Analogies Test.

The study concluded that for younger ELLs who were progressing well on measures of L2 reading acquisition, there were more similarities than differences in the relationship found between performance on measure of language, word reading, and reading comprehension across language groups. Grant et al. (2012) also concluded that there were relationships among variables similar for these ELLs as for monolingual English speakers, suggesting that these measures were equally valid for groups of readers who were achieving within the average range in second grade regardless of their L1 status.

To further explore ELL comprehension, studies were conducted on the contributions of background knowledge and reading comprehension strategies to L2 reading comprehension. McNeil (2010) found that background knowledge and reading comprehension strategies, operationalized as self-questioning, combined to account for a significant portion of variance in reading comprehension scores, with self-questioning being the stronger predictor of reading comprehension than background knowledge.

Anderson and Pearson (1988) wrote, "to say that one has comprehended a text is to say that she has found a "home" for the information in the text, or else that she has modified an existing mental home in order to accommodate that new information (p. 37)." While background knowledge may enhance comprehension, its impact seemed to be limited. Carrell (1991) explained that low L2 language knowledge readers do not use their background knowledge because they were text-bound and must meet a minimum threshold of

L2 language knowledge in order to be able to apply background knowledge to any text they came in contact with.

Another study conducted by Al-Shumaimeri (2006) suggested that L2 level readers showed no effect for background knowledge because "their language knowledge freed their cognitive resources to make effective use of skills and strategies of their comprehension procedures (p.12)," therefore, having background knowledge having background knowledge that was relevant to the text assisted in comprehension. The study had 22 participants enrolled in a reading course in an Intensive English Program (IEP) at a large university in northwestern United States. The participants' background ranged from eight countries including China, Japan, Korea, Libya, Malaysia, Saudi Arabia, Thailand, and the Ukraine. Their ages ranged from 20 to 36 years old, with a median age of 24. They had all completed high school in their home countries and were enrolled in the IEP in order to study at US universities.

During the study the participants were divided into two groups which met twice a week for an hour and a half each meeting. The course ran for eight weeks long and both groups were taught from the same book-*Academic Encounters: Life in Society* (Brown & Hood, 2002). The teachers for both groups worked together to create lesson plans, so that both classes covered the same material during each class period. The data collection methods were through questionnaires, and self-questioning which took place over ten days and included three stages. The results showed that while background knowledge and self-questioning combined accounted for 56.7% of L2 reading comprehension variance, the overwhelming majority of this explained variance which came from self-questioning.

A similar study conducted by Taboada and Guthrie (2006), also demonstrated that background knowledge accounted for 23% of comprehension, while disciplined related background knowledge accounted for up to 30% of the reading comprehension scores. Consequently, in both studies there was a weak association of background knowledge and reading comprehension, in which background knowledge may not explain large portions of reading comprehension variance when other variables are accounted for.

While background knowledge might have played a role in L2 comprehension, there has to be explicit instruction in order for nonnative speakers to achieve comprehension of text and content. Manyak and Bauer (2008) suggested that strategies such as use of visual aids, gestures, facial expressions, providing opportunity for extended talk, and deliberately defining key words in the directions, the phonemic awareness, phonics lessons, and the reading texts. These strategies seemed to have inarguably proved that comprehension instruction was critical to the long-term achievement of ELLs. It was also important to note that research had demonstrated that ELLs may comprehend more when they were able to communicate orally in English (Garcia, 1991; Moll & Diaz, 1987).

The overall understanding regarding ELLs and comprehension varied amongst the research already conducted. One particular aspect that had been considered unanimous amongst all the studies was that ELL comprehension depended on a facet of different learning strategies. Some of these strategies included already discussed ones such as collaborative learning, think-pair-share, along with the use of graphic organizers and inquiry-based approaches. Along with these strategies ELLs needed challenging experiences as much as native speakers because hands-on inquiry based science was an effective way to promote academic language in English (Lee & Buxton, p. 4, 2010). According to Lee and

Buxton (2010) although these strategies aided in the development of ELL comprehension, further research into the relationship among background knowledge, reading comprehension strategies, and reading comprehension will help the field better understand how variables operate in an interactive manner.

Summary of the Literature Review

Based on my own personal experiences, English language learners come into the educational system with limited to almost no first language experience. These students needed assistance in developing background knowledge pertaining to what will be read, learned and studied, thus connecting what is known with what will be learned. According to Ediger (2009), it was good to have students relate the content to their own personal lives in terms of uses to be made of the information. Learning acquired needs to be extended in order to emphasize in-depth understanding of vital facts, concepts, and generalizations.

When presented with various different learning strategies and testing, ELL students' performance varied amongst each. This was due to whether the students had prior schooling, previous exposure to the English language, and engagement with the text, as well as strategies to use in order to be able to comprehend the text. Some researchers suggested that these factors affected the ability of an ELL student to comprehend varied amongst where they came from and the type of exposure they had to school.

According to Nabors and Edwards (2011) teachers must develop and implement lessons designed to ensure success and mastery for both English language proficient students and the ELLs involved in the same lesson. The Nabors and Edwards (2011) also concluded that teachers need to view the inclusion children who are learning English as an enrichment opportunity for everyone; children who are learning English as a second language, English

speaking students, and even themselves. Nabors and Edwards (2011) also believed that wise teachers embraced classroom diversity and created an atmosphere where all children could thrive and progress.

Overall, the literature on the topics of comprehension, the use of graphic organizer and multiple response strategies, as well as ELLs comprehension concluded that implementing a variety of different methods in teaching ELLs content or text works best to support their learning. Both the students as well as teachers played the important role of determining the ability of the students to comprehend text. Arthurs and Templeton (2009) suggested that multiple response strategic activities were perceived as being very helpful by the students and suggested that they helped in improving students learning gains and attitudes about learning. Even though research has been conducted that supported reading ELL comprehension, further research needs to be conducted due to the current and ongoing changes in student demographics.

Chapter III

Methods

Participants

The participants in this study were 27 children enrolled in a 6th grade class at a public elementary school in a low to middle class urban district in northern New Jersey but due to language conflict only 12 students were the chosen participants for the study. The school curriculum was a comprehensive curriculum with a review cycle with annual modifications based upon needs determined by district and state assessments results. Teachers created lesson plans based on the curriculum guides which were aligned with the common core state standards. The class duration was of 1.25 hours including time for individual and group work based on the daily science lessons.

The participating group consisted of 7 girls and 5 boys, all between the ages of 10 and 12 years old. This class was a Bilingual mainstream classroom, consisting of one Puerto Rican student, and 11 students from the Dominican Republic. The primary language spoken at home for all 12 students was Spanish. More than half of the group (9 students) had two working parents, while two of the families had one working parent.

During the study, there was one teacher and a paraprofessional working in the classroom. The teacher-researcher was the head teacher, working with the paraprofessional between the hours of 8:25 a.m. and 3:15 p.m. The head teacher had a Bachelor of Liberal Studies concentration in Biology, held teaching certifications in Kindergarten to Grade 5, a sixth through Grade 8 middle school Science, and a Bilingual certification, and was in the process of completing a Master's Degree in Bilingual/ESL Education. At the time of the study, she had been teaching sixth grade for 2 ½ years at this school as a Spanish bilingual

science teacher. The paraprofessional had 21 years of experience working with children in bilingual Spanish classes and had a Business degree and 99 credits from an accredited college. Both the head teacher and paraprofessional speak both English and Spanish.

Materials

Science Readers

Science readers displayed under each student desk were available for children to read after each science investigation. These books contained science related stories that helped the students further their comprehension of the investigations completed in the class.

Pre- and Post-Assessments

The teacher-researcher created a pre- and post-assessment (Appendix A) test to track what the students knew and what they learned throughout the study. There were 10 definition questions, seven multiple choice questions, and three open-ended questions that the students had to answer in relation to the Earth Processes unit. Along with the test was a rubric to score each student (Appendix B).

KWL

Based on the research conducted by Barron (1979), the teacher-researcher created a KWL chart (Appendix C) to use during the comprehension assessment of text. The KWL measured the students' ability to take out the important pieces of information from the content learned.

Venn Diagram

The teacher-researcher also created a Venn diagram (Appendix D) in order to be able to confirm that the students were able to comprehend the material that was presented. The

diagram assisted the students in comparing pieces of information from the text with the actual investigations conducted in class.

Anecdotal Notes

During the class discussions and investigations, anecdotal notes (Appendix E) were taken based on the discussion between the students about the experiments. The teacher-researcher wrote down any comments the students made about their findings and observations. The teacher-researcher also recorded comments made about the steps or processes that they students took in order to arrive at an answer and or conclusion, at the time the teacher-researcher was walking around during activity.

Journal

Along with the anecdotal notes, the teacher-researcher wrote in a journal at the end of each day in order to keep accurate notes on student progress and to be able to reflect on changes that might be necessary in order to ensure that students' comprehension of the text.

Lesson Plans

Lesson plans were created by the teacher-researcher (Appendix F) and were used throughout the study. They detailed the investigations, the story that went along with the investigation, and the students' learning objective. The lesson plans were obtained from Delta Science Modules, Earth Processes (2011).

