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High School Science Teachers' Perceptions of Teaching Content-Related Reading Comprehension Instruction

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Abstract

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by

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MA, Columbus State University, 1981

BA, Columbus State University, 1979

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

K-12 Educational Leadership

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Abstract

In order to achieve academic success, students must be able to comprehend written material in content-area textbooks. However, a large number of high school students struggle to comprehend science content. Research findings have demonstrated that students make measurable gains in comprehending content-area textbooks when provided quality reading comprehension instruction. The purpose of this study was to gain an understanding of how high school science teachers perceived their responsibility to provide content-related comprehension instruction and 10 high school science teachers were interviewed for this study. Data analysis consisted of open, axial, and selective coding. The findings revealed that 8 out of the 10 participants believed that it is their responsibility to provide reading comprehension. However, the findings also revealed that the participants provided varying levels of reading comprehension instruction as an integral part of their science instruction. The potential for positive social change could be achieved by teachers and administrators. Teachers may use the findings to reflect upon their own personal feelings and beliefs about providing explicit reading comprehension. In addition to teachers' commitment to reading comprehension instruction, administrators could deliberate about professional development opportunities that might improve necessary skills, eventually leading to better comprehension skills for students and success in their education.

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Dedication

I dedicate this doctoral dissertation first and foremost to the Holy Spirit who has been my guide and strength throughout this dissertation process from the beginning to the end. I love you so much!

Next, I dedicate this doctoral dissertation in loving memory of my wonderful father – Mr. Calvin Jenkins. My father instilled in me a desire to get a good education and to work hard. I have certainly worked hard to obtain this doctorate. I thank you so much daddy; I believe you are rejoicing in heaven over this accomplishment. I love and miss you so much!

I also want to dedicate this dissertation in loving memory of my grandmother – Ms. Lizzie McCotton – who helped me to strive for excellence. You too – along with my parents –instilled in me a desire to learn all I can and to seek after valuable things. Obtaining this doctorate is a valuable thing and I owe so much to you. I believe you are also rejoicing in heaven over this hard earned doctoral degree. I love and miss you too!

Finally, I dedicate this paper in honor of my mother – Mrs. Ethel Jenkins. I thank God that you are still with us. You made many sacrifices to help me obtain a quality education. I would not have gotten this far without your love and support. I love you with all of my heart!

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Chapter 1: Introduction to the Study

Introduction

This qualitative study addressed high school science teachers' perceptions of providing content-related reading comprehension instruction, particularly for struggling readers. Within the United States, a substantial number of secondary students struggle to comprehend content area textbooks. Of particular concern are the problems many students have with comprehending science textbooks (Johnson & Zabrucky, 2011). Johnson and Zabrucky maintained that many students have difficulties understanding the words used in science textbooks. Additionally, many students lack the comprehension strategies needed to extract meaning from the textbooks. Comprehension strategies are mental activities that readers engage in to support comprehension and provide opportunities for learners to monitor their level of comprehension (Palinscar & Brown, 1984).

This study was needed because research has shown that aside from English teachers, very few subject area teachers are equipped to provide subject-related reading comprehension strategies (Goldman, 2012). The results from this study might be useful to classroom teachers and school administrators who make curriculum and instructional decisions.

Chapter 1 includes the following components: the introduction, the background, the problem statement, the purpose of the study, and the conceptual framework. Additionally, this chapter includes the research questions, definitions of key terms, and a discussion of the nature, scope, limitations, delimitations, scope, and significance of the study.

Background

Comprehension is the ultimate goal of reading and is essential for success in school and throughout life (Eason, Goldberg, Young, Geist, & Cutting, 2012). Reading comprehension is the ability to make sense of text or to understand what is read. Additionally, reading comprehension involves reading to learn and not just learning to read. There is a significant difference between the two (Chall, 1983). Learning to read involves learning and applying reading skills in order to decode unknown words and to read with fluency (Duke & Block, 2012; Lesaux, 2012). Chall maintained that reading to learn involves going beyond applying basic decoding skills to being able to extract meaning from text. In other words, effective readers use decoding skills when necessary but are able to go beyond what the text says to what the text means (Goldman, 2012).

Goldman (2012) contended that when students read to learn, they read in order to acquire knowledge, apply that knowledge in various academic situations, and are able to connect information across various sources. However, various studies have revealed that children with poor decoding or word recognition skills will experience serious problems with reading comprehension (Adams, 1990; Lyon, 1995; Torgesen, 2000). Chall deduced that many students have problems making the transition from learning to read to reading to learn, and found that such students need specific instruction as they move from the primary grades to the upper grades where they are required to read more challenging texts.

A substantial number of middle and high school students throughout the United States have difficulties comprehending science texts (Johnson & Zabrucky, 2011).

Secondary students are expected to read proficiently and be able to learn from the texts prescribed in the school's curriculum. However, although many students learned to read in the primary grades, many are unable to "read to learn" science (Herman & Wardrip, 2012). According to Carnine and Carnine (2004), one of the reasons why many students struggle with comprehending science texts is because these texts contain too many vocabulary words and present too many difficult concepts at one time. According to Best, Rowe, Ozuru, and McNamara (2005), science texts mix both familiar and unfamiliar words rather than presenting them in a logical, connected manner better suited to student understanding.

The lack of reading comprehension proficiency is not only problematic for some regular education students, but also for a significant number of students with learning disabilities (SLD) who have difficulty comprehending informational or expository textbooks. Expository or informational texts are written to "explain and describe to the reader new content that has a foundation in truth and/or empirical evidence" (Graesser, Leon, & Otero, 2002, p. 6). Expository or informational texts are written to convey new or unknown facts, theories, and dates in an organized, structured manner (Bakken & Whedon, 2002), which makes expository texts substantially different from narrative texts that tell a story. Science texts, like other expository or informational texts, contain more complex text structures that present even more of a challenge for SLD (Mason & Hedin, 2011). A study by Hall, Kent, McCulley, Davis, and Wanzek (2013) found that SLD are particularly challenged by material in social science textbooks. Based upon statistics from the NAEP 2013 math and reading assessments, only 9% of students with disabilities scored at the Proficiency and Advanced levels in the eighth grade reading assessment (National Center for Education Statistics, 2013).

The lack of reading proficiency is a serious problem. According to Archer (2010) 69% of the students at the middle school where she taught were reading at elementary school levels. Archer noted that 31% of the students were four to eight years behind in reading; 38% were three years behind; and only 31% were at or above grade level. Archer argued that the problem with serious reading deficiencies at high-poverty schools is a national norm. The problems associated with reading deficiencies are especially pronounced for SLD, particularly as students advance to middle and high school and their texts get longer and include more challenging concepts (Carnegie Council on Advancing Adolescent Literacy, 2010). The Common Core State Standards (CCSS) for literacy in history and social studies can be problematic for all students including SLD because the CCSS require students to use higher order thinking skills in problem solving tasks rather than just learning basic facts (Bulgren, Graner, Deshler, 2013).

There are many problems associated with reading comprehension deficits. According to Hernandez (2011), one out of six children who lack reading proficiency by third grade fails to graduate from high school on time. This poor graduation rate for struggling readers is four times higher in comparison to proficient readers. A study by Bridgeland, Dilulio, & Morison (2006) revealed that the unemployment rate is much higher among dropouts than it is for their counterparts who graduate from high school. Bridgeland et al. noted that dropouts are more likely than their peers to live in impoverished conditions and depend upon governmental assistance. Hernandez noted that high school graduation rates for African American and Hispanic students who lacked reading proficiency by third grade were significantly higher compared to Caucasian students with the same reading deficits. Hernandez further noted that the gap in reading achievement between Caucasian and minority students has remained constant despite efforts to increase test scores of African Americans and Hispanics. This persistent achievement gap between minority and Caucasian students presents an ongoing problem for schools and districts throughout the nation, particularly because of provisions in No Child Left Behind ([NCLB], 2001). To address the achievement gap, NCLB established a national education goal: That by the year 2014, all students should be proficient in reading and mathematics. According to Guisbond, Neil, and Schaeffer (2012) documented evidence demonstrates that NCLB has failed in terms of its own goals. It has not impacted academic performance nor reduced achievement gaps.

There is a meaningful gap in the current research literature regarding effective reading comprehension instruction for adolescent students. Ehren, Lenz, and Deshler, (2004) and Goldman (2012) have noted that only a small number of research studies have addressed the problems associated with teaching content and reading comprehension strategies for struggling adolescent readers. The small amount of research devoted to the problems associated with struggling adolescent readers is resultant from the assumption that early reading intervention will prevent the need for later intervention (Ehren et al. 2004; Espin, Wallace, Lembke, Campbell, & Long, 2010). According to Ehren et al., some adolescent students continue to have reading comprehension difficulties even if they received early, intensive intervention in the lower grades. Because of the meager body of research available on content-related reading comprehension instruction for adolescents, I determined that my study was much needed.

This study was needed because reading instruction can enable teachers to provide struggling readers with the additional instructional support to help these students become effective or expert readers. According to Baker and Brown (1984a, 1984b) effective or expert readers are strategic. This means that they have a purpose for reading, and that they make changes or adjustments to their reading for each purpose and for each reading assignment. Additionally, strategic readers use a variety of strategies and skills to extract meaning from reading (Paris, Wasik, & Turner, 1991). A strategy is a plan that the reader develops to accomplish a particular goal or to complete an assignment (Paris, Lipson, & Wixson, 1983; Paris, Wasik, & Turner, 1991). Reading skills are automatic actions that enable a reader to decode and comprehend text with speed and effectiveness. When a strategy becomes effortless and instantaneous, it then becomes a skill (Afflerbach, Pearson, & Paris, 2008). The application of effective reading strategies and reading skills can improve students' self-esteem as they become more proficient readers and the use of comprehension strategies will narrow the gap between unskilled readers and more proficient readers. Teachers may use the results of my study to assist them with developing more effective lesson plans that incorporate reading comprehension instruction.

Statement of the Problem

In order to achieve academic success, students must be able to comprehend material in content-area textbooks. However, a substantial number of middle and high school students are unable to comprehend content-area textbooks. Of particular concern are the problems many secondary students have with comprehending science content (Johnson & Zabrucky, 2011; Roberts, Takahashi, Park, & Stodden, 2012). Johnson and

Zabrucky have suggested that the main reason why students have problems with comprehending science textbooks is their lack of strategies needed to comprehend science concepts.

Although the research indicates that quality comprehension instruction results in noticeable gains in student achievement, it appears that such instruction rarely occurs outside of the English classroom (Block & Pressley, 2002). Some content-area teachers feel their major instructional responsibility is to cover content area material, not to teach reading (Ness, 2007). Goldman (2012) posits that other than English teachers, very few subject area teachers are equipped to teach subject-related reading comprehension strategies.

Purpose of the Study

The purpose of this phenomenological study was to address how high school science teachers perceived their responsibility to provide content related reading comprehension instruction, particularly for students who struggle to comprehend science texts. To do so, I interviewed 10 high school science teachers in a school district in the southeastern United States.

Research Questions

The overarching question of my study was: How do high school science teachers at one high school perceive their responsibility to provide content related comprehension instruction in order to help struggling readers comprehend science content?

Sub-questions were as follows:

1. How do high school science teachers perceive the importance of providing reading comprehension instruction?

2. How do high school science teachers perceive the effectiveness of incorporating reading comprehension instruction for helping all students comprehend science content?
3. What reading comprehension strategies, if any, do high school science teachers report using with struggling readers?
4. How do high school science teachers perceive the need for professional development or other education, in relation to teaching reading comprehension?

Conceptual Framework

I contend that reading comprehension is critical for students' success in science courses. Basic reading involves the ability to pronounce and decode words. However, the ultimate goal of reading is to comprehend the words within a text (Aaron & Baker, 1991; Snow & Sweet, 2003). That is, reading comprehension is the ability to make sense of a text and to understand what is read. Reading for understanding is essential for students in all grade levels (Meyer & Ray, 2011). Because the academic demands of secondary students are more challenging, reading comprehension is even more critical to student achievement (Goldman, 2012). Students in grades 4 and beyond are expected to learn from expository texts in language arts, science, and social studies (Guthrie & Davis, 2003). The research shows strong evidence that reading comprehension instruction is beneficial to students in all grades (Ness, 2009). More specifically, when teachers explain and demonstrate various comprehension strategies and provide guided and independent practice of these strategies, middle and high school students make noticeable gains in reading comprehension.

Teachers' attitudes and theoretical beliefs play a major role in what they do and do not teach. Squires and Bliss (2004) have noted that "decades of research on the connection between teachers' theoretical beliefs and their practices yield a common theme: all teachers bring to the classroom some level of beliefs that influence their critical decision making" (p. 756). Lesley (2004) asserted that despite years of research on the subject of literacy, secondary teachers continue to resist incorporating content area literacy instruction in their classrooms. Content area literacy is defined as the ability to use reading and writing competencies to obtain new knowledge in a specific subject area (Warren, 2012). Thus, Warren contends that all content area teachers should teach reading. In Chapter 2 I offer a more thorough explanation of reading comprehension and teachers' attitudes and beliefs about reading comprehension instruction.

I aligned the research questions of this study with the conceptual framework. The overarching question for this study was: How do high school science teachers at one high school perceive their responsibility to provide reading comprehension instruction to help struggling readers comprehend science content? My research questions were qualitative by design. The purpose of qualitative research is to investigate a particular phenomenon or people in order to understand and describe the phenomenon from the participants' point of view (Leedy & Ormrod, 2005). I based the research questions and the conceptual framework upon the premise that teachers' attitudes and beliefs play a major role in whether or not they incorporate reading comprehension instruction in their classroom. Thus the purpose of this study was to acquire an understanding of the teachers' perceptions of reading comprehension instruction.

Nature of the Study

Phenomenological research served as the qualitative approach for this study. A phenomenological study is a study whose goal is to understand people's perceptions and experiences of a particular phenomenon (Leedy & Ormrod, 2005). In this study, I attempted to understand the lived experiences of high school science teachers in terms of reading comprehension instruction in order to help struggling readers comprehend science content. A phenomenological approach seemed the most appropriate because it would provide me with firsthand accounts of the topic rather than secondary sources. I conducted interviews lasting up to one hour for each of the 10 high school science teacher participants. I chose 10 participants because I wanted to obtain as much data as possible during these interviews. All the participants were teachers at the same high school. Data analysis involved organizing large bodies of text into smaller units in order to identify themes. According to Leedy and Ormrod, after identifying the themes, the final step in data analysis involves summarizing the information in the themes to present it to the readers.

Other qualitative approaches I considered for this study included grounded theory, ethnography, and content analysis. However, I decided against all of these approaches because they do not focus on understanding a phenomenon through firsthand, lived experiences. A case study was the only qualitative approach that I seriously considered, but I excluded the case study because of time constraints and the unavailability of specific resources such as lesson plans and syllabi. More specifically, a case study would have involved conducting a more in-depth study with much larger amount of data over an extensive period of time. Because this study involved interviewing 10 teachers, it would not have been feasible to conduct a case study since it would have required even more of the participants' time. Therefore a phenomenological study seemed the most logical choice for the purpose of this study.

Definitions

Achievement gap: The difference in school performance when one group of students outperforms another group and there is a significant difference in average test scores for the two groups. (National Center for Education Statistics, 2015).

Achievement levels: Performance standards set by the National Assessment Governing Board that provide a context for interpreting student performance on NAEP based on recommendations from panels of educators and members of the public. The levels, *Basic, Proficient*, and *Advanced*, measure what students should know and be able to do at each level. *Basic* denotes partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at each grade level. *Proficient* represents solid academic performance; students reaching this level have demonstrated competency over challenging subject matter. *Advanced* represents superior performance (National Center for Education Statistics, 2013).

At-risk students: Students in danger of academic failure (Slavin & Madden, 1989).

Common Core State Standards (CCSS): These are a set of high-quality academic expectations in English-language arts (ELA) and mathematics that define the knowledge and skills all students should master by the end of each grade level in order to be on track for success in college and career (National Governors Association Center for Best Practices, 2010)

Expository texts: Expository texts are written to “explain and describe to the reader new content that has a foundation in truth and/or empirical evidence” (Graesser et al., 2002).

Fluency: The ability to read a text quickly, accurately, using correct intonation and expression (Allington, 1983).

Literacy: The mastery of language, in both its spoken (and augmented) and written forms, enables an individual to use language fluently for a variety of purposes (Foley, 1994, p. 184).

No Child Left Behind Act of 2001(NCLB): This law is a reauthorization of the Elementary and Second Education Act. The major emphasis of NCLB is to ensure that all children receive a fair and equitable opportunity to receive a high-quality education. The U.S. Department of Education included four components of the bill: accountability, flexibility, research-based education, and parent options (NCLB, 2001).

Phonics: The process of applying letter-sound correspondences in order to identify words (National Reading Panel, 2000).

Reading Coach: A reading specialist whose primary responsibility is for providing professional development for teachers by giving them additional support with the school’s academic, instructional program (Dean et al. 2012).

Reading comprehension: Intentional thinking during which the meaning is constructed through interactions between text and reader (Harris & Hodges, 1995).

Assumptions

According to Leedy & Ormrod (2005), an assumption is a condition that is taken for granted. In this study, I assumed that participants would truthfully answer the interview questions. This assumption was based on my guarantee that each participant would be provided anonymity and confidentiality before, during, and after the study. Additionally, I informed participants that their participation was on a volunteer basis and that they had the right to withdraw from the study at any time without any negative consequences.

Scope and Delimitations

Scope refers to the specific parameters under which a study is conducted (Simon & Goes, 2013). The scope for this study was high school science teachers at one high school in the southeastern United States. I focused exclusively on high school science teachers' perceptions of reading comprehension instruction used to help students comprehend science content. I selected science as the subject for examination because a significant number of students in the United States are less proficient in science when compared to students in other advanced countries (Organization for Economic Co-operation and Development, 2013).

Delimitations define the boundaries of a study and mark what a study does not include. I did not include other grades or subjects. Even though elementary and middle school teachers may have strong opinions about this topic, the boundary for this study focused on high school science teachers only. Additional boundaries for this study included only high school science teachers from one school district in the Southeastern United States. Although the ideas from high school teachers could be beneficial to this topic, only high school science teachers from one high school in the southeastern United States were included in this study.

Limitations

Limitations have to do with the potential weaknesses in a study (Creswell, 2003). Limitations are the issues and situations that take place in a study which is out of the researcher's control, but which may mark a potential weakness in the study (Simon & Goes, 2013). One potential limitation of this study is its lack of generalizability. Since this study was limited to a small sample, the findings cannot be generally applied to a larger population, they can only be suggested. However, while my study may not be generalizable, it is transferable. Transferability is possible because teachers at other schools might be able to apply the findings of this study to their own personal experiences. Simon and Goes posited that transferability can be applied to the majority of research investigations including qualitative studies. Unlike generalizability, transferability does not make broad claims but allows readers to make relationships between components of a study and their own experience. This study was limited to high school science teachers at one high school in the southeastern United States. From the start of the study, I recognized that the findings would be based upon data collected from a small sample at a single point in time, and that the analysis of data collected from a different sample at a different time could yield different results.

Bias is "any influence, condition, or set of conditions that singly or together distort data" (Leedy & Ormrod, 2005, p. 208) and affects the outcome of the study. Pannucci and Wilkins (2010) contended that bias can occur during any phase of the research process including the design, data collection, data analysis, and publication stages. According to Leedy and Ormrod (2005) bias can enter the research study in very subtle, unsuspecting ways. For an example, while conducting an interview, the researcher’s personality, tone of voice, or emphasis within a sentence can influence the participants’ responses. To control bias, I conducted a trial interview with a person who was not connected to the study. This person provided feedback about whether or not my tone or sentence choices affected her responses.

Another condition that can result in bias is any influence that affects the randomness by which a sample population has been selected. Convenience sampling is an example of sampling bias because not everyone in the population has an equal chance of being selected. To address this bias, I emphasized to the reader that convenience sampling does not represent a random sample of the overall population. Thus the results of the study cannot be applied to the overall population (Leedy & Ormrod, 2005).

Significance

Successful readers must be able to use different knowledge, reading practices, and cognitive processes to various types of content (Goldman, 2012). Goldman posited that, in addition to knowing and applying basic decoding skills, proficient readers must know how to extract meaning from content specific texts. According to Reed and Vaughn (2012), many students in grades 4 through 12 experience difficulties comprehending challenging text material. However, Goldman noted that only a small number of studies have addressed the problems associated with teaching content and reading comprehension strategies for adolescent students. Goldman further stated that the little that researchers know about effective reading comprehension is based upon research conducted on a small scale. Research related to content comprehension strategies is just emerging. Because of this meager body of research available on content related comprehension instruction, I determined that this study was needed. I conducted this study to determine high school science teachers' perceptions of reading comprehension instruction to help students understand science content. High school teachers were selected for this study because studies have revealed that the reading challenges that secondary students face are more complex than those of younger readers (Lee & Spratley, 2010).

Until students reach fourth grade, the majority of their reading instruction is focused on learning to read. As previously noted, learning to read involves mastering basic reading skills – particularly decoding skills – for the purpose of identifying unknown or unfamiliar words. However, reading to learn involves moving beyond reading skills to acquiring information from text (Chall, 1983). Therefore, if students are to understand the content in subjects such science and social studies, it is imperative that reading comprehension strategies be taught in content-area classes (Goldman, 2012).

The results from this study might be useful for classroom teachers and school administrators who make curriculum and instructional decisions. This study contributes to the body of knowledge needed to address the lack of reading comprehension proficiency among adolescent students. In terms of positive social change, improving students' comprehension abilities may positively impact student retention thus ensuring more graduates from high school.

Summary

Chapter 1 began with an introduction to the study. The introduction provided readers with a basic overview of the research topic and my focus on how high school science teachers perceived their responsibility towards providing reading comprehension instruction to help students comprehend science content. The remainder of the chapter addressed the background of the study, the problem statement, the nature of the study, the purpose of the study, the conceptual and theoretical frameworks, the limitations, and the scope and delimitations.

Chapter 2 will present a review of the literature that I used as a foundation for understanding reading comprehension instruction for secondary education students.

Chapter 2: Literature Review

Introduction

The purpose of this phenomenological study was to address how high school science teachers perceived their responsibility to provide content related reading comprehension instruction, particularly for students who struggle to comprehend science texts. My secondary goal was to find out which reading comprehension strategies, if any, high school science teachers reported using with struggling readers. For the purposes of this study, I define a reading strategy as an activity or series of activities that aid with comprehending text (Garner, 1987). According to Arabsolghar & Elkins (2001) reading strategies play a crucial role in reading. Paris et al. (1983) asserted that readers who know a range of reading strategies and how to appropriately apply these strategies are considered to be strategic readers. Whereas strategic reading is a characteristic of proficient readers, novice and struggling readers are deficient in reading strategies (Ryan, 1981; Paris & Myers, 1981; Wagoner, 1983).

Many adolescents struggle with comprehending content-related texts (Goldman, 2012). The lack of reading proficiency is especially problematic for these struggling readers because middle and high school teachers' priority is to teach content, resulting in less time devoted to teaching students literary practices needed to successfully comprehend texts. Although there is evidence that shows just how effective comprehension strategies are at enhancing student achievement, there is also evidence to suggest that such instruction rarely occurs (Block & Pressley, 2002). Durkin (1978-79) found that less than 1% of instructional time was devoted to comprehension strategies in elementary classrooms. Although these findings have been extended to include upper elementary grades (Hodges, 1978; Pressley, Wharton-McDonald, Hampston & Echevarria, 1998), this work has yet to be extended to middle and high schools. Researchers are left to wonder about the amount of time reading comprehension instruction occurs in content area classrooms as well as teachers' attitudes and feelings about the need for such instruction (Trabasso & Bouchard, 2002).