Procedures

The present study utilized both quantitative and qualitative data collection methods. Quantitative research relies on being an independent observer with a set of instruments, while qualitative research is interested in observing participants, collecting documents,

interviewing, and developing a theory (Goodwin & Goodwin, 1996). The objective of this study was to determine if ELL students' acquire more comprehension of text by having utilized a specific set of instruments.

The study was conducted during four consecutive weeks towards the end of the year. The students that were participating in the study went about their daily routines with no disruptions while data were being collected every day during the study. The teacher-researcher interacted with the students during individual and group activities on a daily basis, but just observed during partner and group discussions as the students discussed their observations and findings. There was a pre-assessment, intervention, and post-assessment.

Pre-Assessment

Before the study began, students were given a pre-assessment (Appendix A) in order to determine how much students' knew about the topics that were going to be covered during the four weeks of study. This was a 20 question assessment, in which the students had to select the correct answer to each question. Each question pertained to topics related to the processes that Earth goes through as it changes due to varying environmental and manmade conditions.

Intervention Daily Procedures

As soon as the students came into the classroom, there was a daily routine that needed to be followed. Students were instructed to take out their notes and write down their objectives and demonstration of learning. Once the students completed this do-now activity, the teacher-researcher proceeded to explain what the students were going to be working with for the day. Each investigation usually took one to two days sometimes even three for the students to complete. Once the teacher-researcher explained the day's lesson, students were

instructed to begin their investigations. While the students were working on the investigation, the teacher-researcher was circling around the room listening to the groups work and recording information.

During the investigations students were giving various tools to assist with the comprehension of the text they were working with. For example, they were given graphic organizers, along with multiple response strategies, which would have facilitated their understanding. The students used a graphic organizer such as the KWL charts in order to write down new information that was learned during the investigation. The Venn diagrams were used to compare and contrast different pieces of information. The teacher-researcher reviewed these materials with the students prior to providing them. At the time of the study students were instructed on how to properly use these tools as well as what sort of relevant information should be included.

On a daily basis, the teacher-researcher collected anecdotal notes while the students were engaged in their investigations. While the students were in their groups each afternoon, the teacher-researcher strategically placed herself around the room and listened to the students conversations while taking notes. She recorded any dialogue that demonstrated students' comprehension of the text they were working with. Notes were taken such as who was speaking, to whom, and what was being discussed, were written in a designated journal.

Post-Assessment

Immediately following the completion of interventions and daily procedures, the participants were once again given the pre-assessment in order to determine if they students had made any progress in learning the material presented during the four weeks of study.

Table 1 displays the lessons occurring during the study.

Table 1

Weekly Lesson 1 to 4

Week 1:	• Pre-Assessment • Activity 1 • KWL • Anecdotal notes • Journaling
Week 2:	• Activity 2 • Venn Diagram • Anecdotal notes • Journaling
Week 3:	• Activity 3 • Think-pair-Share • Anecdotal notes • Journaling
Week 4:	• Activity 3 Continued • Turn and Talk • Anecdotal notes • Journaling

Data Collection

The data collected in this study were used to examine the effects of graphic organizers, and multiple response strategies on a student's comprehension of text, as well as the difference between the two methods on student comprehension. The teacher-researcher used daily data collection in order to obtain sufficient data to thoroughly answer the original research questions.

According to Meier and Henderson (2007), a research project that uses anecdotes, interviews, work samples and photos can create a better understanding of the topic being studied and inspire teacher-researcher reflection; therefore both qualitative and quantitative methods of collecting data were utilized. According to Thomas (2007), the qualitative approach usually describes participants and experiences without interest in amounts or numerical statistics, as daily anecdotal notes described students' comprehension of text.

Along with qualitative data collection, quantitative method of data collection was also utilized to determine the effectiveness of the tools used in order to elicit comprehension. The quantitative instruments used included the pre- and post-assessment tests as well as the graphic organizers. Unlike qualitative methods, the quantitative tools yielded results in the form of amount or frequencies (Thomas, 2007) to be analyzed by the teacher-researcher.

In the study, the role of the teacher-researcher was one of a participant as an observer (Goodwin & Goodwin, 1996). As the students worked on their investigations, the teacher-researcher observed and collected data about students' discussions, as well as being completely involved in the teaching process and in conversations with the students. The teacher-researcher was the only one involved in the comprehension activities with whole group as well small group by taking anecdotal notes. The objectivity throughout the study

was maintained by the use of five data collection methods, with previous knowledge of the students being omitted from the gathering and analysis of the data. Table 2 visually, displays the data collection methods in relationship to the three research questions being studied and answered in this research.

Table 2
Data Collection Methods

Research Questions	**Pre- and Post-Assessment**	**KWL**	**Anecdotal Notes**	**Venn Diagram**	**Journal**
What affect does using graphic organizers have on ELL students' comprehension of text?	**X**	**X**		**X**	**X**
What affect does using multiple response strategies have on ELL students' comprehension of text?	**X**		**X**		**X**
What is the difference between the two methods on students' comprehension of text?	**X**		**X**		**X**

CHAPTER IV

Results

Overview

The data collected in this study were used to determine the effectiveness of using graphic organizers and multiple response strategies in ELL students' comprehension of text. Data were also used to see the differences on the students' comprehension of text. The data collected demonstrated to the teacher-researcher the extent to which the graphic organizers and multiple response strategies improved students' comprehension of text based on their pre- and post-assessments scores. Both quantitative and qualitative research methods were used to analyze the data collected.

The teacher-researcher utilized a pre- and post-assessment (Appendix A) to record any improvement in the content learned throughout the study. The topics on the assessment were chosen from the material that was being studied. At the end of the study the created a pre- and post-assessment Scoring Rubric (Appendix B) in which each student's scores were listed next to his or her name for the length of the study. The teacher-researcher then reviewed the scoring rubric, looking to see if students' comprehension of text was improved throughout the study.

The study took place over four weeks. Week one served as the pre-assessment and activity 1 week. The pre-assessment was administered to establish present level of understand of the text that was being covered. During the first week, the teacher-researcher also introduced the KWL chart, which students were to use to take notes.

Whole group instruction as well as small group instruction was conducted to identify any connection with the text and the comprehension gained from it. The teacher-researcher led the whole group discussion four times a week using the different activities

that followed the pace accordingly. An activity was introduced according to the teacher-researcher's individualized Lesson Plans (Appendix F). A new activity was used each week.

Once the activity was introduced each week, the students had different methods of recording information regarding the text. During Week One, the students used KWL (Appendix C) chart to write down information they knew, wanted to know and learned about the text regarding the Theory of Continental Drift. Each student's chart was analyzed individually in order to determine their ability to comprehend the text. During Week Two, the students used a Venn diagram (Appendix D), in order for students to compare two main topics in the text regarding the Structure of Earth. Again the students' responses were analyzed individually in order to determine whether students were able to compare to pieces of text. Week Three focused on Earth's weathered crust; in this activity students had to use think-pair-share, in order to help each other comprehend the text. Week four students were introduced to the Turn and Talk strategy. During Weeks One, Two, Three and Four, the teacher-researcher completed anecdotal notes (Appendix E) next to each student's name. She also made daily entries into a journal.

During the last day of Week Four, the post-assessment was administered. The teacher-researcher completed the Scoring Rubric and compared the results to those of the pre-assessment administered during Week One.

Furthermore, the anecdotal notes and journal writing collected by the teacher-researcher were analyzed for both patterns and any connections the students were making between the graphic organizers and the multiple response strategies. Repetitive terms were highlighted in multiple colors in order to guide the teacher-researcher in analyzing

the notes, in order to look for patterns. The correlation between the students' conversations and chosen method of learning between the two strategies would allow for comprehension analysis. The triangulation of four varied data sources used to collect a combination of both quantitative and qualitative data enhanced the dependability and accuracy of the information analyzed in this study (Goodwin & Goodwin, 1996).

Analysis of Data

Hypothesis 1 – Relationship between graphic organizers and students' ability to comprehend text.

It was hypothesized that graphic organizers would increase students' level of comprehension through the development of their own graphic organizers. To test this hypothesis, the teacher-researcher utilized a pre- and post-assessment (Appendix A) to record the students' initial and final knowledge gained about the text that was being learned.

To further test the hypothesis, the teacher-researcher utilized a KWL chart (Appendix C), a Venn diagram (Appendix D), and journaling. The KWL chart consisted of three columns, while the Venn diagram consisted of two circles intertwined, in which the 13 students had to input information related to the activity of the day. Journaling was also gathered at the end of each day, so that the teacher-researcher could reflect on the day's lesson.

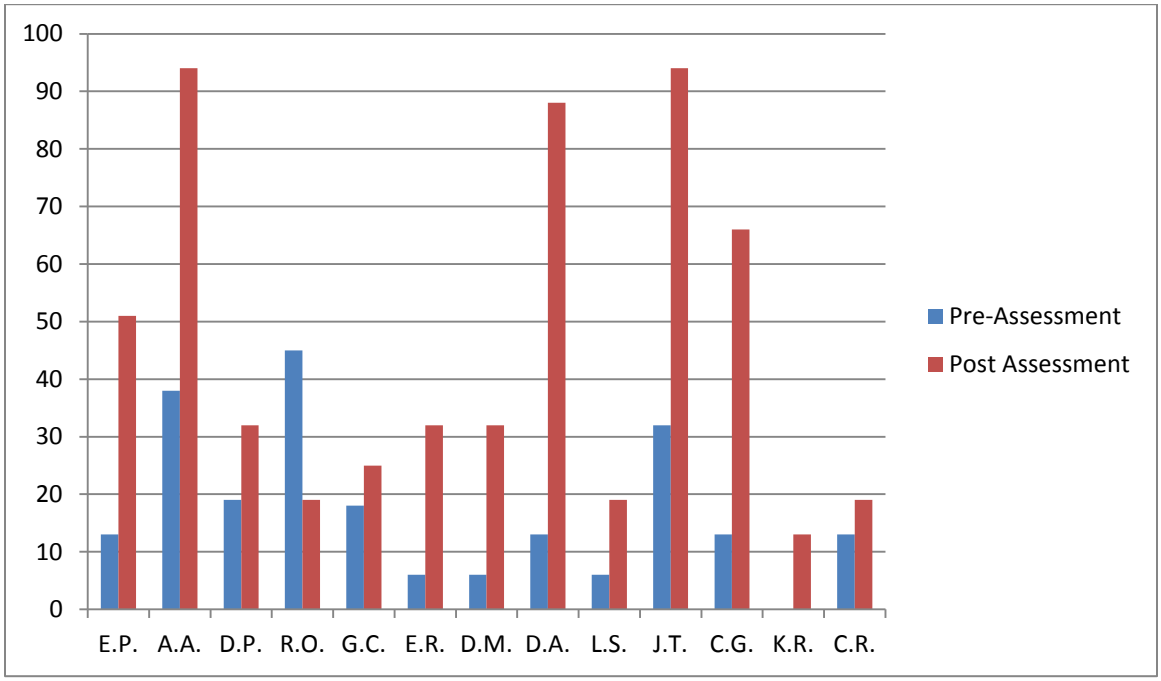
Following data collection, the pre- and post-assessments were scored to determine if the students' made any increase in their scores based on the comprehension of the text presented. The pre- and post-assessment contained a total of 13 questions: 7 were

matching, 4 were multiple choice and 2 were short-answer response for each of the 13 participants.

As noted in Figure 1, the results of the data analysis indicated that most of the students made a significant increase in their scores, but one of the students actually had a decrease in score. These results supported the hypothesis that the use of graphic organizers increases the level of student comprehension of text because there was significant growth in scores, not necessarily to a passing level but nonetheless an increase.

Figure 1

Pre- and Post-Assessment Scores



Furthermore, journal notes were analyzed for patterns and acceptance of the use of graphic organizers. There were a total of 12 journal entries recorded over the course of four weeks. The data were separated into three categories based on the observed dialogue: liked it (helped), not very helpful, and did not like it (didn't help). Out of the 12 journal entries, the students observed dialogue varied. Based on the results the hypothesis was supported because those students who either preferred one over the other, both or were not sure demonstrated an increase in their score. The results are summarized in Table 2.

Table 2

Patterns and Acceptance of Graphic Organizers (KWL and Venn diagram)

Type of Organizer	**Like it (Helped)**	**Not Sure**	**Didn't Like it (Didn't Help)**
1. KWL	5	4	4
2.Venn Diagram	7	2	4

Total number of students = 13

Based on the results from the KWL and Venn diagram the students demonstrated an increase in their overall comprehension. These tools helped in overall students' comprehension of the complex science text they were working with. Looking at the pre-assessment scores and later at the post-assessment scores we can determine that the KWL and Venn diagram were effective in the students learning.

In conclusion, the data collected from the pre- and post-assessment as well as the journaling concluded that the students' comprehension of text increased from the pre-assessment to the post-assessment. Furthermore, the analysis of the journal notes demonstrated that the students whether they liked the graphic organizer or not showed improvement. Therefore, the results showed that utilizing graphic organizers did help ELL students in their comprehension of text, thus Hypothesis 1 was founded.

Hypothesis 2 – Relationship between Multiple Response Strategies and Students' comprehension of text.

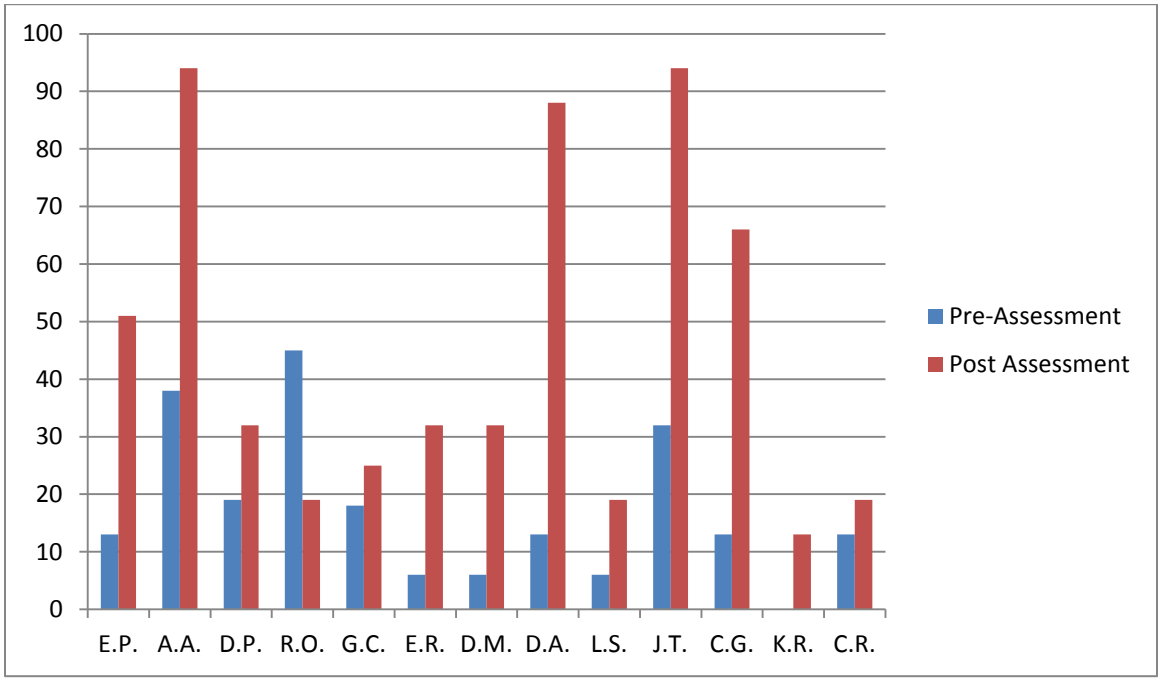
It was hypothesized that multiple response strategies would allow students the opportunity to develop their comprehension skills through a wide range of activities. To test this hypothesis, the teacher-researcher utilized a pre- and post-assessment (Appendix A) to record the students' initial and final knowledge gained about the text that was being learned. The teacher-researcher also utilized two multiple response strategies in order to determine if comprehension of text was obtained. The multiple response strategies used by the teacher-researcher included Think-Pair-Share and Turn and Talk.

To further test the hypothesis, the teacher-researcher utilized anecdotal notes and journaling. The anecdotal notes were recorded to investigate the dialogue between students during their group/partner work in order to determine which strategy students liked best.

Journaling was also gathered at the end of each day, so that the teacher-researcher can reflect on the day's lesson. Subsequently, the pre- and post-assessments were scored on the Rubric sheet in order to determine whether there was an increase in student scores. The results showed that three students had a big increase in score, one student had a decrease in score, and the other nine students also had a significant increase in their scores. Figure 2 shows this change in scores.

Figure 1

Pre- and Post-Assessment Scores



The teacher-researcher analyzed the anecdotal notes as well as the journal entries for trends of growth in text comprehension, based on using the different multiple response strategies. There were a total of 12 journal entries recorded over the course of four weeks along with 12 anecdotal notes entries. The data were separated into three categories based on the observed dialogue: liked it (helped), not very helpful, and did not like it (didn't help). Out of the 12 journal entries, the students observed dialogue varied. Based on the results the hypothesis was supported because those students who either preferred one over the other, both or were not sure demonstrated an increase in their score. The results are summarized in Table 3.

Table 3

Patterns and Acceptance of Multiple Response Strategies (Think-Pair-Share and Turn and Talk)

Type of Organizer	**Like it (Helped)**	**Not Sure**	**Didn't Like it (Didn't Help)**
1. Think-Pair-Share	10	0	3
2.Turn and Talk	9	0	4

Total number of students = 13

The anecdotal notes and journal entries revealed that 10 out of the 13 students felt that the Think-Pair-Share strategy was very helpful in aiding them to remember the text learned, while three of the students felt that it wasn't helpful because the other students were participating in the activity. In relations to the Turn and Talk, 9 out of the 13 students felt that it also helped in the acquisition of learning the text, while four did not like the strategy because they didn't want to talk; these were my quiet students, when asked why there were not participating, student responded by saying "no," and they faces turned red which was an indication of being embarrassed.

In summary, the results showed that even though there is preference between one over the other by some of the students, whichever one they used helped in their ability to comprehend the text better and helped them perform better on their test. Therefore, the results supported the hypothesis that multiple response strategies help ELL students' comprehend text.