Reading comprehension is essential for scientific literacy (D'Alessandro, Sorensen, Homoelle, & Hodun, 2014) because it is the basic foundation for many of the competencies in which scientists and engineers must be proficient including conducting research investigations and building sound, logical scientific arguments (National Reading Council, 2012). However, there has been a shift in how literacy is viewed (Adams & Pegg, 2012). According to Adams and Pegg, instead of viewing literacy in terms of a collection of discreet skills and facts, literacy is now being viewed as an integral component of content-subject disciplines. Moreover, a recent move has been made to incorporate reading comprehension and literacy instruction within science courses (Fang et al., 2008***).*** Fang et al. emphasized that the skills needed for inquiry-based science are similar to those required for reading proficiency. Science and reading both use the following skills: predicting, inferring, understanding key vocabulary concepts, interpreting and analyzing data or information, and the ability to interpret and articulate information (Conley, 2008; Norris & Phillips, 2003; Osborne, 2002). Fang et al. noted that "both knowledge of science content and knowledge of reading are essential" in order for students to be successful in science, and that "students benefit from infusion of reading and science" (p. 2083, 2081). However, Deming, O'Donnell, and

Malone (2012) argued that although the research indicates the importance of science literacy, scientific literacy is waning.

The need for science literacy has been a key focus of science education reform and standards in the United States since the end of World War II (Ross, Hooten, & Cohen, 2013). According to Dambekalns and Medina-Jerez (2012), content area subjects such as science are often taught in ways that show no connection and relevance to students' lives. Cervetti & Pearson (2012) argued that science literacy instruction should be presented in supporting roles, and suggested that science and literacy should work harmoniously to promote knowledge and learning. In addition to the problem of science being disconnected from students' lives, Ross et al. (2013) stated that although there has been some improvement in the comprehension of science facts over the past 10-20 years, there is a growing concern that many people in the United States lack understanding of the nature of science. The authors further contended that science college courses are an ideal place to promote science literacy. However, there is a problem with science courses for non-science majors because non-science majors generally take a science course during their freshman year. Ross et al. contended that a science course taught in one semester is not enough time for students to acquire a comprehensive understanding of science concepts; at best, students in a one semester science course have only enough time to try to learn a range of science facts. Ross et al. thus argued that an interdisciplinary approach that integrates science and the humanities would attract non-science majors; furthermore integrating science and the humanities would provide students with more exposure to scientific concepts within their personal interests and academic pursuits.

Like high school science teachers, secondary teachers in other disciplines are also challenged by the demands of teaching textbook content to significant numbers of struggling readers. For an example, some secondary social studies teachers have problems with integrating reading comprehension instruction without compromising content learning (Vaughn et al., 2013). This issue presents a serious problem for teachers because the reading demands of content texts are beyond the reading ability of a significant number of students (Shanahan & Shanahan, 2008). According to Vaughn et al. (2013), in order to address this dilemma, some social studies teachers either replace the text with PowerPoint slides which provide key information, or read the text aloud to the students. Although the use of PowerPoint slides or reading the text to the students accomplishes one of the goals of facilitating content learning, these methods offer little towards helping students read and understand the content on their own. In an observational study in secondary social studies classes, students used the text approximately 10% of the time, with few opportunities to concentrate on the text beyond answering the teachers' questions (Swanson, Wexler, & Vaughn, 2009). Meeting the challenge of teaching content knowledge and reading comprehension skills will thus require significant adjustments in instructional methods.

The inability to read proficiently has serious consequences for these students and for the nation. In addition to the problems associated with poor comprehension in a school setting, the U.S. educational system is producing a large percentage of students who lack the necessary literacy skills needed to meet the challenges of the twenty-first century (Goldman, 2012). Additionally, the issue with reading comprehension is especially problematic in relation to the goals of the Common Core State Standards

(National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO], 2010). A major focus of the Common Core State Standards (CCSS) is to provide all students with the competencies and skills needed for college and career readiness. Furthermore, CCSS require all students to read more challenging, complex texts in order to meet the overall goal of providing all students with a high quality education that provides the rigor in reading and the acquisition of the skills needed to be successful in the 21st century (Abodeeb-Gentile & Zawilinski, 2013).

In the remainder of this chapter, I offer the introduction, describe my literature search strategy, explain the conceptual framework, and present the literature review, the summary, and conclusions.

Literature Search Strategy

In order to address the topic of reading comprehension strategies, I conducted an exhaustive search using the Walden University library website http://library.waldenu.edu, the Wiley Online Library, and Google Scholar. The education databases I employed were: (a) Education Resource Information Center (ERIC), (b) Education Research Complete, and Questia. I used the following keywords in my initial search of the databases: *reading comprehension, comprehension strategies, reading skills and reading proficiency.*

The results of the initial search of the databases yielded other key terms related to reading comprehension which were: *literacy, reading comprehension, vocabulary development, text comprehension, teacher preparation, teachers' attitudes and beliefs, online comprehension, digital literacy, metacognition, content area literacy, technology, digital literacy and new literacies*.

Conceptual Framework

I built the conceptual framework for this study upon the belief that reading comprehension is critical for students' academic success. Basic reading involves the ability to pronounce and decode words; however, the ultimate goal of reading is to comprehend or understand the words within text (Aaron & Baker, 1991; Snow & Sweet, 2003). Thus, reading comprehension is the ability to make sense of text and to understand what is read. Reading for understanding is essential for students in all grade levels (Meyer & Ray, 2011); however, the academic demands of secondary students are more challenging particularly in the area of reading (Goldman, 2012). Additionally, the comprehension of expository text is critical for academic success (National Educational Goals Panel, 1999). Students in grades 4 and beyond are expected to learn from expository texts in language arts, science, and social studies (Guthrie & Davis, 2003). Goldman posited that successful reading at the secondary level requires students to be proficient in analyzing, synthesizing, and evaluating information from various sources, and further noted that competent readers must be able to apply different knowledge and reasoning processes to different types of content material.

Research findings revealed strong evidence that reading comprehension instruction is beneficial to students in all grades (Ness, 2009). More specifically, when teachers explain and demonstrate various comprehension strategies and provide guided and independent practice of these strategies, middle and high school students make noticeable gains in reading comprehension. As previously noted, comprehension strategies are mental activities that readers engage in to enhance comprehension or understanding and they provide opportunities for learners to gauge or monitor their level of comprehension (Palinscar & Brown, 1984). According to the National Reading Panel (NRP, 2000), explicit instruction in comprehension strategies is essential; the NRP stated that "the idea behind explicit instruction of text comprehension is that comprehension can be improved by teaching students to use specific cognitive strategies or to reason strategically when they encounter barriers to comprehension when reading" (p. 4-39). The findings of numerous studies have shown that when explicit, teacher-directed comprehension instruction is used, students make significant progress in reading comprehension (Spencer, Carter, Boon, & Simpson-Garcia, 2008; Park & Osborne, 2006).

Palincsar and Brown (1984) identified four strategies for promoting comprehension: summarizing the most important points in a passage, asking or generating questions about the text, clarifying any unclear or difficult portions read in the text, and predicting what will happen next in the text. According to Palincsar and Brown these four strategies work through an instructional activity referred to as reciprocal teaching (RT). RT is an instructional activity that involves direct instruction from the teacher and active engagement from the students. Additionally, RT is an instructional method a teacher uses to explain and model each of the four strategies. The first stage of this model involves the teacher and students taking turns reading and discussing short passages of text read silently. The second stage offers students an opportunity to practice the four strategies while they are engaged in their discussions. The teacher's responsibility is to model these comprehension strategies and to engage the students at a level that the students are ready for. As the students demonstrate mastery of one level of reading, the teacher increases her demands until the students reach a level of reading proficiency without the teacher's assistance.

A study was conducted by Guthrie and Klauda (2014) in order to determine the extent that teacher support helped students improve their ability to comprehend history content and how teacher support fosters motivation and engagement in adolescent learners. To do so, the investigators examined the effectiveness of providing language arts instruction embedded into history content through a method known as Concept-Oriented Reading Instruction (CORI). The Civil War was the topic for these middle school students. This study incorporated four motivational-engagement supports provided by the teachers: (1) competence support (teachers provided texts that were student friendly); (2) providing choice (allowing students to select books on the topic); (3) stressing the benefits of reading; and (4) setting up collaboration situations (providing students opportunities to read and discuss content-related assignments with their peers). The results revealed the effectiveness of CORI and also showed positive gains in students' motivation and engagement in reading content material.

Landmark Study

Authors of the landmark study *A Nation at Risk* (United States National Commission on Excellence in Education, [NCEE], 1983), identified a literacy crisis facing U.S. public schools:

> Some 23 million American adults are functionally illiterate by the simplest test of everyday reading, writing, and comprehension. About 13% of all 17-year olds in the United States can be considered functionally illiterate. . . . Nearly 40% cannot

> draw inferences from written material; only one-fifth can write a persuasive essay (p. 3).

More than two decades since the publication of the Nation at Risk Study, United States Elementary and secondary schools still face serious academic problems (Lips, 2008). Public schools are turning out learners who lack the necessary literacy requirements needed for the twenty-first century. The results of the most current National Assessment of Educational Progress (NAEP) revealed that only thirty-four percent of public school students scored at or above Proficiency in reading in grades 4 and 8; the percentages in the states fell in the category of 17 to 48 percent. The NAEP results for grade 12 revealed that the average reading score remained the same from the previous twelfth-grade assessment in 2009 but was lower than the 1992 score (National Center for Education Statistics, 2013).

The following section will provide a more comprehensive examination of the findings from the NAEP mathematics and reading assessments.

National Assessment of Educational Progress

A national representative sample of 376,000 fourth-graders, 341,000 eighth graders, and 92,000 twelfth-graders were participants in either the 2013 mathematics or reading assessments administered by the NAEP. The NAEP is a national assessment that is administered to determine what students in the United States know and can demonstrate in specific content domains. The results of the 2013 NAEP revealed that the average reading score for eighth grade students was higher in 2013 than in 2011. The average reading score for fourth grade students in 2013 was not significantly different than that in 2011. Figure 1 shows the trends in fourth and eighth grade reading assessments. In terms of Proficiency, the 2013 assessment revealed that only 35 percent of fourth graders, 36 percent of eighth graders, and 38 percent of twelfth graders scored at or above Proficient (National Center for Education Statistics, 2013).

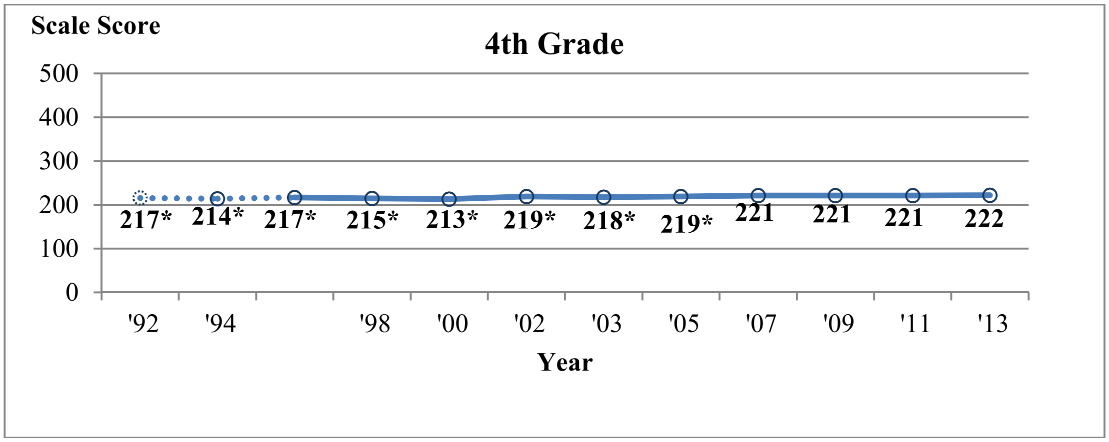

Figure 1. Trend in fourth grade reading average scores. (National Center for Education Statistics, 2013)

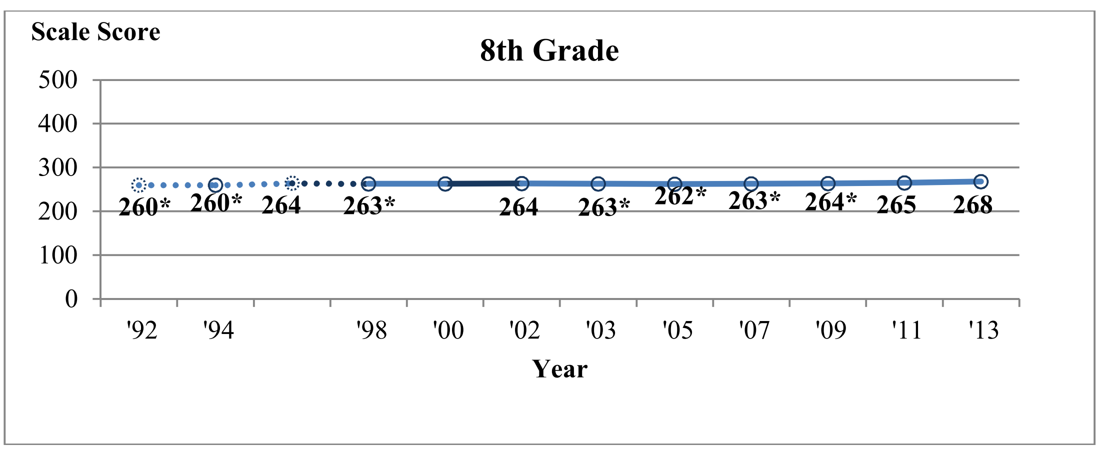

Figure 2. Trend in eighth grade reading average scores. (National Center for Education Statistics, 2013)

Findings revealed that there were no significant changes in fourth grade reading scores for White, Black, and Hispanic students from 2011 to 2013, but there were some narrowing of the racial/ethnic gaps compared to the scores in the first assessment year.

The findings also revealed that the Caucasian-African American gap in reading from the early 1990s to 2013 at the fourth grade level and the Caucasian-Hispanic gap in reading narrowed in 1992 at grade 4 (see Figures 3 & 4).

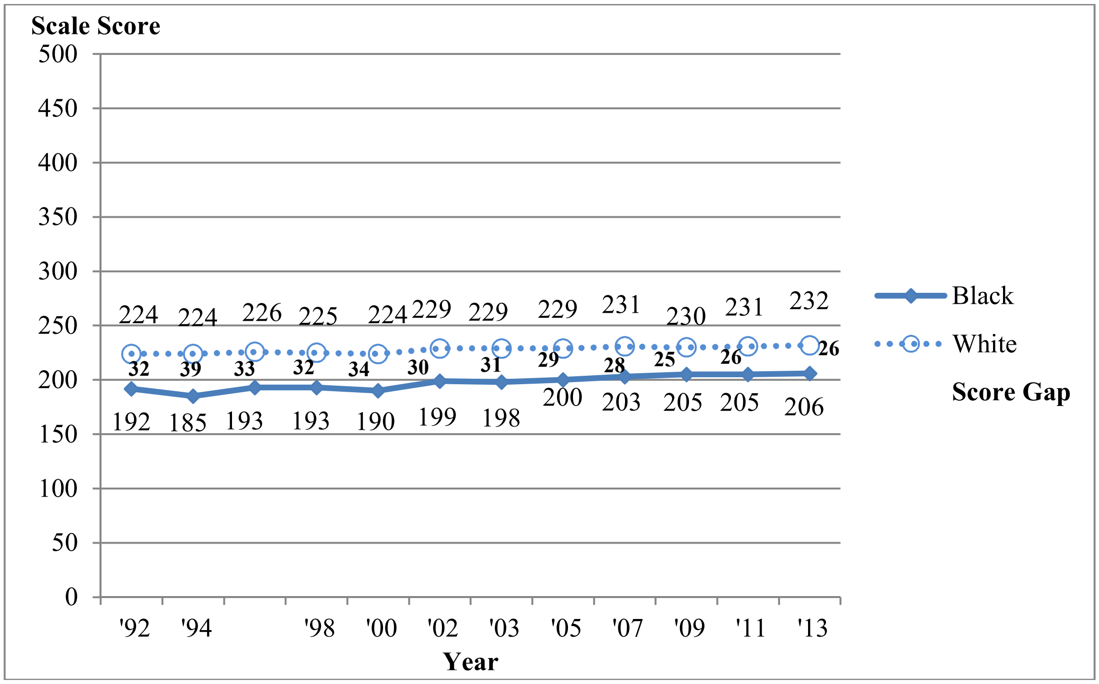

Figure 3. Trend in fourth-grade NAEP reading average scores and score gaps for White and Black students. (National Center for Education Statistics, 2013)

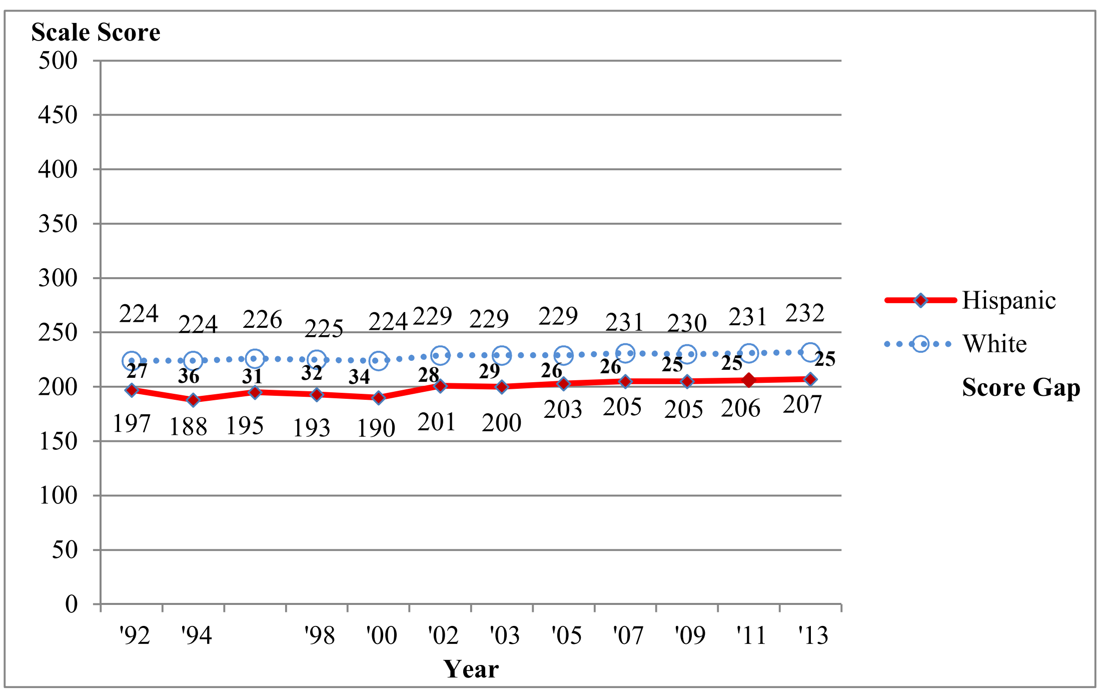

Figure 4. Trend in fourth-grade NAEP reading average scores and score gaps for White and Hispanic students (National Center for Education Statistics, 2013)

The findings demonstrated that eighth grade students had an average reading score of 268 in 2013; eighth grade reading scores were higher in 2013 in comparison to all previous assessments for eighth grade. However, the findings revealed a significant gap in reading scores among African American and Hispanics compared to Caucasian students (see Figures (5 & 6). Among eighth grade students, Caucasians had an average reading score of 276, African Americans 250, and Hispanics 256, and Asian/Pacific Islander had the highest average reading score of 280.

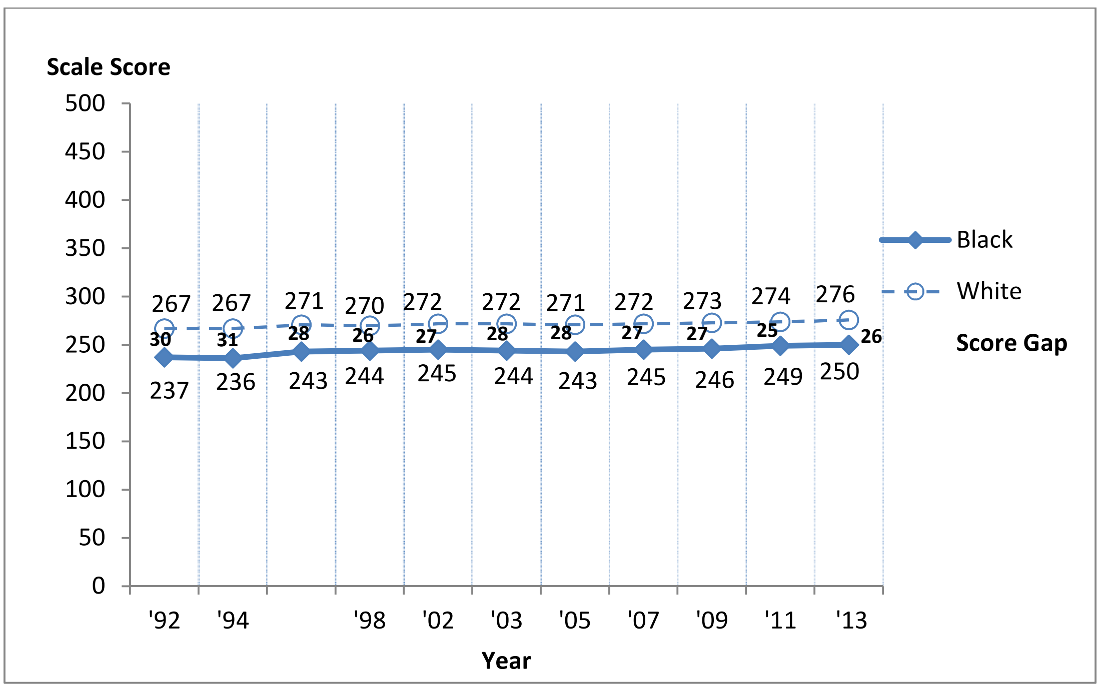

Figure 5. Trend in eighth-grade NAEP reading average scores and score gaps for White and Black students (National Center for Education Statistics, 2013).

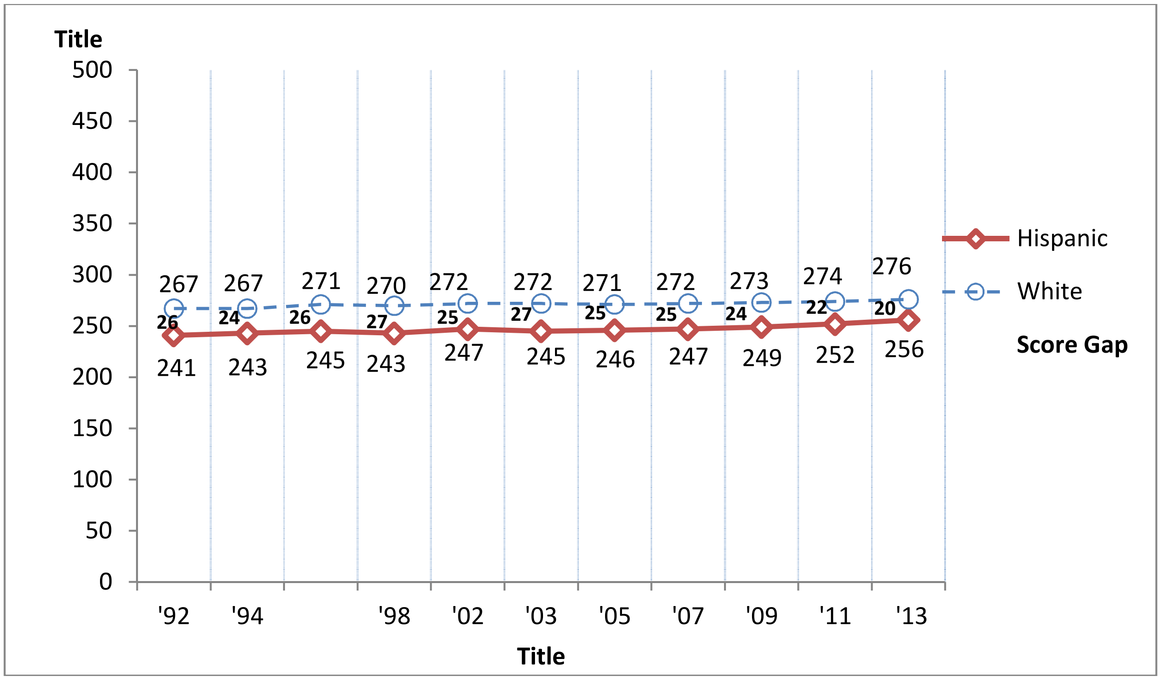

Figure 6. Trend in eighth-grade NAEP reading average scores and score gaps for White and Hispanic students (National Center for Education Statistics, 2013)

The following section will present results from international assessments on reading, math, and science literacy based upon the findings of the Programme for International Student Assessment (PISA). The main purpose of this section is to compare the performance of students from the United States in reading, math, and science literacy compared to other countries.

Programme for International Student Assessment

The Programme for International Assessment (PISA) is an international assessment used to evaluate education systems throughout the world. The PISA assesses the skills of 15 year olds in reading, mathematics, and science literacy. The latest PISA assessment of 2012 focused on mathematics; reading, science and problem solving served as secondary areas of evaluation. PISA assesses how well 15 year olds have obtained vital knowledge and skills that are deemed essential for success in the twenty-first century. Additionally, the PISA assessment does more than test students' knowledge of skills but it assesses the students' ability to take what they have learned and apply this knowledge to unfamiliar settings, both in and beyond school settings. The rationale for this approach is based upon the notion that modern societies reward students not for what they know but for their ability to apply what they know (Organisation for Economic Co-operation and Development, 2013).

The PISA is a component of the Organisation for Economic Co-operation and Development (OECD). The OECD is an entity whose mission is to advance policies that will improve the economic and social standing of people throughout the world (Organisation for Economic Co-operation and Development, 2013). There are 34 OECD countries. The United States is one of the OECD countries. In order to fulfill its mission, the OECD uses a vast amount of information on a broad assortment of topics to help governments promote wealth and fight poverty through economic advancement and financial empowerment. Education is one of the topics included in the OECD's information data bases used to assist the organization with its mission.

A total of 65 countries participated in the PISA 2012. This total included all 34 OECD countries and 31 partner countries and economies. These 65 countries represented more than 80% of the world's economic systems. However, unlike other federal nations, the United States only measured student performance in three states – Florida, Connecticut, and Massachusetts. The latest findings from the 2012 PISA assessment (Organisation for Economic Co-operation and Development, 2013) revealed that among the 34 OECD countries, the United States continues to perform below average in mathematics and is ranked 27th (according to the report, this is the best estimate, although the rank could fall between 23 and 29 due to sampling and measurement error).

The results revealed that the United States performed close to the OECD average in reading and science. In comparison to the other OECD countries, the United States ranks 17th in reading, (range of ranks: 14 to 20) and 21st in science (range of ranks: 17 to 25). In mathematics, the PISA assessment revealed that 26% of 15-year olds in the United States did not reach the PISA baseline of Level 2 mathematics proficiency. This percentage is higher than the OECD average of 23% and has remained the same since 2003. Students at Level 2 can interpret and recognize basic concepts that require no more than basic knowledge. Additionally, students operating in Level 2 of mathematics are able to make literal interpretations of results.

Students performing at Level 6 – the highest level of proficiency in mathematics - are able to perform the most difficult PISA items such as conceptualizing, generalizing, and applying knowledge in non-standard formats. Students at Level 6 in mathematics proficiency have mastered symbolic and formal mathematical operations and relationships in order to create new strategies for addressing new situations. However, only 2% of United States students performed at Level 6 in mathematics. Students performing at Level 5 – the next highest level in mathematics – are able to develop and work with models of advanced situations and make assumptions. Students at Level 5 in mathematics are also able to make reflections on their work and articulate their interpretations and findings. Only 8.8% of students in the United States reach Level 5 in mathematics performance compared to the OECD average of 12.6%.

In reading, 16.6% of the students in the United States scored below Level 2 on the PISA reading scale; the OECD average is 18.0%. Students proficient at Level 2 are only capable of performing very basic reading tasks such as locating information. Students at Levels 5 are able to make inferences, evaluate text, build hypotheses, and utilize specialized knowledge. In the United States, only 8% of students perform at Level 5 or above in reading.

Students proficient at Level 6 in science are able to connect different sources of information to support their decisions, use advanced scientific logic reasoning, and apply scientific logic to solve unfamiliar scientific problems. In the United States, only 1% of students performed at Level 6 in Science. Based upon annualized changes in performance, there have been no significant changes in students' performance in mathematics in the United States since 2003, the first year from which mathematics performance was assessed. Additionally, there have been no significant change in reading performance since 2000 and none in science since 2006 (Organisation for Economic Co-operation and Development, 2013; Kena et al., 2014). (see Tables 1-3).

Table 1

Mathematics Scores for OECD Countries

Country	Math Mean Scores	Share of low achievers in Math (Below Level 2)	Share of top performers in Math (Level 5 or 6)
OECD Average	494	*23.1*	*12.6*
Australia	*504*	*19.7*	*14.8*
Austria	506	18.7	14.3
Belgium	515	18.9	19.4
Canada	518	13.8	16.4
Chile	423	51.5	1.6
Czech Republic	499	21.0	12.9
Denmark	500	16.8	10.0
Estonia	521	10.5	14.6
Finland	519	12.3	15.3
France	495	22.4	12.9
Germany	514	17.7	17.5
Greece	453	35.7	3.9
Hungary	477	28.1	9.3
Iceland	493	21.5	11.2
Ireland	501	16.9	10.7
Israel	466	33.5	9.4
Italy	485	24.7	9.9
Japan	536	11.1	23.7
Korea	554	9.1	30.9
Luxemburg	490	24.3	11.2
Mexico	413	54.7	0.6
Netherlands	523	14.8	19.3
New Zealand	500	22.6	15.0
Norway	489	22.3	9.4
Poland	518	14.4	16.7
Portugal	487	24.9	10.6
Slovak Republic	482	27.5	11.0
Slovenia	501	20.1	13.7
Spain	484	23.6	8.0
Sweden	478	27.1	8.0
Switzerland	531	12.4	21.4
Turkey	448	42.0	5.9
United Kingdom	494	21.8	11.8
USA	481	25.8	8.8

Rounds to Zero

Table 1. Mathematics Scores (Programme in International Student Assessment (PISA) for OECD Countries) PISA 2012 Assessment Results (Organisation for Economic Co-operation and Development, 2013)

Table 2

Reading Scores for OECD Countries

Country	Reading Mean Scores	Share of low achievers in Reading (Below Level 2)	Share of top achievers in Reading (Level 5 & Above)
OECD Average	496	18%	8%
Australia	512	14%	12%
Austria	490	19%	6%
Belgium	509	16%	12%
Canada	523	11%	13%
Chile	441	33%	1%
Czech Republic	493	17%	6%
Denmark	496	15%	5%
Estonia	516	9%	8%
Finland	524	11%	13%
France	505	19%	13%
Germany	508	14%	9%
Greece	477	23%	5%
Hungary	488	20%	6%
Iceland	483	21%	6%
Ireland	523	10%	11%
Israel	486	24%	10%
Italy	490	20%	7%
Japan	538	10%	18%
Korea	536	8%	14%
Luxemburg	488	22%	9%
Mexico	424	41%	#
Netherlands	511	14%	10%
New Zealand	512	16%	14%
Norway	504	16%	10%
Poland	518	11%	10%
Portugal	488	19%	6%
Slovak Republic	463	28%	4%
Slovenia	481	21%	5%
Spain	488	18%	6%
Sweden	483	23%	8%
Switzerland	509	14%	9%
Turkey	475	22%	4%
United Kingdom	499	17%	9%
USA	498	17%	8%

Rounds to Zero

Table 2. Reading Scores (Programme in International Student Assessment (PISA) for OECD Countries) PISA 2012 Assessment Results (Organisation for Economic Co-operation and Development, 2013).

Table 3

Science Scores for OECD Countries

Country	Science Mean Scores	Share of low achiever in Science (Below Level 2)	Share of top achiever in Science (Level 5 & Above)
OECD Average	501	18%	8%
Australia	521	14%	14%
Austria	506	16%	8%
Belgium	505	18%	9%
Canada	525	10%	11%
Chile	445	34%	1%
Czech Republic	508	14%	8%
Denmark	498	17%	7%
Estonia	541	5%	13%
Finland	545	8%	17%
France	499	19%	8%
Germany	524	12%	12%
Greece	467	26%	2%
Hungary	494	18%	6%
Iceland	478	24%	5%
Ireland	522	11%	11%
Israel	470	29%	6%
Italy	494	19%	6%
Japan	547	8%	18%
Korea	538	7%	12%
Luxemburg	491	22%	8%
Mexico	415	47%	#
Netherland	522	13%	12%
New Zealand	516	16%	13%
Norway	495	20%	8%
Poland	526	9%	11%
Portugal	489	19%	5%
Slovak Republic	471	27%	5%
Slovenia	514	13%	10%
Spain	496	16%	5%
Sweden	485	22%	6%
Switzerland	515	13%	9%
Turkey	463	26%	2%
United Kingdom	514	15%	11%
USA	497	18%	7%

Rounds to Zero

Table 3. Science Scores (Programme in International Student Assessment (PISA) for OECD Countries) PISA 2012 Assessment Results (Organisation for Economic Co-operation and Development, 2013)

The National Reading Panel

In 1997, Congress commissioned the Director of the National Institute of Child Health and Human Development (NICHD) along with the Secretary of Education to convene a panel to review the findings of reading research in order to identify the most effective methods for teaching children to read (National Reading Panel, 2000). The role of comprehension was one of the topics included in the National Reading Panel's (NRP) discussions and final report. Reading comprehension is defined as "intentional thinking during which meaning is constructed through interactions between text and reader" (Durkin, 1993). As a part of the Panel's analysis of existing research data on reading comprehension, the NRP identified three major themes: (1) reading comprehension is a complex process that cannot be understood without understanding the role of vocabulary development in reading instruction; (2) engaging interactive comprehension strategies are essential for reading comprehension; and (3) teacher training and preparation to facilitate and teach reading comprehension strategies are crucial and intricately connected to reading comprehension. With these three themes as a background, the NRP decided to organize its findings on reading comprehension in three major categories: vocabulary instruction, text comprehension instruction, and teacher preparation and comprehension strategies instruction.

A study had to meet specific criteria to be included in the NRP's (2000) review: (1) the study had to focus on instruction of reading or comprehension; (2) it had to have been published in a scientific journal; and (3) it had to include an experiment that used at least one treatment and a suitable control group or it had to have one or more quasi-experimental variables that served as comparisons between treatments.

There were 203 studies on text comprehension instruction that fit the NRP's criteria. Inclusive of these studies were 215 grade-level representations with 170 of these distributed among grades three through eight. The Panel carefully scrutinized the studies to determine how well the teachers were prepared to teach text comprehension in a natural environment. At the time of the Panel's report, these studies presented the only experimental attempts to prepare teachers to incorporate evidenced based comprehension strategies that had developed over the past twenty years.

Vocabulary Instruction

After examining more than 20,000 research citations on the relationship between vocabulary and reading comprehension, the NRP (2000) identified 50 studies dating from 1979 for further review. An intensive analysis of these 50 studies revealed that a formal meta-analysis could not be conducted due to the small number of research studies dealing with a large number of variables. The NRP also determined that a significant number of research studies on vocabulary instruction did not meet the NRP research methodology criteria. Although a formal meta-analysis could not be conducted, the Panel decided to collect as much information as possible from the 50 studies.

The review of the studies revealed that vocabulary instruction does result in improvement in comprehension but the age and capabilities of the students must be considered when planning instruction (National Reading Panel, 2000). The Panel's findings indicated that vocabulary instruction on computers proved to be more effective than some traditional approaches. Several important implications for reading instruction were identified: (a) vocabulary instruction should be taught through both direct and indirect ways; (b) repetition and exposure to vocabulary increases vocabulary knowledge; (c) using computer technology increases vocabulary development.

Text Comprehension Instruction

The Panel's (2000) literature review identified 453 research studies devoted to text comprehension since 1980. However, the Panel included only relevant studies published between 1970 and 1980 and a total of 481 studies were initially examined. Of these 481 studies, 205 studies met the NRP's research criteria and were placed into instructional categories according to the instructional method used. Although the Panel identified only a few studies that met their methodology criteria, the Panel used the NRP criteria to evaluate the information found in the studies.

In its review of the studies, the Panel (2000) identified 16 categories of text comprehension instruction of which 7 appeared to have strong scientific evidence of improving reading comprehension among non-proficient readers. The seven types of instruction found effective were: (a) comprehension monitoring where students monitor their understanding of the material being read, (b) cooperative learning where students work collaboratively to learn reading strategies, (c) use of graphic organizers and other visual aids, (d) answering questions presented by the teacher, (e) composing questions where students ask themselves questions about what they are reading, (f) story structure where students use the structure of the story to help them answer questions about what they have read; and (g) summarization where students make generalizations about the content

Teacher Preparation and Comprehension Strategies Instruction

The Panel (2000) identified only 4 studies out of 635 citations that met the Panel's scientific criteria regarding teacher preparation and comprehension strategies instruction. These four studies examined two major approaches to comprehension: Direct Explanation (DE) and Transactional Strategy Instruction (TSI). The DE approach is a method the teacher uses to explain the mental processes involved in becoming a proficient reader. In this approach the teacher's responsibility is not to teach specific strategies but rather to help students understand reading as a problem solving activity. The TSI approach includes some of the essential components of the DE approach. However, in TSI, the teacher does more than provide explicit explanations. In this approach the teacher prepares discussions which provide students with opportunities to interact with other students while reading and then discuss the reading strategies they used.

The NRP (2000) maintained that reading comprehension instruction plays a critical role in helping students comprehend what they read. According to the NRP, students can make significant strides in reading comprehension when teachers explain and model these strategies to the students. Earlier research investigations concentrated on teaching one strategy at a time. However, later studies examined the effectiveness of teaching several strategies in combination with others. An intense analysis of the studies revealed that teachers can be trained to deliver effective reading comprehension to their students within natural reading settings. However, incorporating comprehension instruction with teaching content is problematic for some teachers. Many teachers feel they are not prepared to do this type of teaching. This is especially true among middle and high school teachers (NRP, 2000).

There are strengths and weaknesses in the approach used by the NRP (2000) in selecting and analyzing the studies. In terms of strengths, the NRP's analysis of the studies yielded some key terms that showed positive gains in reading comprehension. The analysis of the studies revealed that vocabulary instruction, text comprehension instruction, and teacher preparation and comprehension strategies instruction were key components in reading comprehension improvement. However, there were weaknesses in the NRP's approach as well. There were other important components to comprehension instruction that were not addressed by the Panel such as instruction in listening comprehension and in writing. Additionally, the Panel subcommittee did not focus on special groups of children such as ELL students nor children with learning disabilities. Moreover, the Panel did not review any research on special populations and therefore the Panel's findings are not relevant to these particular groups (NRP, 2000).

The NRP has been strongly criticized because of its research review methodology. Critics have argued that the NRP reviewed reading research from a perspective that viewed only experimental and quasi-experimental designs as scientific research (Allington, 2002; Coles, 2001; Garan, 2001; Krashen, 2001; Pressley, 2001; & Yatvin, 2002). Moreover, critics have argued that the NRP's narrow definition of rigorous scientific research failed to acknowledge quality research that used other designs such as causal comparative, correlational, and qualitative (Pressley, 2001). Almasi, Garas-York, & Shanahan (2006) contended that the NRP's report might have yielded different results if qualitative research of text comprehension instruction had been included in its report.

Almasi et al. found 12 qualitative studies that met the criteria for inclusion in the study. The authors contended that the inclusion of qualitative studies would not only have described classroom activities that foster comprehension but would have provided the conceptual and theoretical foundation upon which these activities are built.

The following section offers a review of the literature on reading comprehension research since the 2000 NRP report.

Comprehension Research Since the 2000 NRP Report

A follow up study was conducted to review research on comprehension instruction published since the NRP (2000) report (Butler, Urrutia, Buenger, Hunt, & Gonzalez, 2010). This review was built upon the work of the NRP and used the NRP's criteria for the selection of the studies examined. However, this review included two additional criteria beyond the NRP's criteria. The following criteria were included: (1) The studies must have been published between 2001 and 2008; and (2) The studies must have included students in grades K, 1, 2, or 3, or any combination of these grades. After applying all the criteria, the number of relevant studies was reduced to 23. The studies were examined and categorized by the following topics: (a) teacher practice, (b) multiple strategy instruction, (c) instruction in text structure, (d) instruction for students at risk of academic failure, and studies in which comprehension was examined using (e) technology and (f) multi-sensory approaches.

The major findings of the study conducted by Butler et al. (2010) revealed that the way teachers teach reading is very important. Based upon numerous observations of classroom teachers during a school year, Taylor, Pearson, Pearson, and Rodriguez (2003) suggested that certain instructional reading strategies resulted in gains in comprehension such as: (a) small group instruction, (b) comprehension skill instruction, (c) teacher modeling, and coaching for teachers. However, a secondary finding suggested that routine, practice-related approaches to teaching key comprehension processes resulted in fewer gains in student comprehension improvement than to strategic approaches.

The study conducted by Butler et al. (2010) had strengths and weaknesses. In terms of strengths, the major findings of this review supported some of the same findings of the study conducted by the NRP (2000). The findings in both studies revealed that teachers play a crucial role in reading comprehension improvement in studies. Both studies indicated that the use of multiple strategies is more effective than routine practice-oriented instruction. However, there were weaknesses in this study as well. One weakness is the fact that this review only examined studies with participants in grades K, 1, 2, 3, or any combination of these grades. However, the NRP study examined comprehension studies with participants in grades 3 to 8. The results from the Butler et al. review were limited to only the primary grades.

The justification for the concepts is based upon the notion that the entire study is supported by those concepts that have been identified. The topic under investigation is high school science teachers' perceptions of teaching reading instruction to help struggling readers comprehend science. To conduct this investigation, it was necessary to find out which concepts were relevant. The research revealed three major concepts: (1) Reading comprehension is essential for student success at all levels (Ness, 2009); (2) Students' academic success depends upon their ability to effectively use various modes of literacy (Council of Chief State School Officers and the National Governors Association, 2010; Ritter, 2009); online reading comprehension is one of the new literacy competencies essential for the academic success of adolescent learners (Leu et al., 2011); and (3) Teachers' attitudes and beliefs play a major role in their instructional practices (Freedman & Carver, 2007);

Reading Comprehension Instruction

Kim, Linan-Thompson, and Misquitta (2012) conducted a study to determine the effectiveness of important factors in instruction for improving reading comprehension among middle school students with learning handicaps. To do so, the authors reviewed fourteen studies that were published between 1990 and 2010. Five crucial factors were reviewed: (1) type of instructional methods employed; (2) self-monitoring, (3) reading components employed; (4) determining whether instruction was provided as intended; and (5) group size (one-on-one tutoring, small group, or whole group instruction). The findings revealed that specific reading strategies such as identifying the main idea and summarization of information were very effective in improving reading comprehension. The application self-monitoring skills along with the use of main idea also improved comprehension ability. However, the results revealed that instruction that focused on comprehension used with other reading components such as vocabulary instruction had a strong impact upon comprehension. In terms of group size, one-on-one instruction and paired instruction had a greater impact upon comprehension than whole group instruction.

Slavin, Cheung, Groff, and Lake (2008) reviewed research on the findings of four types of instructional approaches used to improve reading comprehension among middle and high school students. The approaches reviewed were: (1) reading curricula, (2) mixed-methods approach (a combination of both large and small group instruction with computer lessons; (3) computer-assisted instruction, and (4) instructional-process approaches (methods that focused on providing teachers with wide-range professional development training for teachers to implement in their classrooms. The findings revealed positive effects for instructional-process programs, particularly those that incorporated cooperative learning, and positive results were found for mixed-method programs.

A research project was conducted to promote reading comprehension in social studies classes for middle and high school students (Swanson & Wanzek, 2014). The researchers identified several components that helped students comprehend social studies content and improve their reading comprehension skills; the first component is called the Comprehension Canopy; the Comprehension Canopy has two elements: (1) acquire and build background knowledge; (2) visual motivators and background builders. The researchers recommended presenting a short video to introduce the topic and afterwards allow students an opportunity to respond to the video. The second component is called Essential Words (EW). The EW component provides students with important instruction in main concepts to support content mastery. Concepts that are related to other concepts and terms support the EW component.

Vaughn et al. (2013) asserted that the EW approach is an effective approach used for vocabulary development and that this type of vocabulary supports long-term recall of key concepts and terms. To prepare for EW instruction, teachers present a one-play display that includes all components of this process (definitions, pictorial representations, related words, examples of words used in context, and two turn-and-talk questions). On the first day of each new unit, the teacher introduces each new term. The following components are included in the EW introduction: (1) Introduction of the new word and its definition, (2) explanation of how the visual is an illustration of the word; (3) explaining the related words and provide clarification if needed; (4) the teacher reads two sentences with the word in context; (5) providing examples and non-examples of how to use the terms; and (6) the teacher reads the turn-and-talk prompt to students and gives the students an opportunity to work collaboratively to discuss each term. On the days following the introduction, students will participate in various warm-up activities designed to review and use each essential word (Swanson & Wanzek, 2014).

Fisher, Frey, and Lapp (2011) conducted a study at a middle school where the majority of the students read significantly below grade level. The teachers at the school developed a school-wide literacy plan to help these students improve their reading abilities. All of the teachers at the school participated in numerous professional development sessions as part of their literacy plan. The PD sessions incorporated some "best practices" in professional learning. Best practices are educational practices associated with higher student achievement (Oliveira et al., 2013). Fisher et al. selected eight teachers for the intervention group and eight teachers for the control group. Both groups participated in the PD classes. Fisher et al. observed the teachers as they modeled TA. As previously noted, TA is a strategy a teacher uses to model comprehension strategies to the students while reading. The intervention teachers received coaching on a weekly basely to discuss the literacy practices learned through their PD sessions while the control group did not receive coaching.

Fisher et al. (2013) compared the reading achievement of the students whose teachers were coached to the students whose teachers participated in ongoing professional development but were not coached. The results of the study revealed that the coached teachers made changes to their instructional practices which resulted in gains in student achievement. The findings also revealed that the two groups did not differ significantly on the September administration of the pretest measure of the Gates-MacGinite reading assessment. However, by the posttest, the average scores for the students whose teachers were coached in the intervention group had increased to 5.3 whereas the test scores of the students in the control group had only increased to 4.7.

There is an intricate relationship between vocabulary development and reading comprehension. A strong, solid vocabulary promotes reading comprehension and reading regularly provides more opportunities to increase one's vocabulary (Freebody & Anderson, 1983. Although vocabulary knowledge is essential for successful comprehension among adolescent readers, it is rarely stressed in middle school curricula (Kelley, Lesaux, Kieffer, & Faller, 2010). A study was conducted by Kelley et al. to determine the effect of a vocabulary program designed for students in low-performing middle schools with high numbers of English language learners (ELL). The program was designed to support the students' vocabulary and reading comprehension skills. The results indicated that the program resulted in significant gains on several components of vocabulary knowledge.

Various instructional strategies have been used to help SLD achieve academic success. Using graphic organizers is one instructional strategy used to promote learning. Dexter & Hughes (2011) conducted a meta-analysis review of experimental and quasi-experimental studies in which upper-elementary, intermediate SLD were given graphic organizers to help them improve their comprehension abilities. The graphic organizers were used by students in grades 4 to grade 12 for all subject-area classes including science. The findings revealed that using graphic organizers resulted in measurable gains in vocabulary knowledge, comprehension, and inferential knowledge. Another instructional strategy used with SLD is explicit instruction. Mason & Hedin (2011) emphasized the importance of science teachers providing explicit, direct instruction for ELL through constructivist and activity-based science lessons. The constructivists' view of learning emphasizes the active role of the learner in building understanding (Woolfolk, 2015).

In a descriptive study, Anmarkrud and Braten (2012) used video recorded observations and teacher interviews in order to gain insights into naturally occurring comprehension strategies in four Norwegian lower-secondary language arts classrooms. The researchers observed classroom instruction while students worked with expository texts. The findings revealed vast differences among the teachers in terms of comprehension strategies used and the types of strategies used were limited. Other findings revealed that whole group instruction was the preferred model of instruction and that the teachers lacked professional knowledge about reading comprehension instruction.