Hypothesis 3 – Difference between Graphic Organizers and Multiple Response Strategies

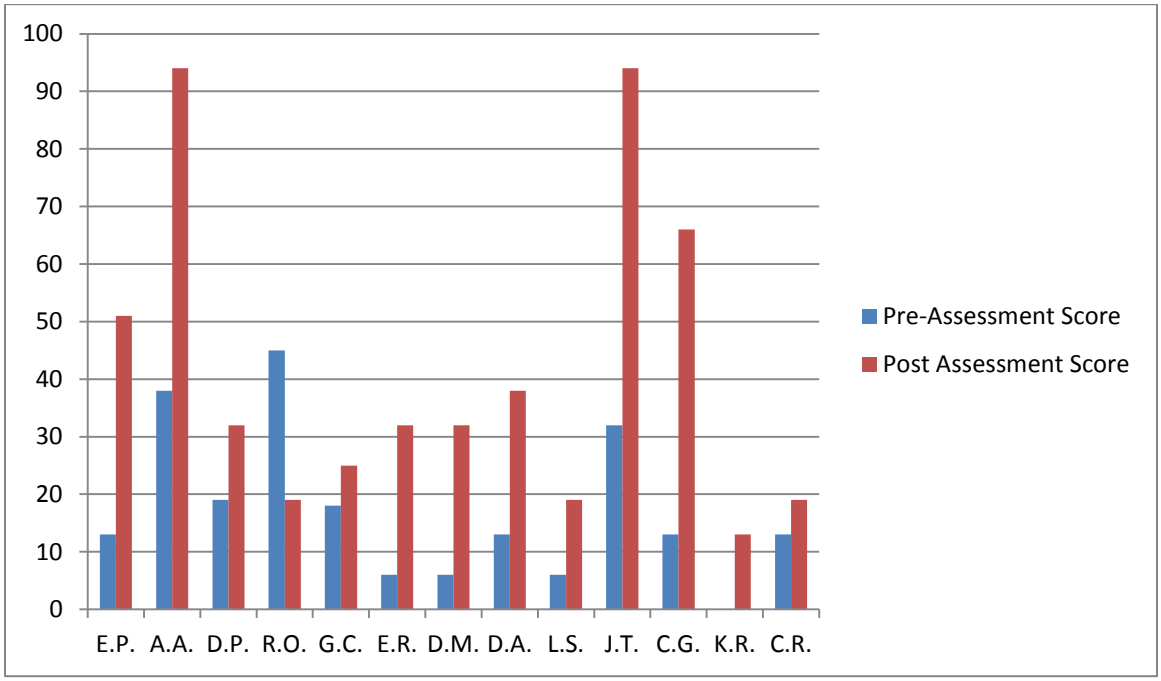
It was hypothesized that graphic organizers would a better tool for ELL students to comprehend text than multiple response strategies. To test this hypothesis, the teacher-researcher analyzed the pre- and post-assessment scores to determine if there were any changes in scores. Anecdotal notes along with journal entries were used to determine whether students preferred one over the other during their discussions.

Following the data collection, the students showed an increase in score from their pre-assessment to their post-assessment. A percent increase was calculated for each individual student to determine what their percent increase was after the four weeks by taking their post-assessment score and subtracting it from the pre-assessment score. The score revealed

an average ranging from 6% to a 56% increase, while one student had a decrease in percentage of -26%. The total average percentage was 28.2%. The total scores are shown on Figure 1.

Figure 1

Pre- and Post-Assessment Scores



Finally, upon analysis of pre- and post-assessment scores, it was found that 99% of the students showed an improvement in their scores, while 1% demonstrated a decrease in score. Overall, the data collected from the anecdotal notes and journals entries indicated that the students had retained a lot of the text that was presented to them through the use of the methods presented. The anecdotal notes and journals revealed that the students did not have a preference as to which strategy they used. For the students both methods helped in their own way to support their comprehension of the text. Therefore, the results do not support the hypothesis. The students used both methods to support their comprehension.

Additional Research Questions

The teacher-researcher posed further questions in addition to the formal hypotheses of this study. The first question was: Which of the two strategies did students prefer? Based on the results from the anecdotal notes and journal entries there was not conclusive factor that determine students' preference between graphic organizers and multiple response strategies. Both methods assisted the students equally in comprehending the text.

The second question was: Does the use of graphic organizers and multiple response strategies differ across levels of students? Based on the findings those students who had a higher level were more open to utilizing the graphic organizers and multiple response strategies, while the students who were at a lower level had a difficult time figuring out how to properly use them. This suggested that regardless of the level of the students, they were still able to perform higher on their post-assessment. If given the proper tools and support ELL students could improve in their comprehension level.

Summary of Results

The results supported the hypotheses regarding the use of graphic organizers and multiple response strategies. As expected, the students were able to use both methods in order to improve in their comprehension of text. However, the hypothesis regarding graphic organizers being better than the multiple response strategies was not supported. No substantial differences were shown between the preferences of either method.

CHAPTER V

Discussion

In the present study, quantitative and qualitative data provided a complementary framework for understanding ELL students and their comprehension of text utilizing multiple response strategies and graphic organizers. Some of the findings were expected, however, there were some unexpected discoveries related to which of the two methods students would rather pick. The following discussion will attempt to examine the implications of the results that both support and contradict the hypotheses of this study.

Hypothesis I – Relationship between graphic organizers and students' ability to comprehend text.

As predicted, the students' comprehension of text increased with the use of the graphic organizers. Prior to the study, the teacher-researcher did not notice that the students' utilized graphic organizers as a way to take notes for later studying. As the introduction to the graphic organizers took place during Weeks One and Two, the teacher-researcher began to notice that some of the students began to use them more frequently and even in other classes. As indicated by the data analysis, most of the students in the class increased in comprehension by the end of the study. This finding was consistent with the literature stating that graphic organizers are an effective tool. The results demonstrated that the experimental group of students improved in all five types of reading to the controlled group of students (Sam & Rajan, 2012).

The findings of this study along with the corresponding literature denote that when students are given the opportunity to create their own graphic organizer to better understand text, they rise to the occasion. According to Barron (1979), when students come out with

their own organizers, they develop their thinking skills. If teachers can avoid providing students with readymade graphic organizers, students would motivate themselves by designing their own graphic organizers.

Furthermore, the study also showed in order for ELL students to comprehend text, they need to be exposed to meaningful ways of attaining the material as noted in the data collected. According to Demachkie and Oweini (2011), inevitably, the level of comprehension among students fluctuated; thus it was necessary to include not only collaborative prospects, but also time for students to independently "approach and read texts in a strategic fashion – first choosing and then using the appropriate strategy or strategies, given their purpose for reading" (Gable et al., 2007, pp. 46-55).

Moreover, the findings by Sam and Rajan (2012) were also parallel to the observations made in Koda. Koda (2007) also confirmed that graphic organizers help readers in identifying the required information from the material, classifying or arranging them in templates which are creatively constructed by the readers themselves and they also guide reader in drafting similar information in a different context. Therefore, it was suggested to use graphic organizers in L2 reading classroom for better learning process and better output.

Hypothesis II – Relationship between Multiple Response Strategies and students' comprehension of text.

As anticipated, students who utilized multiple response strategies increased in their ability to comprehend text. It was specially noted that prior to the study ELL students had a much harder time comprehending text. Only a few of the students that were being studied supported the findings of Smart and Marshall (2012), in which they asked their peers for help when confronted with difficult text. In that study, when students referred to their peers for

advice fostered an environment in which students were comfortable in answering questions to each other. It also led to an increase in higher order thinking on the students' part from prompts provided by the teacher. Within the same study by Chin (2007) and Morge (2005) also confirmed that higher-order questioning allowed for teachers to formatively assess student understandings. Therefore, having student's turn-and-talk to each other reinforced comprehension and understanding of text presented.

Additionally, the work conducted by Alozie et al. (2012) also determined that students who are required to interact and communicate with one another, thereby creating a cohesive understanding of complex text in content areas. It also showed that teachers who enacted this type of teaching and learning have shared how students' achievement has increased. The study concluded that therefore, students become lifelong learners and are more prepared for future problem-solving experiences.

Prior studies have also shown that coupled activities were perceived as being very helpful by the students and suggest that they helped to improve student learning gains and attitudes about learning (Arthurs & Templeton 2009). Along with Bransford et al. (2000) who also confirmed that learner-centered strategies helped students recognize and use their existing knowledge, preconception skills, and attitudes to facilitate their learning, the present study also helped confirm that as well. This finding implied that students benefit from being engaged in multiple response strategies in order to increase their level of comprehension of text. It also signified that the students develop a better engaging and interactive environment with each other, which leads to a deeper learning within the classroom.

Hypothesis III – Difference between Graphic Organizer and Multiple Response Strategies.

Contrary to the initial expectations, graphic organizers were not a better choice over multiple response strategies amongst the students. All the students used the tool that best helped them achieve comprehension of the text. Prior to the study, there were no observations of students trying to utilize tools to aid in the comprehension of text. By the end of the study, almost 100% of the students were either using graphic organizers or the multiple response strategies to aid in text comprehension. These findings supported the results of Carrell et al. (1989). In that study, research indicated that comprehension strategies can be taught and that teaching them with tools enhances comprehension.