Because of the effects of globalization, English has become a dominant language and the number of people who are learning English has increased substantially. Two groups of English learners have been identified: English as a Foreign Language (EFL) and English as a Second Language (ESL). The EFL students learn English in non-English speaking countries and the ESL students learn English in countries where English is used as a tool for communication (Iwai, 2011). Iwai conducted a study focused on metacognitive reading strategies for these two groups of learners. The term metacognition was first introduced by Flavell (1976) and he defined metacognition as "one's knowledge concerning one's own cognitive processes and outcomes or anything related to them" (p. 232). Flavell's (1979) model of metacognition is the core and basic rudimental elements for research in the current field of metacognition. The model consists of four categories: (1) metacognitive knowledge, (2) metacognitive experiences, (3) goals/tasks and (4) actions/strategies. Reading comprehension strategies can be classified into three groups of metacognition: planning, monitoring, and evaluating strategies (Israel, 2007; Pressley & Afflerbach, 1995). Planning strategies are applied before reading begins. Activating learners' background knowledge is used to prepare learners for reading (Almasi, 2003; Israel, 2007). Preparation for reading includes such things as previewing a title, illustrations, headings or subheadings.

Monitoring strategies occur during reading and include self-questioning techniques to determine the level of understanding of what is read, summarizing, and inferring the main idea of each paragraph (Israel, 2007; Pressley, 2002). Evaluation strategies occur after reading. For an example, learners may consider the ways in which they can apply what they have read to other situations. Another example of an evaluation strategy is when the learner is able to relate to the author or character or might have a different perspective of what they have read (Iwai, 2011). Yang (2011) explored the structural relationship between ninth grade students' perceived application of cognitive and metacognitive reading strategies (CMRS) and their reading comprehension of geometry proof (RCGP). Yang and her colleagues examined the differences in students' perceived use of reading strategies among the struggling, moderate, and those with proficient comprehension skills. The findings revealed that students who are proficient in comprehension abilities used more cognitive reading strategies for RCGP compared to the moderate comprehension readers. However, the moderate readers used more metacognitive strategies than the struggling readers.

Teachers' Attitudes and Beliefs About Reading Comprehension Instruction

Research suggests that teachers' attitudes and beliefs play a major role in what they teach and do not teach (Hall, 2005). Nourie and Lenski (1998) posited that the teachers' attitude toward literacy is one of the most significant factors of students' success in reading achievement. Wilson, Grisham and Smetana (2009) stated that content area teachers frequently fail to see a connection between literacy skills and content information. Lesley (2004) asserted that despite years of research on the subject of literacy, secondary teachers continue to resist incorporating content area literacy instruction. Cantrell, Burns, and Callaway (2009) maintained that middle and high school teachers' resistance to incorporating content literacy program stems from several factors: teachers' beliefs about their roles and responsibilities as content area teachers and content teachers' feelings of being ill-prepared to teach literacy practices. Similarly, Goldman (2012) argued that teaching comprehension instruction is the responsibility of all teachers in the United States. However, she further stated that other than English, few subject-area teachers feel qualified to teach content-area reading comprehension skills.

McCoss-Yergian and Krepps (2010) examined the beliefs and attitudes of 39 middle and high school core and elective disciplinary teachers in relation to the implementation of comprehension strategies instruction along with content instruction. The researchers administered a validated assessment scale in order to determine the participants' professional beliefs about reading comprehension. The researchers interviewed the participants to determine the participants' professional practices that were connected to the teachers' reading comprehension strategies. The results revealed that a substantial number of secondary teachers held very negative, unfavorable attitudes in five broad categories toward the implementation of content area reading instruction The results indicated that the teachers' lack of comprehension instruction impacted their classrooms, lesson plans, and curricula.

Peabody (2011) examined the impact that teachers' beliefs and instructional practices had upon students' performance on the Florida Comprehensive Reading Assessment Test in 10th grade. The study consisted of teachers from four schools where the majority of the students were low achievers. The teachers at these four schools were observed and interviewed. The findings revealed that teachers at high performing schools focused on student-centered teacher while teachers at low performing schools promoted teacher-centered instruction. The results suggested that there is a positive correlation between student-centered learning and the Florida Comprehensive Reading Assessment Test performance, and a negative correlation between Florida Comprehensive Reading Assessment Test emphasis and student achievement.

Ulusoy and Dedeoglu (2011) conducted a study in Turkey of 143 science, social studies, and classroom teachers from first to eighth grades. The overall goal of the study was to examine the teachers' reading and writing practices and to investigate their beliefs about content area reading and writing. During the second phase of the study, the researchers conducted semi-structured interviews with 12 teachers. The results revealed that teachers did not use specific reading and writing strategies. This study recommended content area reading and writing courses for pre-service and in-service teachers. In another study Tan (2011) examined secondary mathematics and science teachers' implementation of a language of instruction policy in Malaysia with English being the language of instruction for mathematics and science instruction. This study explored the teachers' beliefs about their responsibilities as math, science, and language teachers and how these beliefs impacted their instructional practices. The results revealed that teachers' beliefs about their responsibilities as either content teachers or language teachers negatively impacted the students' language acquisition opportunities.

Warren-Kring and Warren (2013) examined the impact of an adolescent literacy education course on content area education students' attitudes regarding implementing adolescent literacy strategies in their content instructional practices. Longitudinal data were collected over a span of five years, studied, and analyzed. Data analysis revealed changes in the education students' attitudes regarding implementing literacy strategies within their content areas using a pre/post format of the "Pre-service Teachers' Perception/Attitude Survey."

Literacy in the Twenty-First Century

According to Goldman (2012) being literate in the twenty-first century means individuals must demonstrate proficiency in reading and writing to obtain knowledge, solve problems, and make sound decisions in all areas of life. A major challenge for educators is to make learning more relevant and to help students acquire the critical, problem solving skills needed for academic success (O'Hara et al, 2011). However, twenty-first century literacy is problematic for both students and teachers in four major areas: (1) proficiency in reading requires students to go beyond what the text says to what the text means; (2) successful readers must possess the ability to apply appropriate reading and interpretation skills differently depending upon the subject material; (3) technological advances makes it a necessity for readers to be able to comprehend information in print-based texts and also be proficient in successfully navigating and understanding information on the World Wide Web; (4) students must be able to analyze and evaluate materials from various sources in order to determine whether there is consistency among these sources.

Technological innovations during the first decade of the 21st century have changed the face of literacy (Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012). The term literacy has taken on a different meaning and no longer refers only to the ability to read and write. According to Leu et al. (2011) the meaning of literacy continues to change as new technologies emerge. Literacy is now deictic. Deictic is a term developed by linguists to describe words whose meaning rapidly changes as their context changes (Fillmore, 1966; Traut & Kerstin, 1996). Literacy has become deictic (Leu, 2000) because the meaning of literacy continues to change as new technologies for information emerge. This newer meaning of literacy involves qualities and major consequences for students' academic success (Carroll, 2011). Students' academic success depends upon their ability to effectively use various modes of literacy (Council of Chief State School Officers, 2010; Ritter, 2009); adeptness in fluency, comprehension, evaluation of challenging texts, and social and electronic communication. As a result of the advancements in information and communication technologies (ICTs), educational experts contend that new literacies should become an integral part of instruction. (Hsu, Wang, & Runco, 2013). There is strong evidence that using various types of technology promotes student engagement of and fosters academic achievement (Devlin, Feldhaus, &

Bentrem, 2013). The ongoing developments and changes in technology necessitate a need for trained professionals with the skills to plan and conduct high quality research (Poitras & Trevors, 2012).

Literacy has been expanded to include the term digital literacy. Alvermann, Hutchins, and DeBlasio (2012) described digital literacy in terms of how adolescents actively engage in online environments through online texts, games, and social networking. Gilster (1997) defined “digital literacy as the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers” (p.1). Gilster stated that digital literacy via the Internet involves proficiency in specific competencies. Digital is the current expression in education that describes the integration of new information and communications media (Goodfellow, 2011). Digital technologies include both hardware and software. Some examples of hardware are desktops, laptops, cell phones, and digital recording devices (Ng, 2011). Digital literacy is having a powerful impact upon society. Digital literacy impacts the way people work, study, and think (Littlejohn, Beetham, & McGill, 2012). According to Ertem (2011) a plethora of research has indicated that traditional books are no longer sufficient but that students and teachers need to employ various forms of technology to improve students’ reading skills.

Prensky (2001) introduced the terms digital natives and digital immigrants to describe the changes that are taking place as a result of new technological advances. According to Prensky, digital natives are individuals who were born after 1980 who grew up with the new technology; these are individuals whose lives have been immersed into computers, videogames, digital music players, video cams, cell phones, and other technological innovations. In contrast digital immigrants are individuals born before 1980 who grew up in a world without technology but have acquired or adopted some of the new technologies. However, although digital natives are often very proficient with social networking, texting, and other new technologies, they are not always as proficient with informational literacies of the online environment (Bilal, 2000; Eagleton, Guinee, & Langlais, 2003).

In many classrooms throughout the United States, many teachers go beyond teacher-centered, textbook-based, and other offline instructional practices to digital forms of learning designed to promote reading proficiency (Ryan, 2012). Ryan explained that digital lessons allow students to engage in collaborative learning activities, employ critical thinking, and problem solving activities. Additionally, more students at all age levels are reading digitally through such devices as tablets or smartphones (Beach, 2012). Digital reading has increased to the extent that as of December 2011, 42% of people 16 years or older had read one e-book or a long-form digital text; additionally those who read e-texts also read more compared to non-e-text readers (Rainie, Zickuhr, Purcell, Madden, & Brenner, 2012).

Currently, there is a strong emphasis placed upon students to acquire a solid, basic understanding in science, technology, engineering, and mathematics (STEM) (Israel, Maynard, & Williamson, 2013). According to Zollman (2012) there is general agreement that everyone needs to be STEM literate. However, Zollman contends that there is a difference between literacy and being literate; STEM literacy does not mean proficiency in content areas but rather refers to a proficiency of a compilation of skills, abilities, factual knowledge, and metacognitive abilities for the purpose of acquiring further knowledge. Providing quality STEM education is essential for students' future success (Stohlmann, Moore, & Roehrig, 2012).

Stohlmann et al. maintained that STEM education is one instructional approach to make learning more connected across the content-area disciplines and make learning more meaningful. However, the authors stressed the need for teachers to receive professional development training in order to effectively incorporate STEM education in their classrooms. However, a major challenge with STEM coursework is with the challenging vocabulary terms and concepts (Therrien, Taylor, Hosp, Kaldenberg, & Gorsh, 2011) common in expository texts (Mason & Hedin, 2011). Scott (2012) examined the features of 10 STEM focused high schools that were selected from various areas across the United States. The results revealed that students who attend STEM-focused high schools had higher academic achievement than students from similar schools. Kim (2011) placed an emphasis upon science education. According to Kim, science is important in a person's education because it is viewed by the public as authoritative and plays a strong role in people's lives and the development of societies. However, some researchers emphasize the collaborative role between science and technology (Bensaude-Vincent, Loeve, Nordmann, & Schwarz, 2011).

The implementation of information and communication technology (ICT) is strongly encouraged as an integral part of science teachers' instructional programs (Lin, Tsai, Chai, & Lee, 2013). Tsai et al. investigated science teachers' perceptions of technological pedagogical content knowledge (TPACK) by specifically addressing teachers' perceptions in terms of the practical application of technology in their classrooms. There were 222 pre and in-service science teachers in Singapore were surveyed. The survey examined the teachers' knowledge and practical application of the TPACK model. The findings revealed that the female science teachers indicated a stronger confidence in pedagogical knowledge but lower self-confidence in technological knowledge than males. Hakverdi-Can and Dana (2012) examined exemplary science teachers' level of computer use, their level of proficiency with various science computer programs, their level of computer-related application employment, and the amount of time students spent using the computer for science activities. The teachers who participated in this study included middle and high school teachers who were awarded the Presidential Award for Excellence in Science Teaching Award. The results revealed that the most frequently used computer applications were information retrieval from the Internet, online communication, the use of digital cameras, and data collection probes. The results further revealed that the amount of time the students spent using technology in their science classroom was directly related to the amount of time their science teachers' employed the computer and its applications.

Robotics instruction is another technological innovation to engage students in STEM education. Collaborative robotics projects are very beneficial to student learning. These projects require students to interact, work together and use problem solving skills to solve a robotic task. At the middle and high school level, robotics can be broken down into four main tasks: creating, constructing, programming, and testing. Although STEM education is important for all students, students with disabilities are often excluded from STEM education. Due to the fact that the Individuals with Disabilities Education Act (2004) requires educating students in the least restrictive environment, it is important that

SLD be allowed opportunities to participate in STEM education and engage in robotics activities (Yuen, Mason, & Gomez, 2014).

Text-to-speech (TTS) is another technology that has been used to support adolescents with learning disabilities to assist them with reading and comprehending expository text (Meyer & Bouck, 2014). Meyer and Bouck examined the effectiveness of TTS on oral reading fluency, comprehension, and task completion for two males and one female with reading deficits in a Midwest junior high school. The findings indicated that TTS did not have an impact upon students' fluency, comprehension, or task completion time but the results revealed that the students valued being able to use the software program. Another result of the study showed that students believed they showed gains in the three areas examined.

The emergence of the Internet has been instrumental in bringing about rapid changes in technology and continues to impact the meaning of literacy. Leu et al. (2011) argued that the Internet is the technology that defines literacy and learning in the 21st century. Additionally, the Internet is the most effective and sophisticated system for presenting new technologies that require new skills to read, write, and communicate efficiently. The Internet investigations results in students searching and scanning the Internet for answers to their inquisitions (Kingsley & Tancock, 2013). The Internet is impacting reading comprehension. Reading comprehension is one facet of literacy where change has emerged. It appears that online reading requires additional activities, skills, and strategies than offline reading (Coiro & Dobler, 2007; Leu et al., 2007).

Twenty-first century teachers are faced with the difficult task of knowing how to integrate technology with teaching instruction to meet the needs of diverse student populations (Ruffin, 2012). Brownell, Griffin, Leko, & Stephens (2011) maintained the importance of researchers and those involved in educating students be responsible for developing and employing high quality, researched based practices to support student learning. Quality research based instruction is extremely important due to the fact that 90 percent of adolescents with LD spend a portion of their instructional day in regular education classrooms (Cook & Odom, 2013; McKenzie, 2009; Sanford, Newman, Wagner, Cameto, Knokey, & Shaver, 2011). The majority of regular education classes include students with LD (Kennedy, Aronin, Newton, & Thomas, 2014).

Kennedy et al. (2014) ascertained that meeting the needs of LD students can be especially challenging because many teachers lack the additional instructional support needed to meet these students' needs. Students with learning disabilities (SLD) are especially challenged by content courses such as biology. These students often struggle with difficult concepts in biology and often have a difficult time keeping up with fast-paced lectures (Kennedy & Wexler, 2013). Kennedy and Wexler noted that some SLDS may be challenged when the teacher uses the textbook to assign lengthy homework assignment. However, it is important to note that textbooks play a strong part in STEM instruction (Brigham, Scruggs, & Mastropieri, 2011). SLD and other struggling learners often have difficulties understanding the vocabulary and concepts in the textbooks as well as with the science-specific language used in teacher's oral presentations of the material (Villanueva & Hand, 2011). However, there are instructional strategies proven to be beneficial in helping SLDs learn content material.

Multimedia-based instruction is one tool used to address the needs of SLD. One such multimedia tool used by Kennedy et al. (2014) used a multimedia tool called

Content Acquisition Podcasts (CAPs). CAPs include a number of research-supported instructional design principles and practices to help students learn vocabulary terms and concepts.

Kennedy et al. (2014) conducted a study with forty master's degree students who were taught to develop CAPs which were evaluated in terms of how well the CAPs were aligned to the design principles and practices. The results revealed that the participants were able to develop CAPs that were: (a) aligned to the design principles and research-based practices for teaching vocabulary, and (b) satisfied with their ability to create CAPs to the extent they intended to continue using them for future instructional purposes. These findings were important because they can provide both regular and special education teachers with the additional support they need to provide for the needs of special education students. However, regardless of the particular subject-area, all teachers need to understand and use research-based instructional practices to support all their students (Cook & Odom, 2013; Klingner, Boardman, & McMaster, 2013).

Douglas, Ayres, Langone, Bramlett (2011) evaluated the effects of a computer-based instructional to provide additional support to students with mild to moderate intellectual disabilities. The researchers used pictorial graphic organizers as support for increasing comprehension of electronic text-based recipes. Students' understanding recipes was determined by measuring the students' ability to use their graphic organizers to explain the steps in the recipes. The results revealed that all students improved their comprehension in relation to the e-text presentation of recipes after being introduced to the graphic organizers. Adolescents with disabilities who struggle with reading, writing, and verbal communication can benefit tremendously from high quality instruction and from various forms of technology (King-Sears, Swanson, & Mainzer, 2011).

Comprehending Text Structures

Akhondi, Malayeri and Samad (2011) determined that when readers are able to identify and utilize text structures in expository texts, readers can comprehend text with more ease and facility. Armbruster (2004) describes text structure as the organization and relationship among the information presented in the text. According to Akhondi et al. there is a significant amount of research that supports using text structure knowledge to promote comprehension of expository texts. Meyer (2003) asserts that readers in all grade levels must possess knowledge of texture structure to be successful in academic pursuits. Meyer, Brandt, and Bluth (1980) maintained that readers who lack text structure lack the skills needed to develop a reading plan.

Readers who possess a basic knowledge of text structures can anticipate the text developing in specific ways (RAND Reading Study Group, 2002). Additionally, students who understand text structure are more likely to know more than students who lack text structure knowledge. Based upon research by Meyer (1984) students who understand text structure can see the relationship between the main idea, key points and supporting details which helps readers comprehend expository texts. Akhondi et al. (2011) asserted that understanding text components helps readers locate and organize information in the text. Readers are able to identify and use these text structures in expository texts. Applying knowledge about text structures enable readers to comprehend text with more ease and facility.

Tompkins (1998) identified three steps teachers can use to teach expository text structures: (1) introduce an organizational pattern – the teacher introduces specific words and phrases that identify each text structure and provides students with a graphic organizer to represent each pattern; (2) the teacher provides the students with opportunities to work with the text through informational text and not stories or narratives; (3) Students are given opportunities to write paragraphs using each text structure through whole-class, small-group, and independent writing assignments.

Expository texts include a number of text features that provides very valuable content that enables students to effectively comprehend the main body of the text (Kelley & Clausen-Grace, 2010). Text features consist of several components that are not a part of the main body of the text. Those text features include the table of contents, the index, the glossary, the headings, the bold words, the sidebars, the pictures and the captions, and the labeled diagrams. These features benefit students if these text features are clear and are connected to the content. Text organization is another important feature that helps readers to understand the information. Text organization has to do with the patterns and structures the author uses to write the text. According to Kelley and Clausen-Grace, a well-organized text helps the reader make predictions about the information as they read through the text.

Science and Literacy Integration

The urgency for advancing science literacy in classrooms has received increasing attention over the last decade. Researchers imply that facilitating students' ability to effectively use online searching skills plays a vital role in promoting science literacy (Halverson, Siegel, & Freyermuth, 2010). Conducting searches through the Web is a common practice in many classrooms (Tsai, Hsu, Tsai, 2012). Tsai, Hsu, Tsai stated that Web-based learning not only provides the platform for students to search for information but allows them an opportunity to seek information they are interested in. However, due to the fact that many adolescents struggle with reading comprehension, there has been urgency to integrate reading into secondary content domains such as science (Fang & Wei, 2010). In order to promote science literacy, much time has been devoted to develop effective technological strategies (Kim & Hannafin, 2011). Presently, some common technologies in science classrooms include using: (1) equipment to gather the data, (2) media to deliver content, (3) interactive tools such as simulation learning games, (4) information researching, and (5) tools for developing reports of the findings (Hsu, Wang, & Runco, 2013).

Fang and Wei (2010) conducted a study to examine the effects of an inquiry-based science curriculum that integrated an explicit reading comprehension program and high quality science trade books on middle school students' science literacy acquisition. Students in 10 sixth-grade science classes from 1 public middle school were randomly assigned to 2 conditions: inquiry-based science only (IS) and inquiry-based science in addition to reading (ISR). The findings of the study indicated that the ISR students showed substantial gains in science literacy compared to the students in the IS group. The results suggest that a small amount of reading instruction is very beneficial towards promoting science literacy for middle school students.

Mason, Pluchino, Tornatora, and Ariasi (2013) conducted a study to examine the online process of reading and the offline learning by using an illustrated science text. To do so the researchers, investigated the effects of using a concrete or abstract picture to illustrate text and used an eye-tracking system to trace text and picture processing. The researchers randomly assigned 59 eleventh-grade students to 3 reading situations: (a) text only; (b) text with a concrete illustration; and (c) text with an abstract illustration in a pretest, immediate, and delayed posttest design. The findings revealed that the text illustrated by either the concrete or the abstract picture resulted in better learning than the text alone.

Many ninth graders, especially SLD, have a difficult time understanding biology (Shook, Hazelkorn & Lozano, 2011). These students tend to have difficulties comprehending the biology concepts due to their problems with understanding the vocabulary words. To address this problem, Shook et al. conducted a study using a learning strategy called Collaborative Strategic Reading in an inclusive ninth-grade biology class. CSR is a cooperative learning strategy that helps students comprehend text material by improving their vocabulary (Vaughn, Klinger, & Bryant, 2001). Twenty-six students in the biology class took part in the study. The researchers used CSR. In the CSR, students are assigned jobs various in their groups. One student serves as the leader whose job is to make sure all members in the group remain on task. Another student is the clunk expert who is responsible for explaining the steps to take when a member of the group encounters a difficult word or concept. The announcer is the person who holds up vocabulary note cards and calls on different members of the group to discuss the meaning of the vocabulary words. The encourager provides positive feedback. The recorder keeps a record of the words the group members know and the words they do not know. The time keeper keeps the group aware of time and lets the group know when it is time to move on to another portion of CSR. The results of the study revealed a positive correlation between implementation of CSR and significant gains on vocabulary quizzes (Shook et al., 2011).

Science-literacy integration has also been studied at the elementary level. Webb and Rule (2012) conducted a repeated measures study on animal and plant life cycles on student's vocabulary acquisition and pleasure in academic work under two conditions (a) a control group of drawing and labeling the parts of the life cycle and (b) the experimental condition of using basic figures to create life cycle drawings. To do so, the researchers alternated twenty-two second graders between the two conditions for four different 1-week life cycle lessons focusing on several animals and a plant. The results revealed that students learned more vocabulary in the experimental condition. The students considered both conditions as being almost equally as pleasurable.

Due to the difficulties associated with comprehending expository or informational texts, all students, including SLD, need effective instructional practices to achieve academic success (Jitendra, Burgess, & Gajria 2011). SLD encounter increasingly more challenging content in middle grades and beyond, their reading deficiencies are even more obvious (Fenty, McDuffie-Landrum, & Fisher, 2012). According to Fenty et al., there is an urgent need to provide SLD the support from both general and special education teachers working together. General education teachers provide the expertise in the content area while special education teachers generally specialize in strategy instruction and accommodations. Collaboration among regular education teachers, special education teachers, and reading teachers can help special education students achieve greater levels of academic success (Brownell, Hirsch, & Seo, 2004; Shealy, Mchatton, & Farmer, 2009).

Studies have been conducted to examine various strategies aimed at helping SLD achieve greater academic success especially in the area of reading. Seifert and Espin (2012) conducted a study to examine the impact of three types of reading interventions on the science text reading of secondary SLD. To do so, the researchers included twenty 10th-grade SLD as participants in the study. The three instructional approaches used with the experimental group were: text reading, vocabulary learning, and text reading plus vocabulary learning; the participants in the control group received no instruction. The researchers examined the three interventions on reading fluency, vocabulary knowledge, and comprehension. The findings revealed that the text-reading and combined interventions had a positive impact on reading fluency and vocabulary knowledge, and that the vocabulary intervention resulted in a positive effect on vocabulary knowledge. The findings suggested that students' ability to read the science text and understanding of the content vocabulary can be enhanced through direct instruction.

The acquisition of science content can be challenging for students in the English as an Additional Language (EAL) program because of their limited English language skills (McCallum & Miller, 2013). McCallum and Miller argued that EAL high school students in Australian classrooms are especially challenged because they are still learning English while at the same time expected to learn complex subject-related concepts as those found in science texts. Various efforts have been used to address these challenges. Some programs such as the Science World 9 Workbook (Stannard & Williamson, 2011) were designed to address the science literacy needs of EAL students. While this workbook contained a number of language-centered activities, it was designed with the assumption that students possessed basic literacy skills. McCallum and Miller – teacher-researchers - argued that the key science concepts used in this traditional workbook were way beyond the students' language and literacy skills. To address this problem, the authors created five modified texts designed to simplify the science concepts. The authors simplified complex sentences into simplified sentences that contained fewer words. These simplified texts contained more visual support than the regular textbooks. The results of this approach revealed that some of the EAL students were able to complete the assignments contained in these modified texts with little teacher assistance while a few other students needed more teacher support.

According to Lee and Buxton (2013a), the role that teachers play is more crucial and evident as the student population in the United States continues to become more diverse especially among English language learners (ELL). ELL are the fastest growing segment of students among the school-age population in the United States and it is predicted that within the next 15 years, one out of every four children will be an ELL (National Education Association [NEA], 2008). However, despite the tremendous increase in ELL in school districts throughout the United States along with more focus struggle with English language proficiency (Klinger, Boardman, Eppolitio & Schonewise, 2012). According to Klinger et al. as ELL enter middle school and beyond, the reading tasks become more difficult as well as the level of English proficiency that is required to be successful in school.

Lee and Buxton (2013a) emphasized the importance of ELL acquiring proficiency in general and content-literacy skills while receiving instruction in academic English proficiency. This presents a challenge for secondary teachers. According to Cisco and Padron (2012) recent data indicate that a substantial number of ELL can only comprehend English texts at a very low level of English proficiency. High school science teachers are challenged not only with helping native English speakers understand science content but are even more challenged with teaching science content to ELL. The challenges associated with teaching science content to ELL are largely due to the lack of academic English proficiency experienced by many ELL (DeLuca, 2010). DeLuca described the differences between social or spoken English to academic English; English for Speakers of Other Languages (ESOL) teachers are fully aware of these differences.

Deluca (2010) ascertained that social or spoken English relies on simple sentence structures while academic English uses complex sentence structures with more challenging, content-specific vocabulary. Furthermore, ELL appear to master social English in about one to two years. However, it takes approximately five to seven years to become proficient in an academic language (Cummins, 1986, 2000). DeLuca further explained that just because an ELL appears to be proficient in speaking social English does not mean that he or she will be proficient in academic English found in textbooks. ELL should receive the instructional support they need to develop the academic English proficiency they need to be proficient in content subjects such as science (Lee & Buxton, 2013a).

Taboada (2012) investigated the influence of general vocabulary knowledge, science vocabulary knowledge, and student text-related questioning upon science reading comprehension of three categories of students who varied in their English language proficiency. A total of 93 Grade 5 students participated in this study: thirty-five were English-Only (EO) speakers in the United States, 25 students were Asian English Learners (ELs) in the United States, and 33 were students who learned English as a foreign language (EFL) where Spanish is the dominant language. The results of the study indicated that general and science vocabulary knowledge, and student questioning contributed greatly to the varying degrees of science reading comprehension among the three groups of students. However, there was no specific variable that was identified that explained the relationship between language proficiency to the students' science reading comprehension acuity. One main limitation of this study is that the study did not include measures of vocabulary, student questioning, and comprehension in the first language of the two groups of second language learners (L2). The measures for the study were presented in English only.

As previously mentioned, in order for students to be successful in the twenty-first century requires proficiency in using various technological innovations both for school and career success (Hsu et al., 2013). Hsu and his colleagues conducted a study to investigate the integration of information and communication technologies (ICTs) with science literacy instruction. To do so, the researchers observed 32 middle school science teachers' ICTs and new literacies skills, and randomly observed 15 teachers' new literacies instructional practices in their individual classrooms. The findings of the study indicated that although teachers expressed the vital importance of using ICTs in the classroom, the integration of ICTs with science instruction was only minimally observed in their classrooms. In another study, Kruse and Wilcox (2013) identified two problems with integrating science education with technology: (1) science education focuses mainly on students learning facts and (2) the use of technology is centered mainly upon the ability to use the technology proficiency. Kruse and Wilcox argued that proficiency in science and technology literacy requires that students understand the natures of both science and technology (NOST). The authors contended that through understanding NOST, students acquire the skills to make practical applications of science and technology. Teachers can use technology to provide instruction in text comprehension and use technology to improve students' reading and writing skills (Montelongo & Herter, 2010).

A study was conducted by Wang, Ke, Wu, and Hsu (2012) to examine the outcomes of an action research investigation using blogs, MS PowerPoint (PPT), and the Internet as instructional tools on project-based learning in sixth grade science classes. Wang et al. posited that incorporating technology into project-based learning provides students with opportunities to use technology as integral part of their academic program. The authors stated that using technology strongly motivated the students to learn science information. However, the findings indicated that the students were lacking in information literacy, evaluation skills, note-taking and information synthesis. Additionally, the students lacked visual literacy and were unable to integrate visuals into their PP effectively. The findings included a recommendation about the importance of teachers teaching students about how to use information literacy and visual literacy. The authors recommended that teachers should teach information literacy by incorporating it into an inquiry-based project for subject learning rather than teaching it as an isolated subject. The authors concluded that further research on teacher professional development should focus on using collaboration action research as a part of graduate courses for science teachers in order to advance technology integration in classroom practices.

Carnahan and Williamson (2013) evaluated the use of a compare-contrast strategy on the ability of students with autism spectrum disorder to comprehend science text. The participants in the study were three middle school students with advanced autism and their teacher. To conduct the study, the researchers used content analysis to compare the number of meaning units in passages to the number of meaning units in student.

The incorporation of literacy and science in science classrooms have been supported by both literacy and science instructors (Washburn & Cavagnetto, 2013). According to Washburn and Cavagnetto, a federally funded initiative such as the Framework for K-12 Science Education was developed to integrate literacy as a part of the science curriculum. There is a plethora of Web-based science activities that promote science literacy (Zhang, 2013b). However, Zhang pointed out that prior research has revealed that many middle school students tend to acquire only a superficial understanding of Web-based science material. To combat this problem, a software program called IdeaKeeper was developed to help facilitate students' online learning abilities (Zhang & Quintana, 2012). This software tool was specifically designed to support middle school students' in three key strategies: skim-read-summarize information, use prompts to assist them with reading, and making reading more relevant. Zhang examined the differences between unguided and guided online reading assignments of eight pairs of sixth grade students in a science-based project. The results revealed that guided online reading was more structured, purposeful, and effective than the unguided online reading. The overall results suggest that middle school students' online reading of scientific materials needs to be guided.

A '*Position Paper'* created by the IRA (2012) strongly argued for disciplinary literacy instruction in secondary schools. Disciplinary literacy is defined as advanced literacy instruction that is an integral part of content instruction (Shanahan & Shanahan, 2008). A recent attempt by some literacy researchers (Lee & Spratley, 2010; Moje, 2008; Shanahan & Shanahan, 2008) has been aimed at improving content area literacy by shifting the focus to disciplinary literacy. Disciplinary literacy differs from content area literacy. According to Warren (2012) content area literacy focuses on general comprehension strategies that can be applied across the disciplines while disciplinary literacy focuses on the different strategies and conventions within various disciplines. Disciplinary literacy programs challenge the notion that a single approach to reading and writing is appropriate across the disciplines. Moje (2008) asserted that disciplinary literacy "builds an understanding of how knowledge is produced in the disciplines, rather than just building knowledge in the disciplines" (p. 97). According to the IRA, although there have been some evidence of disciplinary literacy instruction in secondary classrooms, a large number of content area teachers feel they lack the skills needed to provide literacy instruction within their discipline. From an international perspective, there are growing concerns about secondary teachers' abilities to incorporate disciplinary or content-related literacy instruction in their classrooms (Taylor & Kilpin, 2013).

The Web has become a major source of information to middle school students to complete school assignments (Zhang, 2013a). However, Zhang argued that many students have difficulties reading, understanding, and taking notes from online material. Zhang conducted another study to analyze the effectiveness of a digital notepad which used prompts to support middle school students in learning online scientific information. The researcher amassed data from 8 sixth grade students who participated in a two-week online science investigation. The results revealed that although the prompts were designed to help students to critically evaluate the websites, their notes indicated that the students' understanding of online information was superficial and lacked depth of understanding.

SLD are especially challenged by middle school science content (Marino et al., 2014). Assistant Technologies (AT) is an example of the technologies that teachers need knowledge of. According to the Technology-Related Assistance for Individuals with Disabilities Act of 1988, AT are pieces of equipment designed to assist and meet the needs of individuals with disabilities. AT reading instruments include such things as software, hardware, and other tools used to assist and enhance text-based reading more accessible and effective for students with learning disabilities (Hasselbring & Bausch, 2006). Mayer (2011) stated teachers should carefully select plan and use audio and visual tools that will meet the needs of SLD. However, although using AT is beneficial to SLD's academic growth, some research studies suggest that SLD are not receiving AT (Okolo & Diedrich, 2014). For an example, data from the National Longitudinal Transition Study 2 (NLTS) revealed that there were approximately 8% of over 300,000 students with SLD were fusing ATs in the last 12 months (Bouck, Maeda, & Flanagan, 2011). Findings revealed that only about 1% reported AT after high school.

Professional Development

A plethora of research studies have shown that effective PD for content area teachers have identified important characteristics resulting in changes in teacher knowledge and instructional practices (Desimone, 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Penuel, Fishman, Yamaguchi, & Gallagher, 2007). Garet et al. identified basic features of effective professional development which are: (a) content centered, (b) engaging learning, (c) coherence, and two structural features (d) adequate duration, and (e) interactive, collaborative participation.

According to Garet et al. (2001), the first feature, content focus, emphasizes the need for (PD) activities that are centered on subject matter content, on how students learn content, and how to improve teacher knowledge on content material. The second core feature, engaging learning, stresses the importance of being actively involved in productive discussions and planning as a part of the PD activities. The third feature, coherence, emphasizes that PD activities stand a greater chance of being effective when they are aligned with a broader scope of teachers' learning and development. The fourth feature, adequate duration, means that effective PD must be sufficient in the total number of hours and in the length of time that the activities occur. The last feature, interactive, collaborative participation means that effective PD involves the active engagement of teachers from the same school, department, or grade level who can work together to develop common goals and effective instructional plans. Kosanovich, Reed, & Miller (2010) posited that PD for content-area teachers is more effective when it supports adolescents to the extent that they become proficient in comprehending texts in any particular subject area.

Current science education reform (National Research Council, 2007) has identified three major components of teacher knowledge and practices that are essential for effective science instruction: (a) teacher knowledge of science content, (b) instructional practices that help develops students' understanding of science concepts and (c) instructional practices that fosters students' interest in scientific investigations. Heller et al. (2012) stressed the importance of PD that offers teachers a solid conceptual understanding of science content to provide students quality instruction. Lee and Buxton (2013b) maintained that content PD should incorporate both science and language. Lee and Buxton ascertained that science and language are intricately connected. Lee and Buxton emphasized the importance of teachers using meaningful language to promote science comprehension. The authors posited that students' understanding and mastery of science concepts can develop through exploring and conducting scientific investigations.

Investing in quality PD is essential for improving the quality of science teachers and science instruction (Lustick, 2011). In a descriptive study, Lustick examined 118 candidates for National Board Certification in Adolescent and Young Adult Science from 42 states about their professional learning experiences. The purpose of the study was to answer the question: 'How do candidates perceive the relative effectiveness of different professional learning experiences?' 'Effectiveness' in this study is defined as a PD's ability to provide a teacher with the help needed to promote student achievement. The study focused on the approaches to PD rather than the content or intentions of the said experiences. The participants in the study identified what they considered to be the three most effective approaches to PD: (1) developing science curriculum; (2) reading scientific literature; and (3) pursuing National Board certification. Education courses and in-service workshops were identified as the least effective. The results indicated that none of the PD provided an explanation of the most highly rated activities.

Kushman, Hanita, and Raphel (2011) investigated the impact of a teacher PD program called Project CRISS which stands for Creating Independence through Student-owned Strategies. The overall goal of Project CRISS was to help students learn different reading strategies, to improve comprehension, and to practice reading and writing strategies in various classes. The primary research question for this study was: What effect does Project CRISS have upon reading comprehension for grade 9 students in rural towns in the Northwest Region states? To determine the effectiveness of the program, the researchers used the Stanford Diagnostic Reading Test Fourth Edition Comprehension Subtest as the assessment measurement. The researchers administered the pretest and the posttest during the fall and spring, respectively, during the second year of implementation to the treatment group. The results revealed that there was no statistically difference between the treatment group and control on the mean reading comprehension scores.

Adamson, Santau, and Lee (2012) examined elementary teachers' instructional strategies to promote scientific understanding, inquiry, and support English development for a diverse population of students which included ELL. The study was part of a 5-year research and development initiative of a restructured science program and teacher training workshops to promote science literacy in inner city elementary schools. The data for the study included 213 post-observation interviews with third, fourth, and fifth grade teachers. The teachers reported using instructional strategies to build scientific understanding, but usually did not include more advanced inquiry-based strategies in their instructions. The teachers used various instructional strategies to support English language development. The findings revealed there were substantial differences among grade levels and teacher participation.

Carrejo and Reinhartz (2012) conducted an investigation of thirty-five teachers who participated in a yearlong PD program to promote science and language literacy for ELL. The researchers used an explanatory design methodology to determine the students' development in science and literacy. The research question guiding this investigation was: In what ways was the yearlong PD science program instrumental in assisting teachers at 10 elementary schools become more knowledgeable and proficient with science, language, and literacy instruction for ELL? The results revealed significant gains on the quantitative state science and reading tests. The qualitative data from the teacher observations revealed that teaching both science and language in an integrated method resulted in gains for both.

Online professional development (OPD) can be a very effective method of improving teachers' knowledge and instructional practices towards improving students' academic performance (Masters, Kramer, O'Dwyer, Dash, & Russell, 2010). Masters et al. explored the effects of a series of three learning-community model OPD workshops on teachers' knowledge and instructional practices for fourth grade language arts students. The results revealed substantial improvement in teachers' knowledge and instructional practices in vocabulary, reading comprehension, and writing instruction.

Heineke (2013) studied the effectiveness of reading coaches working with teachers to facilitate teachers' professional learning. This study included four reading teachers from four different elementary schools in one school district in a southeastern state. To do so, the researcher recorded the coaching sessions and conducted individual post interviews to examine the one-on-on relationship between the 4 elementary coaches and the teachers. An interpretative analysis revealed that the coaches supported the teachers but monopolized the discussions. The findings revealed that two of the coaches used different coaching methods to fit each teaching situation. Three teachers credited the reading coaches for instructional program changes. However, although all four coaches and teachers spoke in positive terms about their relationship, all of them stated that there were challenges with building a positive, mutually respectful relationship. The researcher stressed the importance of coaches working on conversing with teachers in a considerate, respectful manner. Coached-based PD has been used for early childhood programs and has improved Head Start teachers' vocabulary and phonemic awareness instruction (Powell & Diamond, 2013).

Annetta et al. (2012) examined the effects of a 3-year PD program designed to help secondary science teachers use video game design and development technology in the classrooms. Fifty-one secondary-science teachers participated in this study. The results revealed that the science teachers in this program were more proficient with technology and had a more positive attitude toward integrating technology and science during the second year of PD.

Teacher collaboration has been identified as an important component of students' academic success (Morgan, Parr, & Fuhrman, 2011). Clary, Styslinger, and Oglan (2012), conducted a study to determine the effects of a PD that focused on a collaborative learning approach impact instruction. The findings revealed that staff development that centers on teachers working together in learning communities had a positive impact on content area reading. In a similar study, Fletcher, Grimley, Greenwood, and Parkhill (2013) found several contributing factors to school success and student achievement: collaboration among school leadership; ongoing school-wide PD on reading instruction by an outside literacy expert, assessment data used to inform teaching and a school-wide action plan for literacy improvement.

A major goal of science PD programs is to close the gap between college science instruction (content) and classroom-based science instruction (pedagogy). To do so, many of the grants awarded to K-12 teachers for PD require a cooperative relationship between university scientists and teachers. It is assumed that a collaborative effort between university science instructors and teachers will help improve teachers' knowledge of content and pedagogical knowledge (Bell & Odom, 2012). Bell and Odom conducted a study to examine how college professors facilitated a science-based PD course. This descriptive study examined the pedagogical practices of three college instructors during a two-week summer PD program on inquiry-based science instruction. The study consisted of twenty teachers of fourth-through ninth grade students in a Midwestern city who were engaging in lessons based on the learning cycle. A descriptive analysis of video-recorded observations and audio-recorded follow-up interviews revealed that implementation of the learning cycle lessons differed among the three instructors. The findings further led to questions about the instructors' beliefs about the learning cycle and the methods by which the teachers were expected to learn the material presented in the PD course.

PD has been an important goal of equipping teachers with vital skills needed for a changing, global society (Ebenezer, Columbus, Kaya, Zhang, & Ebenezer, 2012). Ebenezer et al. identified other important goals of PD as: assisting teachers with skills that prepare students to be successful citizens in a technologically advanced society; and (2) the need for creating IT science curricula that will increase the number of STEM trained students.

Carrejo and Reinhartz (2012) conducted a study to determine the extent that science and language literacy co-developed. Thirty-five elementary teachers from 10 schools participated in a yearlong professional development program. The goal of the program was to promote science content learning while improving English language proficiency in ELL. The results of the study showed measurable gains from the state science and reading tests. Greenleaf et al. (2011) implemented an apprenticeship program to train teachers to incorporate disciplinary literacy instruction within science instruction. The results revealed that students of the teachers in the treatment group scored substantially higher scores on the state standardized tests of English language arts, reading comprehension, and biology than the students of the teachers in the control group.

Summary

The main purpose of Chapter 2 was to report the findings of various studies related to reading comprehension instruction particularly among adolescent students. Chapter 2 addressed some of the major issues regarding reading comprehension among adolescent learners. A major theme in Chapter 2 was the important role teachers play in helping all students comprehend texts. The research revealed that all teachers including secondary education teachers need to integrate content literacy strategies into their instructional program.

The role of technology was also discussed in Chapter 2. The research indicated that students must be able to use various technologies in school and beyond. Online reading comprehension effectively using the Internet for research, and using other technological advances are some of the skills students must learn to be successful in the twenty-first century. Chapter 2 included a discussion on the importance of secondary education teachers receiving ongoing quality PD in order to equip them with the training and knowledge needed to increase student learning and achievement.

Research studies have reflected what is known about effective comprehension strategies for adolescent students. However, there is very little research available about teachers' perceptions about reading comprehension strategies in terms of content instruction. The content focus for this study is science. Chapter 2 provided a plethora of research on teachers' perceptions of reading comprehension strategies to help students comprehend science content.

Chapter 2 offered the review of the literature. Chapter 3 will describe the methodology for the study.

Chapter 3: Methodology

Introduction

The purpose of this phenomenological study is to address how high school science teachers perceived their responsibility to provide content related reading comprehension instruction, particularly for students who struggle to comprehend science texts. This study is important because research has shown that aside from English teachers, very few subject area teachers are equipped to teach subject-related reading comprehension strategies (Goldman, 2012).

In Chapter 3 I present the research methods I used for this phenomenological study. I describe my role as researcher, and included: an explanation of the interview process that I used with the participants, a description of how the interview results were recorded, and an explanation of how I used the interview data. Other components in this chapter include descriptions of: the methodology; the instrumentation; the procedures for recruitment, participation, and data collection; the data analysis plan, issues of trustworthiness, ethical procedures, and the summary.

Research Questions

The overarching question for my study was: How do high school science teachers at one high school perceive their responsibility to provide content related comprehension instruction in order to help struggling readers comprehend science content?

Sub-questions:

1. How do high school science teachers perceive their responsibility to provide reading comprehension instruction?

2. How do high school science teachers perceive the effectiveness of incorporating reading comprehension instruction for helping all students comprehend science content?
3. What instructional strategies for reading comprehension, if any, do high school science teachers report using with struggling readers?
4. How do high school science teachers perceive the need for professional development or other education in relation to teaching reading comprehension?

Research Design and Rationale

In this study, I used a phenomenological research design because I was interested in gaining an understanding of the lived experiences of high school science teachers in terms of their perceptions of teaching reading comprehension to help students comprehend science texts. Other qualitative approaches I considered for this study included grounded theory, ethnography, and content analysis. However, I excluded all of these approaches because they do not focus on understanding a phenomenon through first-hand or lived experiences.

A case study was the only other qualitative approach that I seriously considered. However, I excluded it because of time constraints and the unavailability of specific resources such as lesson plans and syllabi. More specifically, a case study would have required a more in-depth study with vast amount of data over an extensive period of time. Another reason why I chose a phenomenological design was because of my limited personal experiences. My personal perceptions of reading comprehension instruction are limited to only elementary students. I feel I could learn much more about teachers' perceptions of reading comprehension instruction from the experiences of high school science teachers.

Role of the Researcher

I was the sole investigator for this qualitative endeavor. There were numerous responsibilities that I had to perform. I adhered to the guidelines for conducting research that have been established by the Institutional Review Board (IRB) of Walden University. As the sole investigator, I acknowledged that I did not know any of the faculty or staff at the school where the study was conducted. I did not know the participants personally or professionally. Additionally, I did not have any supervisory or instructor relationship neither with the participants, nor with anyone else at this school.

My role in this study was mainly as a listener. I conducted phone interviews lasting up to one-hour with 10 participants. I listened closely as each participant described personal experiences of their perceptions of teaching content related reading comprehension in their science classes. I recorded each interview session on a voice recorder. After conducting all ten interviews, I identified common themes among the participants' responses.

In order to avoid the influence of researcher biases, I refrained from expressing personal views on reading comprehension that might have influenced the participants' responses during the interviews. Additionally, to guard against bias, I conducted the interviews by phone with one participant at a time; so that no teacher would be able to hear the responses of the other teachers. Thus, the participants' responses were not influenced by those of the others.

Another important role of the researcher has to do with ethical matters. Consent and confidentiality were two key issues that I addressed in this study. All the participants in this study consented to participate without coercion, manipulation, or pressure (Patton & Cochran, 2002). I informed the participants about the purpose of this study and assured them that they reserved the right to withdraw from the study at any time. In order to maintain confidentiality, I did not reveal the identity of the participants. I used pseudonyms for the participants and their work place in order to protect their identities (Creswell, 2003). Additionally, I made sure to protect the participants' identity by making sure my notes from the interviews, voice recorder, and any other confidential data were kept in a secure place.

Methodology

Participant Selection Logic

The participants for this study were 10 science teachers at one high school in the southeastern United States. I used purposive sampling as the selection method for recruiting the participants. In purposive sampling, participants are chosen for a particular purpose (Leedy & Ormrod, 2005). For this investigation, purposive sampling was deemed appropriate because I was interested in studying only high school science teachers. I used the school's website to identify its science teachers. I selected science this study because results from the latest PISA (2012) assessment revealed that students in the United States were very weak in science proficiency (OECD, 2014).

My rationale for choosing 10 and no more participants was based upon findings in my literature review. Experts generally agree that qualitative research requires fewer participants than quantitative studies (Atwood, 1948; Bursk, 1962; Curry, Nembhard &

Bradley, 2009; Mason, 2010; Newman, 1957). Additionally, qualitative researchers' focus is on conducting an in-depth investigation of a wide range of issues related to the phenomenon (Curry et al., 2009). According to Bonde (2013), researcher experts disagree on the exact number of interviews it takes to reach data saturation. Data saturation or theoretical saturation occurs when the researcher senses that it is not necessary to continue collecting additional data because additional data will only result in more of the same findings (Marshall & Rossman, 2011). Guest, Bunce, and Johnson (2006) argued that data saturation may be reached with as few as six interviews, depending on the sample size of the population. Some researcher experts contend that a sample of one is enough for certain qualitative research studies (Back, 2012; Becker, 2012; Brannen, 2012; Denzin, 2012; Passerini, 2012). According to Burmeister and Aitken (2012), data saturation is not about the numbers but rather the depth of data. I chose 10 participants because I believed in doing so would assure that I reached data saturation.

I invited ten science teachers at one high school to participate in this study, delivered informed consent forms through the mail to each, and gave them the opportunity to accept or reject the invitation.