Additionally, Song (1998) also concluded that significant improvements in comprehension were achieved if students were provided with the proper explicit instruction and materials to support their comprehension. These results also supported the findings of Beck and McKeown (2006). In that study, they concluded that providing ELL students with collaborative strategic comprehending reading break-down texts into small sections, and allowed students to discuss meanings. It also helped the students to clarify confusion, and apply specific comprehension strategies while reading, thus offering real-time support for ELLs developing understanding of text and, at the same time, providing them with opportunities to participate in rich discussion.

Additional Research Questions

Informal observations, anecdotal notes, and journal entries suggested that there was no conclusive factor that determined students' preference between graphic organizers and multiple response strategies. While students that participated in the study ranged from learning levels of L1 to L4, it appeared as if they all benefited from the two strategies. Both methods assisted the students in comprehending the text.

Observations also suggested that the practice of showing the students the different tools that would assist in comprehending text impacted their ability to actually comprehend the science content being learned. Two strategies that were introduced to the students were graphic organizers and multiple response strategies. The one graphic organizer used was the KWL chart, in which students had to input information based on their prior knowledge, what they wanted to learn and what they did learn. The other strategy used was the turn and talk multiple response strategy. The teacher-researcher noted that the students' seemed to be interested in utilizing these strategies when working with the science content.

Conclusions

This study was conducted for the purpose of determining if explicit instruction with graphic organizers and multiple response strategies would improve ELL students' comprehension of text. Based on the results, in general it is difficult for ELL students' to comprehend text due to their lack of L2 language acquisition. ELL students' tend to transfer what they know from their L1 into the L2 language but most of the time it is not correct, either because they lack the skills in their native language to be able to transfer over into the L2 language. This was also proven in the present study because there were instances in which students made errors which correlate with a L1 transfer of language. A major role for

a Bilingual teacher is to provide the ELL students with skills and strategies to assist them in developing the skills necessary to acquire text comprehension.

The problem that prompted the teacher-researcher to conduct the present study was that she noted how her ELL students were having a difficult time attaining comprehension of the text being presented. The students were not retaining or making sense of the content being taught in science class. The teacher-researcher and paraprofessional were left to figure out how to help the students grasp the abstract concepts that they were being faced with.

The Lipka and Siegel (2011) study discussed that for ELL students' reading comprehension is a persistent difficulty. In that study Lipka and Siegel (2011) used students in grade 7, in order to determine their reading comprehension levels. In the study the students were able to increase in their comprehension level but only if provided with appropriate instruction, thus demonstrating that if ELL students are given the proper tools they can increase in comprehension.

Another important factor for the teacher-researcher was to see whether the children could comprehend text by utilizing the graphic organizers and multiple response strategies provided. The students were introduced to two different methods that they could use in order to assist in comprehension. The teacher-researcher presented the students with a KWL chart and modeled how to accurately use it. Along with modeling how to use the multiple response strategy, the teacher-researcher and paraprofessional modeled how to accurately use the method when experiencing difficulty comprehending a concept. As the study went on students began to utilize and apply the tools presented throughout the study without being told to do so.

Educational Implications

There were several educational implications to consider with these findings. One was that students needed to be taught directly how to properly utilize the tools that would assist them in comprehension, also that these skills needs to be included and/or implemented in the curriculum. Comprehension is not is something that many students struggle with. Students might be able to read a text, but to actually understand what they are reading is something different. These skills and tools need to be monitored over the years across all students not just ELLs in order to identify the students that are having difficulty in this area. According to Lipka and Siegel (2011) those will be the students that will have the challenges "reading to learn" as opposed to learning to read.

When considering using graphic organizers and multiple response strategies with ELL students, educators need to be aware that ELL students have difficulty figuring out what is important and/or how to properly use them. Specific and thorough modeling through teaching is an essential strategy to support proper learning for these students. When ELL students' are shown how to properly use these tools, they can incorporate them in any other subject area.

Overall, this study demonstrated that ELL students can learn to understand text by utilizing graphic organizers and multiple response strategies. In addition, based on the results of the study, it was shown that students were able to increase in their scores (pre-assessment to post-assessment) after being taught to properly use these strategies in their science class. Moreover, graphic organizers and multiple response strategies help readers in identifying the required information from the material. The teacher-researcher suggests that educators utilize and spend time explicitly teaching ELL students' how to use graphic

organizers and multiple response strategies. Since the study showed that ELL students retain information better and produce better output in the classroom, such methods of presenting information such as graphic organizers and multiple response strategies should be used.

Limitations of the study

There were some limitations to this study that may have affected the results for the proposed hypotheses. The sample for the analysis in this study was small, consisting of only 13 students over a course of four weeks. Further research is needed, perhaps with a larger sample size for a longer duration, to see if the results would vary from this study to those studies to the present. Also further research is needed in order to determine the effectiveness of graphic organizers on L2 reading comprehension.

Another limitation was that the teacher-researcher was the active observer throughout the course of the study. The data collection was taking place during regular classroom instruction, while the teacher-researcher was simultaneously ensuring students were conducting experiments and readings correctly.

Furthermore, the study was also conducted at the end of the school year, when the students were involved in other activities such as graduation practice, field trips, and sixth grade dance. Conducting another study in which the intervention occurs at the beginning of the school year when there is less activities going on may warrant to see if there are notable differences in the results as compared to the present study.

Another limiting factor in the study was due to the fact that the sample population was taken from one school in an urban district. Most of the ELL students had limited to no prior schooling before entering in our school district. Therefore, additional research is also warranted to determine if the students' limited schooling had an effect on their ability to

comprehend text. Another limitation to the present study was that, there was no specific way to determine whether the graphic organizers or the multiple response strategies truly helped the students' scores increase. Future studies should be conducted to determine the actual effect of each on students score improvement.

Implications for Future Research

While the study allowed the teacher-researcher to study a small group of ELL students, it might be beneficial to do the study with a larger sample group. Having a larger sample size would provide a bigger data sample to use in order to draw more reliable conclusions. Along with having a larger sample size, we might want to consider using a wider school setting, such as using a suburban school setting in order to further investigate whether the environment has an effect on the ELL student's comprehension of text.

Additionally, the participants in the study were predominantly from the same cultural background, with the exception of three of the participants. The teacher-researcher suggests further research is needed to consider the impact of having children from other cultural backgrounds as well as comparing these students to non-ELL students. In this manner, we are able to determine if students that come from a particular region need more assistance in the comprehension of text.

Finally, a study regarding the effects of graphic organizers and multiple response strategies could be more effective if performed over a longer period of time. Recording ELL's use of graphic organizers and multiple response strategies for a whole school year would provide further analysis on how effective these strategies are in aiding in comprehension. Once again, we might need to take into consideration the environmental factors, length of schooling, curriculum, and prior knowledge these students might bring with

them. Including this type of information would present a more well-balanced collection of data.

APPENDIX A

Pre- and Post-Assessment

Name: _____ **Date:** _____

Unit Test: Earth Processes

Part A: Vocabulary

Choose the correct vocabulary word for each definition. Write the letter on the line.

Definitions

_____ 1. The dropping of eroded material in a new place.

_____ 2. Theory that huge pieces of Earth's solid crust move very slowly.

_____ 3. Breaking down of rocks into smaller pieces by water, wind and other forces.

_____ 4. Huge land mass that broke up long ago into today's continents.

_____ 5. When sediments are often carried away by wind or water.

_____ 6. The physical breakdown of rocks into smaller pieces, gradually reducing them.

_____ 7. Is the breakdown of rock cause by a chemical reaction with other substances.

a. Chemical weathering	b. Continental Drift	c. Deposition	d. Mechanical Weathering
e. Pangaea	f. Erosion	g. Weathering	

Part B: Science Concepts

Circle the letter which provides the best answer to the question.

8. Earth's core is made up mostly of what materials?
   a. the metals iron and nickel
   b. very hot gases
   c. granite and basalt rock
   d. liquid water and solid ice
9. Which of Earth's layers is thickest and contains most of Earth's mass?
   a. crust
   b. mantle
   c. outer core
   d. inner core
10. What was lacking in Alfred Wegener's theory of continental drift?
    a. a similar fossil evidence on different continents
    b. a definition of the term supercontinent
    c. the appearance of matching coastlines
    d. an explanation of how or why the continents moved

11. Acid rain is cause of _____?
    a. mechanical weathering
    b. mass movement
    c. cementation
    d. sedimentary

Write the answer in the space provided.