Researcher-Developed Instrumentation

Research instruments are devices used for collecting information that pertains to the research project (Wilkinson & Birmingham, 2003). I used phone interviews as the data collection instrument used for this study. I created 16 interview questions and have included them in Appendix C.

Kahn and Cannell (1957) described interviewing as "a conversation with a purpose" (p. 149). In an interview, the researcher asks specific questions related to a topic. In this study, I asked the participants questions about their perceptions of reading comprehension as a part of science instruction. There are three interview models: the unstructured interview, the semi-structured interview, and the structured interview (Wilkinson & Birmingham, 2003). The unstructured interview allows more flexibility. In unstructured interviews, the areas for discussion are established by the researcher, but the discussion is basically steered by the participants. In a semi-structured interview, the researcher predetermines more of the questions. In a semi-structured interview, the researcher has more control over the direction of the interview, but there remains adequate flexibility allotted to the interviewees to direct the course of the interview.

In a structured interview, the researcher predetermines all questions and thus has more control over the flow of the discussion. For this study, I employed the structured interview format because of time constraints. Although the unstructured and semi-structured interviews allow participants more control of the interviews, the disadvantage of using these is the possibility that the discussion will diverge from the main focus. The main focus for discussion was the teachers' perception of their responsibility to teach content related reading comprehension as a part of their science instruction. Since each interview lasted up to one hour, it was essential that both I and the interviewees stayed focused on the main topic. In order to stay within the one-hour time frame, I composed questions that addressed the issues regarding reading comprehension and asked enough questions to allow sufficient time for responses. I asked the same questions to all of the participants. I developed the research questions and the interview questions using my findings from the literature review.

Content validity was established when the researcher, along with at least half of the participants (the teachers), and the peer debriefer agreed that the findings of the study were accurate. A peer debriefer is someone who reviews and asks questions about the qualitative study to strengthen the validity of the findings (Creswell, 2003). The peer debriefer for this study is a colleague. This individual is certified to teach language arts, and social studies. She has 23 years of teaching experience and has taught at the elementary and middle school level. She holds a bachelor's degree in journalism and a master's degree in middle grades education for grades 4-8. Ms. Smith (alias) has published 4 inspirational books and is currently a middle school teacher where she teaches language arts and social studies.

Content validity can be established because all ten participants in the study are all licensed, highly qualified educators. All 10 participants were provided a copy of the findings to determine if they agreed with the findings. The findings from the participants and those of the peer debriefer were compared to establish a match between their findings and those of the researcher's. A match in the findings established content validity of the study.

Procedures for Recruitment, Participation, and Data Collection

The participants for this study were 10 high school science teachers from one high school in the southeastern United States. I invited each teacher to participate in the study by email. The teachers who chose to participate in the study signed a consent form. The study commenced once I received IRB approval to conduct research and after I received the signed consent forms from the teachers. All 10 science teachers chose to participate in the study. The interviews were conducted through the telephone and lasted up to one hour. All of the interviews were recorded through a voice recorder.

After the final interview, I transcribed each interview. After completing the phone transcripts, each participant was sent a copy of her transcript through email. The participants were given the opportunity to make changes or revisions to their individual transcript if they deemed necessary. They were asked to email me if any changes or revisions were needed. None of the participants made changes or revisions. All 10 transcripts were accepted as they were.

After completion of data analysis, I used member-checking to determine the accuracy of the findings. Each participant received a summary of the findings through email; the summary included common themes as well as points of difference. They were asked to indicate whether they agreed or disagreed with the findings then sign and return the bottom of the summary of findings document. Participants who chose not to fill out the bottom of the form were given an option to email me instead to indicate whether they agreed or disagreed with the findings. I informed the participants that I would give careful consideration to any disagreements of the findings. I would then determine whether or not I deemed it necessary to make changes to the findings. The results of the study were mailed to the participants and the stakeholders. The participants exited the study after receiving a thank you card which included a $5 gift card to a coffee house. The gift card was included to thank the teachers for participating in the study.

After concluding the data collection process, the next step in the process involved the data analysis plan.

Data Analysis Plan

The major task in the data analysis process was to identify general themes (Leedy & Ormrod, 2005). After transcribing the interviews, I used the steps in data analysis. Data analysis involved open, axial, and selecting coding. Open coding is the process whereby the data is broken small segments and carefully examined for similarities in order to reflect categories or themes. More specifically, each of the interview questions and the participants' responses were carefully scrutinized in isolation. I looked for similarities among the responses based upon words, phrases, or explanations that were repeated among the participants' responses.

For each question and corresponding response, I color coded the similarities using colored markers. The similarities were used to identify themes or categories. Responses that did not reflect commonalities were assigned a different color. I then used axial coding by putting the data back together in new ways to generate connections among the themes or categories. The last phase of the data analysis process involved selective coding. Selective coding is the process of combining the categories and their connections in order to develop a detailed description that explains the phenomenon being studied. In this study the phenomenon being explained was the participants' perceptions of content-related reading instruction in order to help struggling readers comprehend science texts.

Issues of Trustworthiness

Credibility

In qualitative research studies, credibility is the term that refers to internal validity. Leedy and Ormrod (2005) defined internal validity of a research project as "the extent to which its design and the data it yields allow the researcher to draw accurate conclusions about cause-and-effect and other relationships with the data" (p. 97). In simpler terms internal validity has to do with whether the study measures or tests what is actually intended (Shenton, 2004). Lincoln and Guba (1985) asserted that establishing credibility is of the utmost importance in establishing trustworthiness. Credibility was established through member checking, using rich, thick description of the findings and using a peer debriefer. Member checking involved presenting the findings to the participants to determine if they felt the findings were accurate. The purpose of using rich, thick description is to give the readers a clear, concise presentation of the findings. A peer debriefer is a person who is not involved with the study who reviews the findings and asks questions about the study (Creswell, 2003). Getting feedback from a peer debriefer determined whether or not she agreed or disagreed with the findings (Leedy & Ormrod, 2005).

Transferability

The term transferability is the term that is used to determine external validity. In quantitative studies, the term generalizability is used to determine the degree to which the findings of a study can be applied to new settings, people, or samples (Creswell, 2003). Additionally, generalizability involves extending the research findings from a study conducted on a sample population to a large population. There is a fundamental difference between generalizability and transferability. Generalizability makes broad claims while transferability allows researchers to make relationships between the components of their study and their own experience (Simon & Goes, 2013). In this study, generalizability was limited; however, transferability was possible because readers might have been able to find similarities between this study and their own experience. In order to make the results of this research investigation transferable to another situation, I maintained a detailed account of the environment within which the study takes place and included a rich, thick description of this environment in the final report (Shenton, 2004).

Dependability

Dependability is the term used to address the issue of reliability. Shenton (2004) stated the following regarding reliability "in addressing the issue of reliability, the positivist employs techniques to show that, if the work were repeated, in the same context, with the same methods and with the same participants, similar results would be obtained" (p. 71). In order to address the issue of dependability, the processes within the study should be explained in detail which would allow a future researcher to repeat the work; although the work might be repeated the results might be different (Shenton, 2004). In this research investigation, dependability was addressed by doing the following: (1) the research design and its implementation were fully described and were strategically conducted; (2) a detailed description of the method of data collection procedures was provided; and (3) a reflective assessment of the research investigation was included to determine the effectiveness of the research inquiry.

Confirmability

Confirmability is the qualitative counterpart to objectivity. To establish confirmability I took steps to ensure that the findings of the study were the result of the experiences and opinions of the participants rather than my own (Shenton 2004). In order to address confirmability, I used an audit trail. An audit trail is a detailed description of the research steps taken from the start of the research study to the development and reporting of the findings (Cohen & Crabtree, 2006). An audit trail included the following data: (1) a summary of the interviews, (2) a detailed description of the methodological design; and (3) instrumentation development information. Confirmability was maintained by providing full, descriptive records of what transpired in the research study.

Ethical Procedures

Before commencement of the study, permission was obtained from the Institutional Review Board (IRB) at Walden University to conduct research. Once permission was granted by the IRB, I sent a letter to the principal of the school requesting permission to conduct research with the science teachers. Included in the letter were the following items: the intent of the study, how the study would be conducted, the amount of time involved, and the potential benefits and outcomes of the investigation.

Each participant received an informed consent form. The informed consent form included the following components: an explanation about the purpose of the study, the procedures of the study, and a discussion about the participants' rights. Other components of the informed consent form included the potential benefits and risks of the study, the participants' signatures, and my signature indicating I agreed with the terms specified in the form. The participants were informed that their participation in the study was on a volunteer basis and that they had the right to withdraw from the study if they chose to.

One phone interview was scheduled for each participant. The interviews were scheduled at a time that was convenient for them. Each interview lasted up to one hour. All of the interviews were recorded on a voice recorder and the participants were provided with a typed transcript of her individual interview. All of the information gathered from the interviews remains confidential. Aliases were used instead of the actual names in order to protect the identity of the participants and the school. The data was stored in a safe place throughout the research investigation. Only the researcher has access to the data. The data will be stored for 5 years in a secure place. At the end of the 5 year period, the data will be destroyed.

Summary

Chapter 3 included the research design and rationale for the study, the role of the researcher, methodology, and issues of trustworthiness. This chapter also included an in-depth discussion about the research instruments. Interviews were the only instrument used for this study. The purpose of this phenomenological study was to address how high school science teachers perceived their responsibility to teach content related reading comprehension instruction particularly for students who struggle to comprehend science texts.

Chapter 3 also addressed how the study established external and internal validity. In qualitative research, credibility is the term used to determine the plausibility of the study. Credibility is the extent to which the study measures or tests what it is intended (Shenton, 2004). This study employed thick descriptive language, member checking, and peer debriefing to establish credibility. External validity is the degree to which the findings of a study can be applied to other situations (Leedy & Ormrod, 2005). In qualitative studies, transferability is the term that is used to determine external validity. Transferability was strengthened in this study by maintaining a detailed account of the environment where the study occurred and also through the use of rich, thick description of the report (Shenton, 2004).

Chapter 4 will present the results of the study.

Chapter 4: Results

Introduction

The purpose of this phenomenological study was to address how high school science teachers perceived their responsibility to provide content related reading comprehension instruction, particularly for students who struggle to comprehend science texts. This study was important because research has shown that aside from English teachers, very few subject area teachers are equipped to teach subject-related reading comprehension strategies (Goldman, 2012).

The overarching research question for this study was: How do high school science teachers at one high school perceive their responsibility to provide content related comprehension instruction in order to help struggling readers comprehend science content? The study was guided by the following sub-questions:

1. How do high school science teacher perceive the importance of teaching reading comprehension?
2. How do high school science teachers perceive the effectiveness of incorporating reading comprehension instruction to help struggling readers?
3. What reading comprehension strategies, if any, do high school science teachers report using with struggling readers?
4. How do high school science teachers perceive the need for professional development or other education in relation to teaching reading comprehension?

This chapter will include discussions of the setting, demographics, data collection, data analysis, evidence of trustworthiness, and results, and will conclude with a summary.

Setting

Because I conducted phone interviews, the setting for these interviews was the privacy of my home. The only difficulty occurred during the scheduling the phone interviews because the time commitment was an issue for all 10 participants. All of the participants had problems with scheduling because of job-related and personal responsibilities. I used a time-interview schedule sheet to make scheduling easier and more convenient for the participants. Each participant was sent a copy of the time-interview schedule form which consisted of numerous dates and hourly blocks of time for the participants to choose from.

Demographics

The participants for this study were 10 high school science teachers from one high school located in a district in the southeastern United States. Participants had a combined total of 125 years of teaching experience, ranging from 4 years for the participant with the least amount of experience, to 31 years for the participant with the most years of teaching experience. Five of the participants hold an educational specialist degree, three hold a master’s degree, and two hold a bachelor’s degree in education. One of the participants is currently pursuing a doctoral degree. Two of the participants have gifted education certification and two other participants are certified in reading. The science courses taught varied among the participants, and included chemistry, biology, physical science, and social science.

Data Collection

The phone interviews were scheduled over a two-week time frame. The interviews took place from October 10 through October 20 of 2015. I used the Olympus Digital Voice Recorder, model VN-7200 to record the phone interviews. All of the phone interviews were conducted in the privacy of my home away from any disturbances or outside noises that might have interfered with the quality of the recordings. Prior to conducting each interview, I conducted several test runs of the digital recorder to make sure the recorder was working properly and to make sure I understood how to use the device correctly. I asked each participant 16 interview questions that were aligned to the 4 research questions. The participants were given ample time to respond to each question. Each phone interview lasted up to an hour. I collected a total of 8 hours and 15 minutes of data. Eight of the 10 interviews lasted a full hour. The remaining two interviews lasted 30 minutes and 45 minutes respectively. I asked all 10 participants all 16 of the interview questions. I noted that eight of the participants gave lengthier, detailed responses to each question which resulted in their interviews lasting a full hour. However, I noted that the responses from the two interviews that lasted under an hour contained fewer details.

Data Analysis

The initial phase of the data analysis process involved transcribing the phone interviews. It took me approximately three weeks to transcribe all ten interviews. After I finished transcribing the phone interviews, I emailed each participant a transcript of their individual phone interview and asked them to review the phone transcript for accuracy. The participants also had the opportunity to make any changes or revisions to their individual transcript if deemed necessary. None of the 10 participants made any changes or revisions to the phone transcripts, and I accepted the transcripts as they were.

This next phase of the data analysis involved the open coding of the phone transcripts in order to identify common words, phrases, similarities, and differences among the participants' responses (Appendix E). I examined each interview question and each participant's responses in isolation. I color coded similar responses using highlighter markers. I used the following colors to represent similar responses: orange, blue, yellow, red, green, and pink. I used purple and gray to represent no commonalities among the responses. I explain the open coding and axial coding that emerged from the data in Appendix D.

Selective coding was the next phase of the data analysis process. The purpose of selective coding is to identify the major theme or category of the findings. The major theme of the findings from the four research questions revealed that 8 of the 10 teachers believe that it is their responsibility to teach reading comprehension. The selective coding processes also helped me answer the overarching question: How do science teachers at one high school perceive their responsibility to provide content-related reading comprehension instruction in order to help struggling readers comprehend science content? Eight of the 10 participants reported that it is their responsibility to teach content-related comprehension strategies to help struggling readers comprehend the science content; however, the findings also revealed that all 10 participants provide varying levels of reading comprehension as an integral part of their science instruction. Additionally, all 10 participants stated that they did their best to address the instructional needs of their struggling readers. They further stated that time constraints made it very difficult, if not impossible, to meet all of the needs of struggling readers. Eight of the 10 participants expressed that they have not had any formal training in reading comprehension and felt they lacked the skills needed to meet all of the reading comprehension needs of low performing readers. Only 2 of the participants have reading endorsement certification.

The 10 participants' responses to questions about their perceptions of their responsibility to provide reading comprehension instruction as a part of their science classes shared some common themes. The common themes that emerged from the data were: (a) teaching reading comprehension is an integral part of science instruction and the two cannot be separated; (b) comprehension in science classes involves being able to comprehend the content, charts, tables, and lab assignments; (c) science has a language all its own and contains many technical terms that many students are unfamiliar with; (d) understanding science vocabulary is major part of comprehending science textbooks; (e) teaching the roots of science words is one of the strategies science teachers use to teach vocabulary; and (f) professional development (PD) training needs to provide science teachers with specific strategies that can be incorporated in science classes.

The participants stated that the PD courses they have taken in the past has been generic and not content specific. In other words, the science PD training they have participated in does not address the comprehension needs of science teachers. One participant stated that literacy is totally different in science classrooms because science has a language all its own. This same participant further stated that reading comprehension is completely different in science classrooms. As an example, this participant stated that reading comprehension in an English class is very straightforward because students read stories which contain a plot, setting, and characters. However, science texts are very technical and do not flow like other content.

Seven of the participants expressed a need for effective PD for science teachers. However, three of the participants were concerned about the time involved with PD training. These three participants stated that they are challenged with trying to meet the academic demands of many students along with attending to other teacher responsibilities. Taking PD training would be an additional obligation. One of the participants who was in favor of PD stated that teachers are feeling lost and confused about how to get students who are reading far below grade level to the level where they should be. She further stated that science teachers need to be provided with effective PD tools that teachers can incorporate without overworking themselves or their students. Along these same lines, another theme that emerged was that none of them felt that they had all of the tools and strategies required to meet all of the reading and comprehension needs of struggling readers. Only 2 of the 10 participants have reading endorsement certification.

Evidence of Trustworthiness

Credibility

In qualitative studies, credibility refers to internal validity. Leedy and Ormrod (2005) defined internal validity of a research project as "the extent to which its design and the data it yields allow the researcher to draw accurate conclusions about cause-and-effect and other relationships with the data" (p. 97). I used member checking, thick description of the data, and feedback from a peer debriefer as means of providing credibility to the study. In terms of member checking, the participants were sent a copy of the results of the study in order to determine if they agreed with the findings; all 10 participants agreed with the findings of the study. I used thick description of the data in order to provide readers with a complete, comprehensive view of the data and the findings. A peer debriefer is someone who is not involved in the study but is asked to review the findings and asks questions about the phenomenon being investigated (Creswell, 2003). According to Leedy and Ormrod, feedback from the peer debriefer is important in order to determine whether or not this person agreed or disagreed with the findings. The peer debriefer agreed with the findings of this study.

Transferability

The term transferability is the term used to determine external validity. In quantitative studies, the term generalizability is used to determine the degree to which the findings of a study can be applied to new settings, people, or samples (Creswell, 2003). Additionally, generalizability involves extending the research findings from a study conducted on a sample population to a larger population. There is a fundamental difference between generalizability and transferability; generalizability makes broad claims while transferability allows readers of research to make relationships between the components of their study and their own experience (Simon & Goes, 2013).

In this study, generalizability was limited due to the small sample size. Transferability is possible if the study participants and environments are similar in other cases. More specifically, the degree of transferability is based upon the individual participants and the circumstances upon which the study was conducted.

Dependability

Dependability is the term used to address the issue of reliability. Bitsch (2005) defines dependability as "the stability of findings over time" (p. 86). According to Lincoln and Guba (1986) dependability occurs when the findings are consistent over time and can be repeated. Shenton (2004) asserted that similar results would be obtained by: (1) duplicating the same study, (2) using the same context with the same methods and procedures, and (3) using the same participants. Based upon Shenton's guidelines, I established dependability in my study by providing a full, detailed description of the research design and its implementation in order to enable a future researcher to repeat the work. Additional procedures recommended by Shenton to establish dependability were included in my study; those procedures consisted of a comprehensive description of the data collection and data analysis procedures and a reflective assessment of the research investigation.

Confirmability

Confirmability is the qualitative counterpart to objectivity. To establish confirmability, I made sure that the findings of the study were the result of the experiences and opinions of the participants rather than those of the researcher (Shenton, 2004). In order to address confirmability, this study utilized an audit trail; an audit trail is a detailed description of the research steps taken from the start of the research study to the development and reporting of the findings (Cohen & Crabtree, 2006). This study included the following audit trail: (a) a detailed description of the methodological design used; (b) instrumentation development information; (c) checking numerous times for accuracy of the transcripts; and (d) confirming member checking of the findings.

Research Results

The overarching research questions for this study was: How do high school science teachers at one high school perceive their responsibility to provide content related comprehension instruction in order to help struggling readers comprehend science content? In order to address the overarching research question, the study was guided by four sub-questions. Appendix C includes sixteen interview questions used to collect the information needed to answer the research questions.

Research Sub-Question 1

How do high school science teachers perceive the importance of teaching reading comprehension instruction?

The majority of the participants reported that teaching reading comprehension is very important. These participants further stated that reading comprehension is essential for the students' success in science. According to Eason, Goldberg, Young, Geist, and Cutting (2012), comprehension is the ultimate goal of reading and is essential for success in school and throughout life. Several of the participants reported that teaching reading comprehension is the responsibility of all content-area teachers and not just science teachers. Two of the participants acknowledged that teaching reading comprehension was not their responsibility. These participants felt that reading comprehension should have been taught long before these students entered high school.

Although two of the participants felt it was not their responsibility to teach reading comprehension, all 10 participants reported teaching varying levels of reading comprehension strategies as a part of their science instruction. The participants talked at length about how science textbooks contain many difficult vocabulary words and challenging concepts that many students are unfamiliar with. Carnine and Carnine (2004) posited that one of the reasons why many students struggle with comprehending science texts is because of these many difficult vocabulary words and too many challenging concepts presented at one time. The difficulty that many students experience with the science vocabulary is the primary reason why science teachers spend time addressing comprehension strategies. In order to help students understand the vocabulary terms, the teachers teach the roots of science words to help students understand what these terms mean. Other comprehension strategies the participants reported using are: breaking down the science content into smaller, more understandable terminology and teaching students how to read and interpret data, charts, and tables.

Although the majority of the participants reported the importance of teaching reading comprehension, all of the participants reported some problems they have with trying to teach reading comprehension along with teaching science content. Time constraints are the main problems the participants have with incorporating reading comprehension on a daily basis. They stated that teaching the science content consumes the majority of the science class. However, the participants made it very clear that they do address reading comprehension instruction as often as time permits. Another problem they reported was that the fact that the majority of them have had no formal training in teaching reading comprehension. Only two of the participants have reading certification.

Research Sub-Question 2

How do high school teachers perceive the effectiveness of incorporating reading comprehension instruction for helping all students comprehend science content?

As previously noted, all of the participants stated that they spend time working on building students' vocabulary knowledge. Research has shown a strong correlation between students' knowledge of vocabulary and comprehension of content in textbooks (Carlo et al., 2004; Cunningham & Stanovich, 1997; Hirsch, 2006; Nagy, Berninger, Abbott, Vaughn, & Vermeulen, 2003). They work on building vocabulary by having the students use the words in different contexts and be able to use these vocabulary words when explaining the content and in writing assignments (Archer & Hughes, 2011). Additionally, with the teachers' help and guidance, the students are instructed how to use these words when explaining the content and how to use these words in their writing assignments.

Several of the participants attested to the effectiveness of a reading program called READ 180; READ 180 is an intervention program designed to help upper-elementary, middle and high school students who are having difficulties with reading (Slavin, Cheung, Groff, and Lake, 2008). The READ 180 software contains mainly videos that mainly address science and social studies topics. The program requires the students to read about the content on the videos and then complete comprehension, vocabulary, and word study activities that are based upon the content. Teachers who use READ 180 are provided with the materials and training to support instruction.

Peer tutoring and differentiated instruction were two of the most effective strategies the participants reported using with struggling readers as well as with other students. Peer tutoring is an instructional approach where one student serves as the tutor and another student is being tutored. Peer tutoring has been used in all content areas and has resulted in academic growth and improvement for many students (Scruggs, Mastropieri, & Marshak, 2012). According to Kunsch, Jitendra, and Sood (2007) peer tutoring is most effective when students of different ability levels are paired together. The participants said that they often paired a high achiever with a low performing student. Most of the participants reported that peer tutoring is a very effective strategy for struggling readers because the students can discuss the content and ask questions in a non-threatening environment. Several participants stated that many of their struggling readers generally participate and engage more in the content discussions in their peer groups than they do in whole group discussions.

Differentiated instruction (DI) is another effective strategy that the participants reported using for all students which includes struggling readers. Differentiated instruction is an approach used in classrooms for planning instruction for students with varying levels of reading abilities and learning styles. Tomlinson and Strickland (2005) identified five elements of differentiation: (a) content which is what is taught, (b) process which is how students acquire understanding of the various topics (c) the product is the way in which students demonstrate what they know; (d) affect is how students connect and express their thoughts and feelings in the classroom setting; and (d) the learning environment is the manner in which the classroom is arranged and set up. All of the teachers differentiate instruction to some extent.

Most of the participants stated that they differentiate instruction mainly through product and process. In terms of the product, the teachers stated that they give the students a choice as to how they will present a product for a project. For an example, students can present information through a poster, poem, song, rap, power point project and any other creative format. In terms of process of information, most of the teachers stated that they regularly read the text out loud to students as well as break down the content in easier to understand terminology. In terms of content, the participants stated that due to the demands of teaching the state standards, they could not differentiate the content. The only exception to differentiating the content was in the inclusion class which has a high number of special education students; these students were given the same content but were often asked to write less to explain answers on quizzes and tests than the more capable, advanced students.

Research Sub-Question 3

What reading comprehension strategies, if any, do high school science teachers report using with struggling readers?

All 10 participants stated that incorporating reading comprehension instruction to help struggling readers is effective to some degree for some of these students. However, the participants further stated that the reading comprehension problems of struggling readers are many and complex. They talked about how they lack the training, resources, and time needed to meet all the comprehension and instructional needs of struggling readers.

Research Sub-Question 4:

How do high school science teachers perceive the need for professional development or other education, in relation to teaching reading comprehension?

Most of the participants expressed a need for PD in order to learn more effective strategies for teaching reading comprehension. The participants who had taken previous PD courses for reading comprehension were very dissatisfied with the training. They felt that these particular PD classes did not address the specific needs of science teachers. All of the participants stated that science has a language all of its own and that generic reading comprehension PD did not meet their instructional needs. Participant G stated that literacy is different in every subject. This same participant further stated that reading comprehension is totally different in science compared to other content areas. All of the participants expressed a need for professional development that demonstrated how to implement successful reading strategies they could use in their classrooms.

According to Lustick (2011), investing in quality PD for science teachers is essential towards improving the quality of science teachers and science instruction. Lee and Buxton (2013b) maintained that the focus of professional development should incorporate both science and language. Lee and Buxton further stated that in order for students to understand science concepts, the language used to teach science concepts must be used in meaningful language that promotes comprehension. As previously noted, the majority of the participants expressed a need for PD for reading comprehension; however, two of the teachers were opposed to PD. These participants felt that taking additional PD training workshops would result in more work for them to do. Moreover, these two participants explained that they already had way too much to do to maintain their current workload. Teacher I stated that the teachers needed effective PD learning that would provide teachers with successful strategies to help struggling readers make the progress needed to get them where they need to be. Participants I further stated that effective PD learning should employ strategies that the teachers could implement without overworking themselves or overworking the students.

Summary

The key findings of the study revealed that the majority of the participants felt that it is their responsibility to teach reading comprehension as well as to teach the science content. However, several participants stated that teaching reading comprehension is the responsibility of all content area teachers and not just science teachers. Several of the participants stated that reading comprehension is inherently embedded into the science instruction and that you cannot separate the two. The findings revealed that all 10 participants provide varying levels of reading comprehension instruction as an integral part of their science instruction. In terms of strategies to assist struggling readers, the findings revealed that the participants do their best to provide additional support to help these students with their comprehension issues. However, several of the participants expressed that they have not had any formal training in reading comprehension and felt they lacked the skills needed to meet all of the reading and comprehension needs of these low performing readers. Only 2 of the 10 participants have reading endorsement certification. In terms of PD training in reading comprehension, all 10 participants reported a need for content specific professional learning rather than the generic type of PD.

The main focus of Chapter 4 was the data collection and data analysis processes. In Chapter 5, I will present the interpretation of the findings, the limitations of the study, recommendations and the implications for positive social change.

Chapter 5: Discussion, Conclusions, and Recommendations

Introduction

The purpose of this phenomenological study was to address how high school science teachers perceived their responsibility to teach content-related reading comprehension strategies, particularly for students who struggle to comprehend science texts. This study was important because research has shown that aside from English teachers, very few subject area teachers are equipped to teach subject-related reading comprehension strategies (Goldman, 2012).

The key findings of the study revealed that the majority of the participants felt that it is their responsibility to teach reading comprehension in addition to science content. However, several participants stated that teaching reading comprehension is the responsibility of all content area teachers and not just science teachers. Two of the participants noted that reading comprehension is inherently embedded in science instruction, and that the two cannot be separated. The findings revealed that all 10 participants provide varying levels of reading comprehension instruction as an integral part of their science instruction.

In terms of strategies used to assist struggling readers, the findings revealed that the participants provide as much support as possible to help them. However, the majority of the participants reported that they have not had any formal training in reading comprehension. They felt they lacked the skills needed to meet all of the reading and comprehension needs of their low performing readers. Only 2 of the 10 participants have reading endorsement certification. In terms of PD training in reading comprehension, all

10 participants reported a need for content specific professional learning rather than a generic type of PD.

Interpretation of the Findings

The findings of the study confirmed much of the research reported in Chapter 2. Vocabulary instruction was a major area of agreement between the findings of the study and the research reported in the literature review. All 10 participants stressed the importance of vocabulary instruction in their science classes. They explained that understanding the vocabulary plays a large role in the students' ability to comprehend the science content. The participants stated that many of the students are challenged by the science vocabulary and struggle with comprehending the science content. The participants' perceptions of vocabulary support the research findings discussed in Chapter 2. According to Carnine and Carnine (2004), one of the reasons why many students struggle with comprehending science texts is because these texts contain too many vocabulary words and too many difficult concepts presented at one time. The findings of the NRP (2000) report revealed that vocabulary instruction does result in improvement in comprehension, but the findings also revealed that age and capabilities of the students must be taken into consideration when planning instruction.

The participants reported using various strategies for building students' vocabulary knowledge. Teaching the roots, base words, prefixes and suffices of science words fit into the category of general vocabulary instruction (Hougen, 2015) and is a key strategy the participants reported using to build vocabulary knowledge. Teaching students to identify and understand word families and word parts help students to use this knowledge to understand the meanings of new words (Nagy, 2007; Nagy, Berninger, &

Abbott, 2006). Students who do not know common prefixes, suffices, and base words will know fewer words and generally have greater problems comprehending texts. This is why the participants stressed the importance of vocabulary building. Participant F stated that she spends a considerable portion of her science instruction teaching science words. For example, she stated that students need to know the difference between a prokaryotic cell and a eukaryotic cell. According to this participant, karyo means nucleus and phyto means cell. She further stated that knowing the vocabulary is a key to building a students' knowledge of science. This strategy of teaching the roots of words is part of morphological awareness, the understanding that complex words are built upon morphemes--the smallest meaningful part of a word. Words such as vapor, evaporate, and vaporize are examples of words that share the same morpheme (Hougen, 2015).

Another strategy the participants reported using is having the students read articles that are related to the science lessons they are studying in the classroom. Reading these articles builds vocabulary and broadens the students' knowledge about various topics and concepts. The participants also stated that students are required to use these new science terms in oral and written form to increase their vocabulary knowledge. All 10 teacher participants reported that science has a language all its own and stressed the importance of students being able to effectively use science language in both written and oral form. In order for students to effectively use science language, they need strong vocabulary knowledge. According to Archer and Hughes (2011) frequent exposure to words builds vocabulary and provides a fuller, more comprehensive understanding of what these words mean.

Nine of the 10 participants offered similar responses about the characteristics of effective readers. The participants reported that proficient readers do a better job of summarizing the content. The participants also stated that the good readers are able to apply the information they have read to other contexts. Proficient readers have a strong vocabulary and are able to use the vocabulary to effectively articulate the science content. Participant B noted that effective readers are more loquacious and engage in meaningful conversations about the content with the teacher and with other students.

Participant F, who teaches mostly gifted and high achieving students, had a different perspective on the characteristics of effective readers. According to Participant F, good readers are not always capable of taking the science content, following directions, and then going on their own. This participant further explained that even though these students are proficient readers, they sometimes lack confidence in their own comprehension abilities and are often insecure in their ability to understand what's being asked of them. This participant stated that one of her goals is help the students develop self-confidence. She shared that she tells the students that they are getting the information correct but are having difficulties processing the information. According to Participant F, when students have difficulties processing the information, they sometimes answer the questions incorrectly. This participant explained that she works on helping her students learn how to process information accurately.

All 10 participants had similar responses when describing the characteristics of ineffective readers. They reported that ineffective readers shut down easily and that they rarely engage in the classroom discussions. When called upon to read in class, these ineffective readers often stumble over words and have weak vocabulary knowledge.

These students are weak not only in the science vocabulary, but also in basic vocabulary knowledge. When these students read, they tend to read very slowly because they are focusing on trying to pronounce every word; they do not read for meaning but rather read to try to get the words right. More specifically, these struggling readers have problems with decoding words as well as being able to comprehend what they read. They do not understand what they are reading and cannot summarize what they read. The participants further stated that struggling readers do not read very much, and often fail to complete assignments because of their comprehension issues. Two of the participants reported that struggling readers make many grammatical mistakes when called upon to report on a topic. Additionally, eight of the participants talked about how struggling readers exhibit frustration and anxiety as a result of their reading comprehension difficulties. The participants reported that the weak readers not only lack decoding skills to figure out unfamiliar words, but also have difficulty extracting meaning from texts. The participants talked about how ineffective readers cannot make connections between the science content and real world applications.

The data from this study revealed that effective or expert readers read with a specific purpose in mind, whereas ineffective readers lack any purpose other than to call out words. As I have previously noted, according to Baker and Brown (1984a, 1984b) effective or expert readers are strategic; this means that they have a purpose for reading and make any changes or adjustments to their reading for each purpose and for each reading assignment. Additionally, strategic readers use various strategies and skills as they extract meaning from reading (Paris, Wasik, & Turner, 1991). The application of effective reading strategies and reading skills can improve students' self-esteem as they become more proficient readers, and the use of comprehension strategies can narrow the gap between unskilled readers and more proficient readers.

In terms of strategies to assist struggling readers, the findings revealed that the participants do their best to provide additional support to help these students with their comprehension issues. However, incorporating reading comprehension instruction without compromising science instruction is problematic for many teachers, including the 10 participants in this study. Moreover, teachers are cognizant of the fact that the reading demands of textbooks far exceed the reading ability of a substantial number of students (Shanahan and Shanahan, 2008).

The participants stated that they use various methods to assist struggling readers with the science content. One participant stated that she uses a middle school science textbook that covers the same concepts as the high school science textbook but on a lower level. This same participant stated that she uses this lower level textbook to tutor struggling readers after school. Other participants reported that they read the text aloud to the students. Several participants reported using PowerPoint slides to teach key information. However, it should be understood that reading the text aloud to the students and using PowerPoint slides are two methods of presenting the content to the students. However, these two methods contribute very little towards helping students learn the strategies needed to read and comprehend the material on their own (Vaughn et al., 2013). Several of the participants stated that they have not had any formal training in reading comprehension and feel they lack the skills needed to meet all of the reading and comprehension needs of these low performing reader. Only 2 of the 10 participants have reading endorsement certification.

All 10 participants incorporate technology and online learning opportunities to help their students understand the science content. As previously noted, research indicates that facilitating students' ability to effectively use online searching skills plays a vital role in promoting science literacy (Halverson et al., 2010). Particularly, searching the Web for information has become common in many classrooms (Tsai, Hsu, Tsai, 2012). Tsai, Hsu, Tsai further stated that Web-based learning not only provides the platform for students to search for information but allows them an opportunity to seek information they are interested in. However, because of the problem associated with reading comprehension for many students, there has been an urgency to integrate reading into secondary content domains such as science (Fang & Wei, 2010).

The participants all discussed the importance of utilizing technology as much as possible as a part of their science instruction. According to the participants, many of the students are "savvy" with technology. The participants reported that some students need little to no assistance with using the computer to complete science assignments; these students are proficient in reading and computers and use these proficiencies to create power point projects or other types of computer projects. However, a significant number of students do not have basic technology skills and lack the skills needed to create computer projects. Seven of the participants reported that students who read below grade level lack the reading skills needed to use the computer for science content purposes. The participants reported that they assign various websites for the students to use to do research reports. However, the struggling readers lack the reading and comprehension skills needed to locate and utilize information from websites.

In addition to using the computers, all of the participants have interactive Promethean boards in their classrooms. Participant A reported that she uses the Promethean board regularly as a part of her instruction. The students write things on the Promethean board to complete assignments. This same participant stated that her students are sometimes required to submit assignments to her by email. All 10 participants talked about how they are challenged to use the computers as much as they would like to because there are not enough computer labs or mobile units to accommodate all of the students. They all talked at length about how frustrated they were the times when their students were unable to do computer assignments because the computer lab was being used by other classes.

Most of the participants expressed a need for effective PD for reading comprehension implementation. The majority of the participants strongly stated that past PD classes on reading comprehension did not address the needs of science teachers. They further stated that previous professional learning was more generic and not content specific. The participants strongly stated that they would like professional learning where they could be shown how to implement effective researched based strategies that could be implemented in their classrooms without compromising science instruction.

The conceptual framework for the study was built upon the belief that reading comprehension is critical for students' academic success. Basic reading skills involve the ability to pronounce and decode words. However, the ultimate goal of reading is to be able to comprehend the words within the text (Aaron & Baker, 1991). Reading for understanding is essential for students in all grade levels (Meyer & Ray, 2011). However, the academic demands of secondary students are more challenging particularly in the area of reading (Goldman, 2012). Additionally, the comprehension of expository text is critical for academic success in school (National Educational Goals Panel, 1999). Goldman posited that successful reading at the secondary level means that students must be proficient in analyzing, synthesizing and evaluating information from various sources.

The findings of the study support the conceptual framework. The results of the study revealed that the 8 out of 10 of the participants felt that it is their responsibility to teach reading comprehension. It was very evident that all 10 participants understood the importance of comprehension and that comprehension is crucial for success in their science classrooms. Several of the participants noted that reading comprehension is inherently embedded within science instruction. The participants all reported that comprehension in science classes includes a number of things such as being able to interpret and analyze data, charts, and tables. Additionally, the participants emphasized the importance of students being able to comprehend the science content in order to successfully perform the lab assignments. Science and reading both utilize the following skills: predicting, inferring, understanding key vocabulary concepts, interpreting and analyzing data along with the ability to interpret and articulate this information (Conley, 2008; Norris & Phillips, 2003; Osborne, 2002). The participants all reported that much of their instruction is centered on teaching these reading and science skills.

Limitations of the Study

The sample size was a limitation to this study. This study consisted of 10 participants from one region of the country which was the southeastern United States. I collected a substantial amount of data from these 10 participants. However, had my study included individuals from several regions of the country instead of just one, I would have acquired even more data. This additional data would have provided me with an even deeper, more comprehensive understanding of this phenomenon. The participants in this study teach in a very small district which has only one public high school. However, the responses from a more diverse group might have been vastly different from the participants' responses in this study.

Another limitation of the study was the fact that I used only phone interviews as my data collection instrument. My findings might have been totally different had I included a focus group as an additional instrument. A focus group is a data collection method whereby a researcher interviews several participants simultaneously. In a focus group, I would have interviewed approximately 10 to 12 people in one specified location to discuss the topic for 1 to 2 hours. A focus group has a moderator who is in charge of facilitating the meeting. As the moderator, I would be responsible for: introducing the issues to be discussed, making sure everyone stays focused on the topic, and ensuring that no one dominates the conversation (Leedy & Ormrod, 2005). I would have used other teachers to participate in the focus group instead of the same people who participated in the phone interviews. Utilizing both these two data collection methods would have given me a much broader perspective of the teachers' perceptions of reading comprehension instruction than just the phone interviews.

During the writing of the proposal, it seemed more feasible to conduct only phone interviews and to use only participants from one school district. Time constraints were the main factor in my decision to use only phone interviews. Additionally, although this study has limitations as have been pointed out, I was still able to collect a substantial amount of very valuable data.

Recommendations

The findings for this study may be used to conduct further research on reading comprehension instruction for high school science teachers. Recommendations for future study include expanding the study to include a more diverse group of participants and including more than one data collection instrument. As pointed out in the limitations section, including a focus group would yield more data. The researcher would be able to obtain a fuller, more comprehensive understanding of reading comprehension from several data collection instruments.

I strongly recommend conducting a case study rather than a phenomenological study. In a case study, the researcher would collect more data over an extensive period of time. I also believe that the researcher would learn more about reading comprehension strategies and would have the opportunity to interact with the participants and the program being studied. These interactions would allow the researcher an opportunity to get a first-hand view of what takes place in a science classroom. The researcher would be able to see if and how comprehension strategies are implemented. In a case study, the researcher would also record the various details in and outside the classroom setting that impact science instruction. More specifically, doing a case study would allow the researcher a better understanding of if, how, and under what circumstances reading comprehension does or does not occur in a high school science class.

Implications

Positive Social Change

The potential for positive social change is possible for individual teachers and administrators. Individual teachers may use these findings to reflect upon their own personal feelings and beliefs about teaching reading comprehension. The findings might be beneficial to teachers at all levels but particularly for high school teachers. The results from the study might assist teachers with learning how to integrate reading comprehension strategies into their instructional program.

Potential positive social change can occur at schools that implement effective reading comprehension strategies as an integral part of the instructional program. The results could be beneficial to school administrators whose job it is to develop and revise the curriculum as needed. Teachers may use the results to assist them with developing effective lesson plans that incorporate reading comprehension instruction. Improving students' comprehension abilities may positively impact student retention thus ensuring more graduates from high school.

Conclusion

High school teachers have two related instructional responsibilities: to teach content information and to improve students' reading comprehension abilities (Vaughn, et al., 2013). High school science teachers are especially challenged with being able to integrate comprehension instruction without sacrificing science instruction. It is a matter of being able to have balance between teaching effective reading comprehension strategies along with teaching science content. Science teachers as well as other content area teachers are responsible for meeting the needs of all students which includes struggling readers. Meeting the instructional needs of all students is a daunting task especially for those students who struggle with comprehension issues. It is imperative that teachers and administrators at all levels, as well as community leaders work together to come up with a viable plan to meet the reading comprehension needs of all students.

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Appendix A: Letter to the Principal

07/02/15

Dear Sir:

My name is Theresa Williams. I am a doctoral student at Walden University. I am writing requesting permission to interview high school science teacher at your school. My research topic is entitled: *High School Teachers' Perceptions of Teaching Content Related Comprehension Instruction.* The focus of my study is on acquiring an understanding of high school science teachers' perceptions of teaching content related comprehension instruction particularly for students who struggle with comprehending science content.

My proposal requires the participation of high school science teachers at your school. My study would involve conducting up to an hour long phone interview with each of the teachers who agree to participant in the study. Additionally, if granted permission to conduct phone interviews with these teachers, each teacher would receive an informed consent form. The consent form would explain the study and would also include a description of the participants' rights.

Included with this letter is a copy of a summary of my proposal for your review. If you have any questions or concerns, I can be reached by phone at 404-783-6871 or by email at tdwill54@yahoo.com.

I look forward to your response.

Onward & Upward,

Theresa D. Williams

Appendix B: Consent Form

You are invited to participate in a research study investigating your perceptions of teaching content-related reading comprehension instruction particularly for students who struggle to comprehend science texts. The researcher is inviting up to ten science teachers from one high school in the southeastern United States to participate in this study. This consent form explains the purpose of the study, the procedures, the amount of participation required, and your rights as a participant.

This research investigation is being conducted by Theresa Williams who is a doctoral candidate at Walden University.

Purpose of the Research

The purpose of this research investigation is to gain an understanding of high school science teachers' perceptions of their responsibility to teach reading comprehension instruction particularly for struggling readers. Additionally, the researcher is interested in finding out which strategies, if any, high school science teachers report using with struggling readers. The study's findings might be beneficial for district, local, and state curriculum developers as well as for teachers and students.

Voluntary Participation

Your participation in this study is voluntary. You also have the right to withdraw from the study at any time without any negative consequences. You will be treated with the utmost respect whether you remain in the study throughout its duration or if you choose to leave the study before its completion. In the event that you choose to withdraw from the study, all of the information you have shared through interviews and tapes will be destroyed and excluded from the final paper.

The Procedures

Your participation in this study will involve up to an hour long phone interview. These interviews will be recorded on a voice recorder. All of the interviews will take place within a one or two week time frame. Below are some questions that you will be asked during the interviews:

1. How do you perceive your responsibility to teach reading comprehension as well as science content?
2. How do you perceive the effectiveness of incorporation of reading comprehension instruction for helping all students comprehend science content?
3. What instructional strategies, if any, have you used to help struggling readers comprehend science content?
4. How do you perceive the need for professional development or other education, in relation to teaching reading comprehension?

Follow Up Interview Procedures

Follow up interviews will take place in approximately two weeks after the initial interviews. After thoroughly reviewing each participant's interview transcript, each participate will be sent a copy of her interview through email. The purpose of the follow up interviews is to give each participant an opportunity to ask questions about the transcript, to reword any statements if needed, or to make any changes to any responses made during the phone interview. The follow up procedures will be done through email; the participants will be asked to review the transcript of the phone interview and then either accept the transcript as it is or send any changes or revisions to me through email. After completion of the data analysis, the participants will receive a summary of the findings via email; I will use member-checking to determine the accuracy of the findings. The findings will include common themes. The purpose of this member checking is to determine whether the participants feel the results are accurate. I will ask the participants to email me with a response indicating whether they are in agreement with the findings or if they want to make some changes. I will work with the participants to make any reasonable changes or revisions to the summary. The final results of the study will be mailed to the participants and the stakeholders.

Benefits and Risks

Your participation will be beneficial in contributing to the body of information about effective comprehension instruction. Additionally, the results of this study might be useful for teachers and school administrators who make curriculum and instructional decisions. Lastly, the findings of this study might be useful in improving reading comprehension ability among struggling readers. The risks in this study are minimal if any. Possible risks might include anxiety and nervousness during the interviews. To minimize or alleviate any discomfort, the interview questions will be presented in a non-intimidating manner. Additionally, all participants retain the right to withdraw from the study without any negative consequences.

Confidentiality

The researcher will tape record all interviews. However, the names of the participants will not be recorded. The participants' names and other identifying pieces of information will not be included in any of the written reports. The interviews will be recorded on a voice recorder in order to accurately reflect what was shared during the interviews. All of the information retrieved from the participants will be kept confidential. The researcher will not divulge any of your information or responses with anyone other than the dissertation committee members and members of the IRB at Walden University. All data will be kept in a secured placed in the researcher's home. Data will be kept for at least five years and will be destroyed at the end of this time period.

Thank You Gift

Following the conclusion of the study, each participant will receive a five dollar gift card to a local coffee shop. The purpose of this gift card is to show my appreciation for your willingness to participate in this study.

Please feel free to contact me if you have any questions or concerns. I can be reached by telephone at: 404-783-6871 or by email at: tdwill54@yahoo.com. If you have questions of a private nature regarding this study, you may contact the Chair of the Institutional Review Board (IRB) at Walden University. Walden University's approval number for this study is 09-17-15-0102733 and it expires on September 16, 2016.

Statement of Consent

I have read and understood the above information. By signing below, I am agreeing to participate in this study under the terms described above.

Printed Name of Participant ___________________________________

Participant's Signature_______________________________________

Date of Consent____

Researcher's Signature_______________________________________

Appendix C: Participants' Interview Questions

Name:

____

Date:

____

Classroom Teacher:

____

Name of School:

____

Overarching Question: How do high school science teachers at one high school perceive their responsibility to teach content related comprehension instruction in order to help struggling readers comprehend science content?

Sub-Research Questions	Interview Questions
1. How do high school science teachers perceive the importance of providing reading comprehension instruction?	1. What are your feelings about teaching reading comprehension as well as science content? In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not.
	2. What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?
	3. Describe your perception of the characteristics of good readers. In other words, what do struggling readers do to demonstrate they comprehend the

	science material? 4. Describe your perception of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do that demonstrate they do not comprehend the science material?
2. How do high school science teachers perceive the effectiveness of incorporation of reading comprehension instruction to help all students comprehend science content?	5. What do you consider to be the difference, if any, between comprehension skills and comprehension strategies? 6. What reading comprehension strategies, if any, have you used in your classroom that have helped all of your students improve their comprehension of science content? 7. What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples, whole group, small group, or one-on-one, reading support specialist, or a combination of methods. 8. What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness. 9. What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach?
3. What instructional strategies for reading comprehension, if any, do high school science teachers report using with struggling readers?	10. What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, lack of background knowledge about various science topics, or a combination of problems?
	11. What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content? 12. What strategies or interventions beyond the

	classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?
4. How do high school science teachers perceive the need for professional development or other education, in relation to reading comprehension?	13. How do you feel about a need for professional development or other education, in relation to reading comprehension?
	14. Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?
	15. How long is your science period? 16. Are there additional services such as summer school, after school tutorial or Saturday school for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Appendix D: Participants' Interview Responses

Name: Participant A

Date: October 10, 2015

Role: High School Science Teacher

Name of School: Amazing High School

Question 1: What are your feelings about teaching reading comprehension as well as science content? In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not.