12. Define weathering, erosion, and deposition.

13. How do chemical weathering and mechanical weathering differ?

APPENDIX B

Scoring Rubric

Student Name	Definitions/ Multiple choice		Short Answer		Score	
	Pre	Post	Pre	Post		

Scores:

Questions 1-11= 6.36 points each Questions 12-13= 30 points each

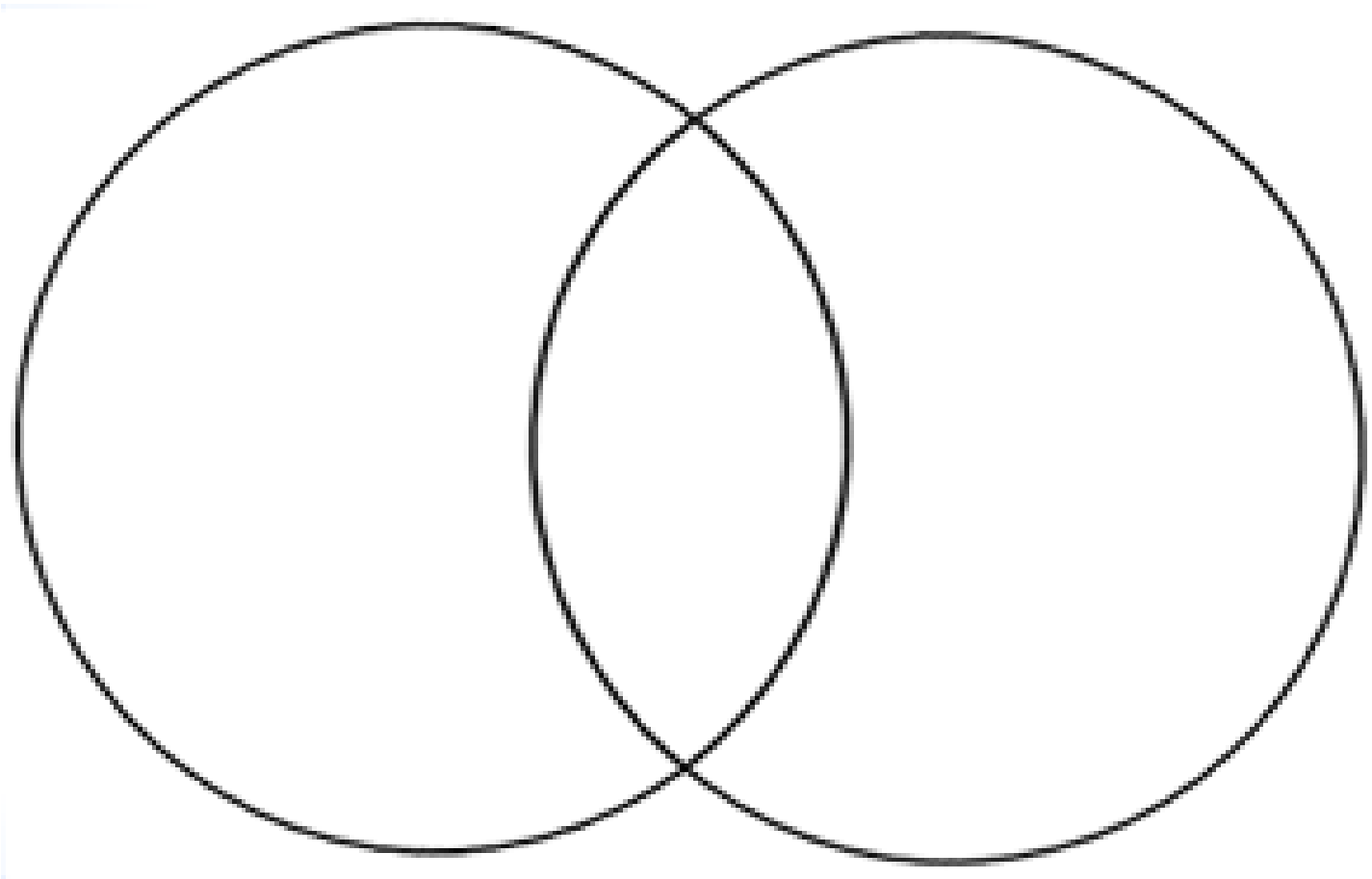
APPENDIX C

KWL Chart

TOPIC:		
What I Know	**What I Want to Know**	**What I Learned**

APPENDIX D

Venn diagram



APPENDIX E

Anecdotal Notes

Date: _____

Student Name	**What was spoken about during walk through?**

APPENDIX F

*Lesson Plans 1-4

*All lesson plans adapted from Delta Science Modules, Earth Processes (2011).

Lesson Plan 1 (2 Days)

1. **Title (of the lesson):** Pieces of a Puzzle
2. **Content Objectives:** Students understand the theory of continental drift and some of the earliest evidence to support this theory.
3. **Learning outcomes of the lesson:**
   - Observe the locations and shapes of the continents on a globe
   - Use paper cutouts of the continents to demonstrate how they fit together somewhat like the pieces of a jigsaw puzzle
   - Explore a variety of rocks and see how their distribution around Earth supports the theory of continental drift
   - Explore several other clues that support the theory

4. **Resources & Materials for the lesson:**
   - Crayons, different colors
   - Magnifier
   - Scissors
   - Fossils
   - Globe
   - Index cards
   - Marker
   - Activity Sheet 1, Parts A and B
   - Different types of rocks: gneiss, igneous, marble, quartzite, sedimentary, and slate
   - Transparent tape

5. **Activities & Procedures (in detail):**

- **Teacher:** Teacher will show students a globe and ask them to imagine that they are scientists who study the structure of Earth.
- **Teacher Asks:** If you were an Earth scientist, what questions might you ask about Earth, based on what you see on the globe? What do you notice about the shapes of the continents?
- **Teacher:** Teacher writes word *Theory of Continental Drift* on the board. Proceeds to explain that this theory states that continents are not stationary, but actually move very, very slowly across the face of the Earth. Teacher proceeds to write the word *Pangaea* on the board. Explain that scientist believed that all the continents were once joined together in one supercontinent called Pangaea meaning "all lands."
- **Students:** Students will look at the globe again, this time they will be looking to see where else can the continents fit together just as South America and Africa do.
- **Teacher:** Students will not be working with paper cutouts of the continents to explore the way in which the continents may have fit together.

- **Students:** Students will be divided into teams of four; each student will get a copy of activity sheet 1, parts A and B, and a pair of scissors. Students will also get a copy of the land mass pattern.
- Once students are completed with their "puzzles," they are to walk around to see how the other teams arranged the continents
- **Teacher asks:** How well did the continents fit together? Did all the teams put the continents the same way? What clues did you use to help you decide how to arrange the continents? Do some of the arrangements of the continents make more sense than others?
- **Teacher:** Tell students that the shapes of the continents were not the only clue scientists use to support the theory of continental drift. They also used rocks.
- Each team will now get a magnifying glass and a bag with each rock sample.
- **Teacher asks:** What similarities and differences do you see among the rocks? Teacher explains that scientists can test rocks to find out when they were formed and whether or not they have the same chemical makeup. **Ask:** How do you think rocks can provide clues about how the continents fit together? Explain that scientists discovered rocks of the same age and composition on opposite sides of the oceans. They think that these rocks must have formed in the same place at the same time but separated as the continents separated. Have students look at activity sheet 1, part B, which shows the location of matching rocks in South America and Africa.
- **Teacher:** Writes the word *fossil* on the board and passes the fossils around for students to examine. **Asks:** What are fossils? Tell students to once again look at part B of the activity sheet, which shows the location of matching fossil remains. Explain that in the same way that matching rocks provide clues for continental drift, so do matching fossils.

  -Example: the fossilized remains of a reptile that lived on land and in freshwater were found in both South America and Africa, two continents separated by a vast of saltwater ocean. Because such reptile could not have crossed the ocean, scientists theorize that the two continents must have been joined at one time.
- **Teacher:** Instruct students to look at the other two maps on par B of the activity sheet. **Ask:** What are some other clues that provide evidence for the theory of continental drift? Teacher writes the work *glacier* on the board. The teacher explains that is a huge mass of ice that moves very slowly, picking up rocks and soil in its path and leaving them behind when it melts. **Ask:** On which continents have scientists discovered glacial rocks of the same age?
- **Students:** Each student will receive four different color crayons, in which they will follow the steps 2 and 3 of activity sheet 1, part A, and answer the questions in order to demonstrate how all these clues support the theory of continental drift.
- **Teacher:** Once the students are finished, have them walk around to see how the other teams put their colored pieces together. Then **ask:** Did everyone put the continents together in the same way? Was it easier or harder to put the pieces together now, compared to before? Why? How is this process like putting together a jigsaw puzzle?

- Review answers to the questions. Tell students to think of the theory of continental drift and **ask:** What evidence have you seen so far to support this theory? List all of the answers.
- Tell students that all the evidence they have observed so far was known when the theory of continental drift was first proposed early in this century, they have been answered and many more clues to support the theory have been discovered.

6. Evaluation plan/criteria:

- Students will be evaluated through informal observations, during teacher-researcher walk through.

Lesson Plan 2 (2 Days)

1. **Title (of the lesson):** The Structure of Earth
2. **Content objective:** Students learn about the inner structure of Earth.
3. **Learning outcome of the lesson:**
   - Students discover that Earth is composed of Layers.
   - Students learn the characteristics of each layer.
   - Students create a mode of Earth and all its layers using a set of concentric spheres.
4. **Resources & Materials for the lesson:**
   - Activity Sheet 2
   - Ball, foam, black
   - Continent shapes, static vinyl
   - Crayon black
   - Crayon blue
   - Scissors
   - Sphere, plastic, large
   - Sphere, plastic, small
   - Cellophane, 30 cm X 50 cm
   - Globe
   - Needle
   - Overhead projector
   - Roll of plastic wrap
   - Ruler, metric
   - String
   - Tape, masking
   - Thread, white
   - Transparency, Earth Cross-Section
5. **Activities & Procedures (in detail):**
   - **Teacher:** Tell the class that their exploration of Earth processes, including additional evidence to support the theory of continental drift, will begin with an examination of the Earth's inner structure. Using an overhead transparency of the cross-section of the Earth, show students that the Earth is not the same throughout, but is composed of layers.
   - Write the terms *crust, mantle, outer core,* and *inner core* on the board. \
   - Point to the board and **ask:** Which of these terms refers to the outermost layer of the Earth?
   - Teacher: Using the overhead transparency point out the crust. Tell students that the crust is the layer of the Earth that contains the oceans and the continents, since the crust is so thin compared to the rest of the Earth, it cannot be shown to scale on a drawing or model.
     Example: the crust that surrounds Earth is even thinner than the layer of pain on a globe, proportionally speaking.
   - **Teacher asks:** What kind of material do you think makes up the crust?
   - Write the words rock and mineral on the board. Tell students that a rock is easy to recognize but more difficult to define. Explain that a **rock** is a relatively hard, naturally formed mass composed of many different grains of minerals that are fused, cemented, or bound together. Tell the students that a mineral is a naturally occurring solid element or compound with specific chemical and physical properties. **Ask:** What is an example of a mineral? Discuss.
   - **Teacher asks:** Now what layer is underneath the crust? Discuss.
   - Identify the mantle on the overhead transparency. Tell students that the **mantle** is the layer of Earth below the crust. It is also made of rock but the rock is slightly

different from that of the crust. Also, because it is under a lot of pressure and because temperatures may reach about 2,100 degrees Celsius, parts of the mantle are molten, or melted, and can flow very slowly.

- Tell students that the very center of the Earth is called the core. Earth's core has two layers, the **outer core** and the **inner core**. Point out the outer core on the overhead transparency of Earth. Explain that the outer core is liquid, but because it is under so much pressure, it does not behave like a normal liquid.
- **Teacher asks:** Which is the innermost layer? Discuss.
- Tell students that now they will make models of Earth that show the inner structure.
- Students will be divided into teams of four. Each student will need a copy of activity sheet 2. Each team will get one black foam with thread attached, one piece of cellophane, two pieces of plastic wrap, one piece of string, one black crayon, one blue crayon, one small plastic sphere, one large plastic sphere, one sheet of vinyl static Continent shapes, one pair of scissors, and several small pieces of masking tape.
- Tell students to follow the directions in steps 1 through 5 on the activity sheet. Advice students that sphere need to be free of dust and dirt before they place the vinyl shapes on them, otherwise they may not stick properly.
- After teams have completed their models, **ask:** In what ways is this a good model? In what ways is this model not accurate? Discuss.

6. Evaluation plan/ criteria:

- Students will be evaluated based on the accurate representation of the interior of the Earth based on their models.

Lesson Plan 3 (2-3 Days)

1. Title (of the lesson): Earth's Weathered Crust

2. Content objective: Students examine the makeup of Earth's crust and explore the role of weathering in the formation of soil.

3. Learning outcome of the lesson:

- Students examine the composition of Earth's crust.
- Students simulate the chemical and mechanical weathering of rocks.
- Students examine the composition of different types of soil.

4. Resources & Materials for the lesson:

- Activity sheet 3, Parts A and B
- Earth model, from Activity 2
- Magnifier
- Pipette
- Tubes, plastic with caps
- Clock, with sweeping second hand
- Container, 1L
- 2 bags gravel
- Roll of paper towel
- 2 bags rocks, marble
- 1 bag soil, clay
- 1 bag soil, sandy
- 2 spoons, plastic
- Roll masking tape
- Vinegar
- Tap water

5. Activities & Procedures (in detail):

Session I

- Have each team retrieve its Earth model from activity 2. To review, **ask:** Where is Earth's crust located? What part of the Earth is underneath the oceans? What is Earth's crust made of? Discuss.
- If students do not mention soil, point out that the surface of the crust in most areas is covered by a layer of soil.
- Instruct students to recall places where they have seen outcropping of rock. **Ask:** In which of Earth's layers were the outcroppings located? What did the rock formations look like? Have you ever traveled along a highway that has had sections of road cut through solid rock? What did you see on the ground at the base of the rock walls? Where else have you observed pieces of broken rock?
- **Teacher:** Show the class samples of the gravel and the two types of soil. **Ask:** Which layer of the Earth do each of these samples come from?
- Write the word *weathering* on the board. Tell students that **weathering** is the process by which rocks in Earth's crust are broken down into smaller pieces. These pieces can very in size from boulders to pebbles to the tiny particles that make up soil.
- Write the terms *mechanical weathering* and *chemical weath*ering on the board. **Ask:** What do you think is the difference between these two types of weathering?
- Explain that **mechanical weathering** is the physical breakdown of rocks into smaller pieces. No matter how small the rock particles become, however they still have the same chemical composition as the original rock. **Chemical weathering**, which is the breakdown of rocks caused by a chemical reaction with

another substance. Chemical weathering results in a change in the chemical composition of the rocks.

- Tell students that mechanical weathering occurs in a variety of ways. **Ask:** What is one example of mechanical weathering? What do you think causes the pieces of rock to break off the rock walls?
- Write the words *wind, water, pressure, temperature*, and *plants* on the board. Tell students that these factors can cause mechanical weathering. Encourage students to suggest how.
- Explain that when a strong wind blows, it picks up sand and blows it against rocks. The result is abrasion similar to that caused by sandpaper on wood, and the rock is gradually worn down.
- Explain that rocks on the surface of the Earth may expand and contract due to rapid changes in temperature or pressure. At some point they will crack into pieces or break apart in layers. **Ask:** Where else besides in rocks can you see cracks cause by temperature changes?
- Explain that plants may grow in these cracks and cause them to expand more rapidly, sometimes splitting the rock into pieces. On steep terrain, these pieces may be pulled down by the force of gravity and break up even more as they tumble to the base of the slope.
- Tell students that water is another powerful agent of mechanical weathering. When water enters cracks in rocks and freezes, it expands and may break off pieces of rock. Weathering also takes place underwater. Rushing water in a stream or river, or the pounding surf along the seashore, bangs the rocks against one another and chips off corners and rough spots, gradually making the rocks smoother, more rounded and smaller.
- To reiterate, **ask students:** How does chemical weathering differ from mechanical weathering?
- Write the terms rainwater, oxygen, and acid rain on the board. Tell students that all of these factors can cause chemical weathering. **Ask:** Where does the oxygen that causes chemical weathering come from?
- Explain to students that many of the acids that cause weathering are released from dead plants and from the roots of growing plants. Pollutants in the air create acid rain, which also causes chemical weathering.
- **Teacher asks:** Where have you seen examples of chemical weathering?
- Explain that rocks that have been pitted by chemical weathering are then attacked by freezing water, and mechanical weathering continues the breakdown of the rocks.
- Tell students that they will now demonstrate both chemical and mechanical weathering. The class will be divided into teams of four. Each student gets a copy of activity sheet 3, part A. Distribute to each team one piece of marble, one pipette, two plastic tubes with caps, a magnifier, a paper towel, and a piece of masking tape. Point out the materials at the distribution station. Tell students to follow the directions in step 1 on part A of the activity sheet and to answer the questions in that section. Discuss answers to the questions in step 1.
- Have students follow the directions in step 2 on part A of the activity sheet.

- When students have completed step 2, assign each team a number, which represents the number of minutes the team is going to shake its tube. Assign two teams to each of the following numbers: 5, 10, 15, and 20. Have students begin shaking their tubes, as described in step 3.
- **Teacher asks:** Why is it important for all of the teams to shake their tubes at the same rate?
- When students have stopped shaking the tubes, have them complete step 4 and then line up their sediments tubes according to the amount of time they shook the gravel. For instance the two groups that shook for five minutes their tubes will be next to each other, etc. Leave the tubes over night to allow the sediment to settle to the bottom.
- Write the word soil on the board. **Ask:** What is soil?
- Inform students that soil is the loose weathered material on the surface of Earth's crust in which plants can grow. Again, show students the two soil samples. **Ask:** Are these the same? How are they different? Make list.
- Explain that all soil formation begins with the weathering of rock. As a result, soils differ depending on the type of rock sediment in soil, as well as the environment in which the soil developed. Point out that even though they were able to produce small amounts of sediments quickly in class, soil formation is a very slow process. It can take a thousand years just for 2.5 cm (1in) of soil to form.
- Tell students that they will separate each type of soil into its component parts to better see how the soil samples are different from one another. Distribute a copy of activity sheet 3, part B, to each student. Give each team two more plastic tubes with caps, and two pieces of masking tape. Instruct students to follow the directions in step 5 on part B of the activity sheet.

Session II

- Distribute one magnifier to each team. Tell students to observe the tubes that contain the gravel sediment from session I. **Ask:** What do you notice about the amount of sediment deposited in the various tubes? How can you explain this observation?
- Point out that soil has four main components. Rock and mineral particles make up about half of all soils. A small but very important component of most soils is organic material the broken down, or decomposed, remains and wastes of plants and animals. In addition, air and water fill in the spaces between sediment and organic particles and each make up about a quarter of most soils. Soil also contains living things, such as insects, earthworms, and bacteria.
- Have students retrieve their tubes of soil and water and follow the directions in step 6 on part B of the activity sheet. Then have then answer the rest of the questions.
- Discuss students' answers to the questions on the activity sheet. Ask: What could you tell about the soil samples after conducting the experiment that you could not tell before by simply observing them?
- **Ask:** To what do you attribute the different colors of the two soils?

- **To wrap up, ask:** What is the connection between Earth's crust, rocks, weathering, and soil? Discuss.

6. **Evaluation plan/ criteria:**
   - Students will be evaluated based on the accuracy of the answers to the questions.

Lesson Plan 4 (2-3 Days)

1. Title of the lesson: Sediments Become Rocks

2. Content objective: Students simulate the deposition of sediments in water and infer how sedimentary rock is formed.

3. Learning outcome of the lesson:

- Students discuss the roles of weathering, erosion, and deposition in the formation of sedimentary rocks.
- Students examine fossils and note their presence in sedimentary rocks.
- Students observe the deposition rates of different-sized sediments in water.
- Students make model sedimentary rocks and compare them to real ones.

4. Resources & Materials for the lesson:

- Activity sheet 4, parts A, B, and C
- Cups, paper
- Magnifier
- Pencil, sharpened
- Spoon, plastic
- Tube, plastic, with cap
- Container, 1L
- Fossils
- 4 bottles of Glue
- 1 bag of Gravel
- 2 bags of Rocks, sedimentary, 5 types
- 2 bags of sand
- 1 bag soil, clay
- 3 spoons, plastic
- 1 roll tape, masking
- Water, tap

5. Activities & Procedure (in detail):

- Divide the class into teams of four. Distribute a magnifier and one of each of the five types of sedimentary rocks to each team. Explain that the rocks of Earth's crust are formed in several different ways. In this activity, they will learn about one of these ways.
- Have students examine the rocks. **Ask:** What is similar about all of these rocks? What is different about the various rocks?
- Write the terms *sediment* and *sedimentary rock* on the board. Tell students that the rocks they are looking at are **sedimentary rocks**, which formed when layers of sediment were deposited one on top of another and became squeezed and cemented together. Explain that **sediments** are small particles of soil and weathered rock.
- **Ask:** Where do the particles that make up sediments come from?
- Write the term *erosion* on the board. **Ask students**: Do you know what erosion is?
- Explain that sediments (soil and small rocks) are often carried by wind or water. This process is referred to as **erosion**. Mention that erosion is especially prevalent after a heavy rain, when runoff from different areas joins together and enters streams. The rushing water carries soil and bits of rock with it. Erosion is also easy to see during a strong wind, after a period of no rain. Then, dry soil and sand particles may be picked up by the wind ad carried through the air.
- **Ask:** Have you ever seen evidence of erosion?
- Point out that weathering and erosion are examples of processes that wear away and break down rocks and landforms. So they are known as destructive forces. However, that is not the end of the story.
- Ask: What happens to the material that is carried away by erosion?
- Write the word *deposition* on the board. Explain that, eventually, earth material carried by wind is deposited on the ground when the wind dies down. Likewise, Earth material carried by water is deposited at the bottom of the body of water when the water slows down. This process is called **deposition. Ask:** What is the Earth material called that is carried away by erosion and deposited somewhere else?
- Explain that, over a long period of time, layers of different kinds of sediment may be deposited in the same place, one on top of another. When subjected to intense pressure from the weight of the layers above, the particles that make up the sediment may be cemented together. **Ask:** What do you think forms when this happens?
- Unlike weathering and erosion, which break down rocks and landforms, deposition builds up rocks and landforms. So deposition is a constructive, not a destructive, process.
- Pass around the fossils for students to examine. Tell them that most fossils are found in sedimentary rock. Explain that as sediments are deposited, the remains of plants and animals may come to rest on top of them, only to be covered by

more layers of sediment. If the rock forms soon after this, the imprint of a skeleton or leaf may be left behind in the rock.

- **Ask:** Do you think there is any difference in the way in which various types of sediment are deposited?
- Tell the students that they will conduct an experiment that demonstrates the formation of layers of sediment. Then they will make a model sedimentary rock.
- Give each student a copy of activity sheet 4, part A, B, and C. To each team distribute three paper cups, one plastic spoon, one plastic tube with a cap, one magnifier, and a piece of tape. Make sure students have a sharpened pencil and access to the materials at the distribution station.
- Instruct students to follow the direction in steps 1 and 2 on part A of the activity sheet, and steps 4 and 5 on part B. Show them where to place their tubes and paper cups overnight.
- When the teams have finished, discuss students' predictions about deposition. **Ask:** What do you predict will happen in the tubes overnight?
- Tell students to discard the empty paper cups, put rest of materials away and clean the area around them.

REFERENCES

Alozie, N. M., Grueber, D. J., & Dereski, M. O. (2012). Promoting 21st-century skills in the science classroom by adapting cookbook lab activities: The case of DNA extraction of wheat germ. *The American Biology Teacher, 74*(7), 485-489.

Arthurs, L., & Templeton, A. (2009). Coupled collaborative in-class activities and individual follow-up homework promote interactive engagement and improve student learning outcomes in a college-level environmental geology course. *Journal of Geoscience Education, 57*(5), 356-371.

August, G. (2011). Spelling facilitates good ESL reading comprehension. *Journal of Developmental Education, 35*(1), 14-16,18,20,22,24.

Bishop, P. A., Reyes, C., & Pflaum, S. W. (2006). Read smarter, not harder: Global reading comprehension strategies. *The Reading Teacher, 60*(1), 66-69.

Bowen, N. K. (2008). Cognitive testing and the validity of child-report data from the elementary school success profile. *Social Work Research, 32*(1), 18-28.

Brady, P. (2006). Student engagement: A neglected aspect of secondary school reform in Ontario. *EAF Journal, 17*(2), 24-42.

Burns, M. K., Hodgson, J., Parker, D. C., & Fremont, K. (2011). Comparison of the effectiveness and efficiency of text previewing and pre-teaching keywords as small-group reading comprehension strategies with middle-school students. *Literacy Research and Instruction, 50*(3), 241-252.

De Jong, T. (2010). Cognitive load theory, educational research, and instructional design: Some food for thought. *Instructional Science, 38*(2), 105-134.

Demachkie, M. O., & Oweini, A. (2011). Using the collaborative strategic reading strategy to improve seventh graders' reading comprehension in Arabic: A pilot study. *International Journal of Pedagogies & Learning, 6*(3), 219-231.

Ediger, M. (2009). Reading comprehension in the science curriculum. *Reading Improvement, 46*(2), 78-80.

Feldman, J., Feighan, K., Kirtcheva, E., & Heeren, E. (2012). Aiming high: Exploring the influence of implementation fidelity and cognitive demand levels on struggling readers' literacy outcomes. *The Journal of Classroom Interaction, 47*(1), 4-13.

Grant, A., Gottardo, A., & Geva, E. (2012). Measures of reading comprehension: Do they measure different skills for children learning English as a second language? *Reading and Writing, 25*(8), 1899-1928.

Lipka, O., & Siegel, L. S. (2012). The development of reading comprehension skills in children learning English as a second language. *Reading and Writing, 25*(8), 1873-1898.

Manyak, P. C., & Bauer, E. B. (2008). Explicit code and comprehension instruction for English learners. *The Reading Teacher, 61*(5), 432-434.

McKeown, M. G., Beck, I. L., & Blake, R. G. K. (2009). Reading comprehension instruction: Focus on content or strategies? *Perspectives on Language and Literacy, 35*(2), 28-32.

McNeil, L. (2011). Investigating the contributions of background knowledge and reading comprehension strategies to L2 reading comprehension: An exploratory study. *Reading and Writing, 24*(8), 883-902.

Mestre, J. P. (2005). Facts and myths about pedagogies of engagement in science learning. *Peer Review, 7*(2), 24-27.

Nabors, M. L., & Edwards, L. C. (2011). Science: A second language for ELL students. *Kappa Delta Pi Record, 47*(3), 133-136.

Sam, P. D., & Rajan, P. (2013). Using graphic organizers to improve reading comprehension skills for the middle school ESL students. *English Language Teaching, 6*(2), 155-170.

Seward, J. J. (2008). Teaching response prompting strategies to special education teachers in Tanzania. (Ph.D., University of Illinois at Urbana-Champaign). *ProQuest Dissertations and Theses,*

Shaw, S., Nihalani, P., Mayrath, M., & Robinson, D. H. (2012). Graphic organizers or graphic overviews? Presentation order effects with computer-based text. *Educational Technology, Research and Development, 60*(5), 807-820.

Smart, J. B., & Marshall, J. C. (2013). Interactions between classroom discourse, teacher questioning, and student cognitive engagement in middle school science. *Journal of*

Zhang, L. J. (2008). Constructivist pedagogy in strategic reading instruction: Exploring pathways to learner development in the English as a second language (ESL) classroom. *Instructional Science, 36*(2), 89-