Participant A: Well, in our department we have reading across the curriculum in which all the contents in our school are supposed to engage the students in reading at least once a week. Actually it's a great thing in science because it gives us an opportunity to read an article, discuss it. And the articles I pull for my students are typically related to whatever unit and lesson that we're working on at that time. It gives them a more in-depth reality of real world situations which they actually learn.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant A: The biggest issue that I find is that our kids' reading levels are extremely low. Some of them are not reading at grade level which causes a problem and the other thing is students haven't learned to read and comprehend what they're reading so we work on that in my class as well.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do struggling readers do to demonstrate they comprehend the science material?

Participant A: What I do in my classroom is they read an article on Friday; their essential question or engaging activity is to read and the article and write a summary. My better readers do a better job of actually summarizing what they're reading and they're able to verbalize better what they've read versus those who go through and call the words out to themselves when they're supposed to be reading and they don't comprehend as well.

Question 4: Describe your perception of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do to demonstrate they do not comprehend the science material?

Participant A: They don't read; they don't read their work. And some of them just kind of skate along; they don't read it to comprehend it but they'll go back and try to look for every single answer versus whether they're reading their notes or reading their textbook because they don't understand. I force it- I push terminology a lot on my kids because science is a different language. And so they have to learn the terminology. They're slower in completing tasks because they're always going back trying to relook for the information versus they've read it and it and comprehend it and were able to complete the task.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant A: That's a tough one because a lot of kids don't have the comprehension skills to understand comprehension strategies. My difference in a comprehension skill is the ability to actually read the passage or read some information and understand what it says. A comprehension strategy is actually in my mind when they read it – they're able to apply it to an area or life skill or life lesson.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that have helped all of your students improve their comprehension of science content?

Participant A: Mainly we're covering a tough subject in class because I teach biology and human anatomy and physiology. But I'll use anatomy and physiology as an example which are my seniors. Comprehension strategies for them when they're reading or reviewing something we've read, I will ask questions and have them explain to me what did they get out of the piece that they've read - to assess are they comprehending it or they able to apply it. Once they give me an answer, I don't tell them whether they're right, I will ask them a question behind that to see if they can use higher order thinking skills to process what we're discussing. As I go through several students and see that they don't understand, then I will take the time to tell them - let's look at it this way – this is what I was looking for – this is what we should have gotten from this etc. etc.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples: whole group, small group, or one-on-one peer tutoring, a reading support specialist, or a combination of models.

Participant A: A combination of methods. I do a lot of differentiated instruction activities in a sense of – to introduce an activity. Sometimes they may do an investigative piece first or whole group as introduction of notes. The activities that are completed throughout the unit might be kinesthetic - or something for every learner in the room. It's not always whole group, it might be small group, or it could be individual; it just varies. Children don't all learn the same way.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness. How much of the homework involves using technology?

Participant A: Our kids today are a lot more technologically savvy than I was when I was in school; it's something that most of them relate to. We have interactive Promethean boards in our room. The kids come up and physically write things or complete things on the board. I also do activities where I use interactive sites to complete tasks - whether it is something they physically do online in which I give them my email address to send me their data or I may walk around the room where they have a sheet that they may have to complete based on what they're doing with online tasks. I feel some of this is beneficial to students because it is what they like. The seniors are getting ready to do an online mystery. It's a small group activity. Each group has a series of things they have to investigate about the bones and figure out the mystery of the case of all the skeletons they have. Kids have the autonomy to create things to show their talents – like quiz-let. In terms of homework, very little homework involves technology because many students do not have computers or do not have Internet access. Most of the technology we use is done in class.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this method? If so, please explain your feelings about the results of this approach.

Participant A: I use it a lot as I mentioned it before. All students don't learn the same and giving then the autonomy to actually complete assignments the way they feel is effective is more valuable to their learning process. For instance in biology I use a cell project in which students have the opportunity to do a rap, a game, a poem, or a 3-d project or an analogy project. I give them the choice of their product. They don't have to write a physical summary – like they might want to do a Venn diagram or some kind of graphic organizer to present their data. In terms of assessment, summative assessments are not differentiated based upon level. However for some formative assessments are differentiated; some groups are little more advanced in a formative piece.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, lack of background knowledge about various science topics, or a combination of problems?

Participant A: A combination of problems altogether. Each student is different so it varies. Some may not have strong vocabulary or may not have happy early backgrounds, or might not remember some of their previous years in middle school. Some may be struggling readers; so it varies.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant A: I basically read the information in the book, present them with activities, provide notes, and study strategies help them get through each lesson or the lesson we are covering. I don't expect them to just read the book and just get it. I explain it to them – break it down - and do different exit strategies to help them. We try to do this most days.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant A: We have reading specialists so those students have been identified. We do a school-wide student reading Lexile test so that every student in our school is evaluated so we can see where they are. We have an electronic system so we can view and see where our students are. Maybe some of them may need additional information – so we can see where they are so we can provide them with the skills they need to get out of our class.

Question 13: How do you feel about a need for professional development or other education in relation to reading comprehension?

Participant A: We have an electronic database so that the teachers can see where their students are. Not all teachers use it. So we have professional development so that they would know how to go in the system and look at. And they can pull articles and look at it. So the information is there. Professional development is being provided. We do so much professional development and they cover so much. I don't know that there is much more they can do for teachers to help them. Maybe in language arts classes they might want to do some different things but in the content area I am not sure how to answer that one.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant A: They provide us with the information; it's a matter of whether or not teachers use the information. Some of them are effective strategies. But as you know we are under so much pressure with so much to do – it's difficult to incorporate additional strategies to what you're already doing. Unless you can find a way to do with that would actually benefit your students. We have the database where you can pull things that are slated to help your students at their level. So the information is there - it's a point of being used.

Question 15: How long is your science period?

Participant A: We're on block schedule so our classes are normally are ninety minutes but because we have an additional period build in called instructional focus which are roughly seventy-five minutes per block. We have 4 blocks a day so the students have 4 classes a day but. On the modified schedule we have 5 classes in which time is actually removed from all 4 block to build an additional block for students to do remediation, retesting, and additional time to complete assignments during that instructional focus block. Because we have found that because students don't have the access to get home after school, so to help students - we built in this extra time during school so that students could do some things that they would have to do after school.

Question 16: Are there additional services such as summer school, after school tutorial or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant A: Yes we also have fifth block**.** Most content areas have a specific day that they stay after school to help students. Most teachers stay on additional days besides assigned days for students to come back and either make up things they've missed or get extra help for things that are being covered in class. So yes those opportunities are there. Summer school varies; I'm not really sure. Sometimes they may have summer school for a few weeks. A couple of years back they didn't do summer school. We do have credit recover and credit repair where students take an online course to make up a course they may have failed or to catch up and be at grade level. For graduation purposes, students must have 4 courses.

Name: Participant B

Date: October 11, 2015

Classroom Teacher: Computer High School Science Teacher

Researcher: Question 1: What are your feelings about teaching reading comprehension as well as science content? In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not.

Participant B: My answer to that would be no; it is not my responsibility. That being said and having taught in the public school system for the length of time in which I have, I do know that most students who come to me have very low reading levels. I teach from ninth to twelfth grade students and most of them read below their grade level. So in order - in fact science is difficult anyway. It has a lot of terms that students are unfamiliar with. So if they already have difficulty reading and they do and understanding what they read then they run into a lot of problems with trying to grasp and comprehend the content. A lot of them don't aren't familiar with just everyday terms that perhaps you and I might use much less to be able to understand the scientific content?

Researcher: Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant B: Time constraint. The science curriculum – our school system is on semesters. So these students have to learn in 18 weeks what someone else on a year round program for science would have to learn in a year's time. So trying to get what is needed in the curriculum – just the standards – not doing anything else – any extra stuff –

trying just to get the content information in – I have time constraints there. To have to teach reading along with that makes it hard – but we have to do it because the students do not come to us on the proper reading level. So we work with it. I'm not bitter about that – it's just the nature of the job I've come to understand.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do struggling readers do to demonstrate they comprehend the science material?

Participant B: They don't ask me just what basic terms mean. They generally score at least with the cut off score – which for our school is a 70 and quite often above the score on tests, quizzes. They're very loquacious. They have engaging conversations with you as the teacher and if you observe their interactions with other students – with other students as well.

Question 4: Describe your perception of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do to demonstrate they do not comprehend the science material?

Participant B: First and foremost they shut down. Quite often students – I've come to understand instead of asking – you know what this means or can you explain what this means. They either shut down or sit there and do nothing or suffer in silence or they act out.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant B: I would really have to think about that very carefully and probably a little bit longer. Actually I'd like to write that answer out so I brain storm each category there.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that have helped all of your students improve their comprehension of science content?

Participant B: Well not necessarily just science content but to speak to the inability of everyday conversations – terms that someone with at least a high school education or bachelor's degree might use. Well what I do with vocabulary if they come across a term whether it is science content or not, I've taken a piece of bulletin board paper – nothing fancy – and if they come across a word - when they ask me what the meaning of it is – we write it on that board – we write it on that paper with a magic marker. And that becomes a part of building vocabulary that at the end of the semester, I sometimes I offer it as extra credit or sometimes I make it as a daily grade that has to be done. I have them to define it. I go and tell them the meaning of the word so that they can get past what it is they need to understand in the content. They have to write and define it to show me that they have made the extra effort to look up that word. A lot of times I have to explain it in everyday common language. I have a conversation and break it down. I discuss the suffixes and prefixes in terms- monosaccharides and polysaccharides. I teach on the computers. Often-times most modern books don't do this but back in the day when I was growing up, they would have those prefixes that would help those students. I would refer to this resource Modern books don't have that but I try to use the terms in everyday manner.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples are whole group, small group, one-on-one peer tutoring, a reading support specialist, or a combination of methods? Note: Teacher B is currently an online science teacher, however, because she has had experience has a traditional, regular classroom science teacher, I asked her to respond to this question and the remaining questions based upon her experience as a traditional, classroom science teacher.

Participant B: A combination and each student is an individual. Some students need all of those at some point. Peer tutoring is one I frequently use. No matter how many times I've used whole group – sometimes it takes their peers to explain things so they can get it.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or some other types of technology? In you have used any of these programs, please explain their effectiveness or ineffectiveness?

Participant B: I have not. The system I am in just now becoming more modernized where we have the technology so that we can. When I was in the classroom we did not often have computers available so we would have to schedule a time and it was always very difficult because someone was always ahead of you. So we would have to take turns. So when I could - we didn't use it (the computer) for that purpose – we used them (the computers for other things; we didn't use any of those programs (reading comprehension programs). Except I have been teaching on the computer; I have not used any of those programs but I am not aware of any of those. But I am definitely for that. This is a technology age that we're dealing with and we need to keep up. And most of the students that come to you now –that's basically all they know. A lot of them are like – what is a textbook kind of thing? I know I'm being coy now but – but everything is on the computer now and we need to be up to par with that.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach?

Participant B: I am going to bold - bluntly honest here. When you have 28 students in a classroom and you're one teacher. When you have groups of students who are not going to do what they're supposed to do unless you're sitting right there- no matter how well it's planned out. I have felt like we have been lacking in that in our system- at least in our school as far as being trained in exactly what being trained in what differentiation is. I do think it is much needed because of the groups that you get; they're so differentiated in their ability. So it's highly needed.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, lack of background knowledge about various science topics, or a combination of problems?

Participant B: That would have to be definitely a combination. A great deal of it is background in science along with the reading ability so it's a combination.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant B: During the class time period that have with students, no because that's pointing them out and they will feel targeted – like everybody knows I don't read well. And no matter how secretive you try to be about it- students will be listening. Now encouraging them to come to what we have called fifth block- an additional period - so you can work with them one-on-one on individual basis. Letting the parents know this is available and encouraging them to read –these are the things I've done to help them. We used to have a bus that would take them home but we lost the funding for that about 4 or 5 years ago. Most teachers have an assigned time for once a week. I tell my students to come by anytime unless I specifically tell you I am not going to be here at that time.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant B: In my opinion we need a reading class at the high school level and offer credit for it. They've changed out credit a lot – credit requirement a lot – they've dropped it in our county. Or give some type of incentive if they feel like they need the extra help. As far as I know, we've not done anything. Now my students – as an individual teacher – I always have an after school program. It is an after school program from 3:30-5:30 offered through our local college. It's fully funded and they use our facility. This year we have a certified teacher all day in there all day long; it's been remarkable. And she has come around to our rooms and asked for specific needs. It's been wonderful. Students who are struggling readers have been able to get help. That's what I'm doing now. But in the past I am not aware of anything that's being done for the whole school to address the reading deficit.

Question 13: How do you feel about a need for professional development or other education in relation to reading comprehension?

Participant B: I am not totally adverse to this and – yes there is a need. I honestly feel like all of our teachers – myself included – are more than aware that there is a need for students to be able to read at a higher level – that they ought to be on grade level when they come to us. We know the need is there. I think our all whole issue is in being able to help students read better. It's basically that – it's not that isn't our job – but it is we don't have time due to time constraints. If there were strategies we could implement with little to no time requirement, I think we would be all over it. We understand there is definitely a need to help these students read better.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant B: In my 12 years with this system, no mam.

Question 15: How long is your science period?

Participant B: An hour and a half. We have four blocks a day. Now what they have done in the last 8 years maybe is what they called is instructional focus. What they've done is chop off a few minutes off of each block so on Monday we have a 50 minute period-students go an extra 50 minutes to their first block, on Tuesday, their second block, on

Wednesday the third block and on Thursday their fourth block. And they have an extra 50 minutes for each of their blocks during the week to work on what is needed – to complete tests or quizzes or whatever assignments during that time period.

Question 16: Are there additional services such as summer school, after school tutorial or Saturday school for students who are struggling to comprehend science comprehension difficulties? Please explain in detail.

Participant B: Our school does offer summer school; our school does also offer Saturday school. To my knowledge, these services are free services. Students must have 4 science courses in this state for graduation.

Name: Participant C

Date: October 11, 2015

Role: High School Science Teacher

Name of School: Amazing High School

Question 1: What are your feelings about teaching reading comprehension as well as science content? In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not?

Participant C: Yes it is some of my responsibility due to the fact that the students are reading science – about science- they sometimes have never come upon these words. You have to break them down for them. So in that aspect - yes ma'am – I do feel like I have to help them with the reading comprehension. But other than that – it is all our responsibility to help the children with reading comprehension. I don't know – some students just work with teachers differently and if I can help a child out with reading where another teacher might not be able to, I feel that is my responsibility as well because we won't be able to well educate the children. But in the science aspect we have to do that because - like I said – some of these words they've never heard of. There are lots of words that are more complex and we have to break them so that they can understand it; and possibly get it on their reading level because unfortunately some kids we get are not on the reading level that they need to be on. It is the job of all teachers to help out with reading comprehension but especially with science due to the complex words.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant C: Just their reading level. We have some students who have ever gone outside of their city limits or county limits. So this is a brand new world for them. I have mainly seniors this year and have some seniors that are literally not up to the 12th grade reading level. So I have to help them to sound out them words to keep them up to our reading level. It's a little bit difficult but we are able to get it done. You help out with one-on-one.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do struggling readers do to demonstrate they comprehend the science material?

Participant C: They start thinking outside the box where they start showing you a higher order of thinking. They start showing you that they can build upon what they've read. They give you the short version. They take that comprehension that they've got and build upon it. They're giving me the language of what they're reading. When we're they're speaking back to me – they bring back to me and show they can use this information like what they use in the court of law. They show they use the words they've learned and the information they've learned and give it back to you.

Question 4: Describe your perceptions of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do that demonstrate they do not comprehend the science material?

Participant C: Unfortunately, I see it in their face. When I do one-on-one with students or we do small group and have them read a passage and explain to me in their words. I can see when they're reading, they have this look in their eyes – this anxiety and this look in their eyes – like please don't let her ask me this question because I am not going to understand it. They shut down. The students just kind of look down all the time. They don't ever make eye contact with me. They shy away from questions and answers. And they go like – oh year, that was what I was going to say. They won't their other classmates to know they don't understand it. They play off of other kids.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant C: They're not the same but they're kind of the same. They build upon each other to me. There are skills you learn early in life. And we have some kids who have to catch up with that and it's very hard for me. Skills are that – I don't want to say common sense – but it's kind of flows with you. It's something that your brain sort of takes on. The strategies help those students that possibly have delayed thinking – that didn't get it in the early years and having start with it again. Comprehension strategies that we can use to help students are the ones they can use to help with their skills - they kind of go hand in hand to me. They build upon each other.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that helped all of your students improve their comprehension of science content?

Participant C: I have them to outline the chapter before we go over. I have them to tell me what they know about; I see what they think the main idea is. I will have to them to tell me what they know about their part. After they've done the outline then I will teach it to them. Then the students realize how much information they missed in their outline. Then they go back through it to comprehend even more of it. And then I've them to group up and take a section and another group take another section and they have to dive into it and they have teach it to us. While they're teaching it, they can reference me. It kind of helps the other students because I can say something one way and some of my students get it. But I have some kids can say the same thing in a different way and their peers get it. I do a lot of different things. I have them peer teach to each other. Sometimes I put a stronger student with a weaker student. And sometimes I put 2 weaker students together to see what they can pull and sometimes they pull out a lot – sometimes they comprehend a lot more than I think they are getting.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples: whole group, small group, one-on-one peer tutoring, a reading support specialist, or a combination of methods?

Participant C: Peer teaching helps a lot that I've noticed a lot in my classes. I group them together where you can have 2 good students together and 2 kind of moderate students. And I've noticed that my moderate students will come up to the good students' level. I've also when we've done the peer teaching, the lower level students rise to the occasion because it's about time for them to shine. Whereas in the whole classroom setting they may be a little shy I guess you can say. When they're one-on-one they have more confidence in what they're saying and they explain things. And when they start explaining, I can see their mind rolling. It's like they're saying – I'm getting this; I understand this. Peer tutoring is really great in my class I've noticed.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness.

Participant C: I think it's great because I son does it in third grade. You read this passage and you answer some questions off of it. So if you're a pretty good reader so you are balked up. Nobody knows what reading level you're on except for the teacher and them. It's not where a whole group does it. It's a pretty good reading program. And even if they're in high school, they get feedback. They get approval – like great job and they move up to the next level. It's not a game but it's almost like a game because they like that feedback. Technology is great – they've gotten better. Some technology will read the passage to them because we deal with some kids who have dyslexia or low reading comprehension level and it will read the passage to them so they can hear it and then they can try to understand it better. But sometimes with some of my kids that are on that lower level – reading themselves does nothing. They can hear somebody read it to them, they can comprehend it a lot better. Programs have gotten better so they're not hearing this computerized woman. It's kind of like hearing a regular human talk. The least effective programs are the ones that sound like a computer person. The ones that speak in a regular tone – kind of like a regular tone like what we're doing – those help them better because they can hear the true sounds of words. The students are using the computer to do a drug project; they create a power point project – a minimum of 7 slides. I use the technology like YouTube to teach lessons. I tell them find trusted sources because a site of Wikipedia can be changed. Most of their work is done at school rather than at home. Studying is the main homework that is done. Technology is not a part of the homework because many students don't have computers or the Internet.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach.

Participant C: I use it but it's really hard with the way the classes are set up now. Like with one of my blocks I have inclusion kids and I have some kids who should be in an advanced forensic class. So then I have those in the middle – the general forensic class. I do reading labs – I pair the inclusions together, the advanced together and my regulars together. In the labs, my lower level kids might not have to go into as much detail as my advanced kids. And sometimes the questions I make my advanced kids require them to think out of the box. They have to build on what they know while doing the lab. As for as explaining things, I kind of teach the middle of the road but the higher order thinking kids will go – "What if"? I set my tone so the inclusion kids can understand; but I can explain things to my higher order kids but they all can get it.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, a lack of background knowledge about various science topics, or a combination of problems?

Participant C: It's a combination of problems. I have kids based upon testing – they are not on a ninth grade reading level. They have to take the notes but I also give them a copy of the notes; even their writing skills are really low. A lot of it – is that we they were learning how to read – I have 3 children a so I can say this. If the parents at home do not help the child learn to read, teachers cannot do on their own. You've seen where the parents go – why aren't you teaching them this. It's only so much a teacher can do. When they (the children) were starting to learn how to read, somebody – whether it was teacher, parent, student or combination of all three dropped the ball somewhere. And they're either – oh, I've been passed up this long, I'll keep being passed up or I've gotten by – by just knowing the basics; I don't have to worry about the rest of it. So a lot of it was when they were in the younger years something happened where they did not catch the reading skills. They did not get that AEIOU and the sounds they make or I before e except after C – thinks like that help them read. But things kids we have now that are not on ninth grade reading level did not get this in some or other. Parents blame teachers and teachers blame parents but we all have to work together with their reading comprehension. They have poor spelling skills. They have poor reading skills. And it's that basic stuff that should have been in their early years – pre-k, kindergarten, and first grade years – something happened in those years that they didn't get it and they've been struggling since then.

Some of them struggle so much they just kind of give up and go- I'll figure it out some kind of way.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant C: One thing I do for those whose reading comprehension is not there- and I got this from another science teacher- we have this sheet that tells you how to break down your science words especially like in biology. It breaks the word down - like the biotic – bio means living. Biotic means a living factor; Abiotic means non-living. They have the prefixes and suffixes to put the meaning of these with the words to help them learn the meaning of the words. But with a lot of the low readers – some of them have the test read to them. Sometimes instead of making up a test during instructional focus – I will have the student write a page or report on everything they know about the lesson or topic instead of doing a test format. When they take a test, I talk the test to do them. I will start talking about the questions and they will give me the answers. This strategy works for my students most of the time.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant C: Luckily at the high school we have a program to help struggling readers. It's an enrichment program. I know the lady that's over it. They go to a separate person and get one-on-one with reading – with reading comprehension. The after school program has been a great help to me especially for these students need this extra help. I have seen the reading levels come up. This program is basically for tutoring all subjects.

Question 13: How do you feel about a need for professional development or other education, in relation to reading comprehension?

Participant C: Yes it's because like in science – the reading and writing level is totally different from the language class or other classes. Writing a lab report is totally different than writing a book report. If you can write a lab report, you can write about anything else. Professional development is not a one size fits all things. Professional development is not specialized enough for science content; professional development is too generic - it needs to be more specific for science teachers.

Question 14: Have you had professional development (PD) training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant C: The district - at the beginning of the year for high school and middle school - provided generic PD. What was provided did not help my students. We need comprehension PD that has been specifically designed for high school teachers.

Question 15: How long is your science period?

Participant C: It's supposed to be an hour and a half. They've changed to where it is 75 minutes long because of a thing called Instructional Focus. I don't like IF; I understand why it is there but for science lab, we need that hour and a half so the students won't rush through the labs. So we need this extra time. We don’t have enough time to complete the labs. Sometimes we don’t finish the work in a day because we run out of time.

Question 16: Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant C: I don’t think we have Saturday School. Fifth block does really well when students come to me so they fully understand what we’re dealing with; I see a big improvement with that. Instructional Focus is a 50 minute time period. The way it’s set up, it’s too long amount of time to really start something. If I’m trying to do something sometime, my classes get ahead of each other where you would like to have them all on that same wave length or time frame.

Name: Participant D

Date: October 11, 2015

Role: High School Science Teacher

Name of School: Amazing High School

Question 1: What are your feelings about teaching reading comprehension as well as science content? In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not?

Participant D: I don't believe it is my responsibility to teach reading comprehension. I do have a certificate to teach reading; I went through the program. It is my responsibility as a teacher to make sure the kids get the information. So having had that background in reading, I give the students what's known as working notes to sort of break things done to help those who have reading comprehension skills acquire the content area because at the end of the day they still have to pass the Milestones and we want them to be successful. I'm not just saying that; that's true. I don't want them to fail. But they also have to buy in it. By the time they get to us as juniors- teaching physical science or juniors so chemistry - those with low Lexile scores know they are low readers. But reading is not a priority in their homes many times so they don't have the support so it's important that they learn how to read.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant D: Time. The majority of the science teachers do not have a reading background. So the teachers do not have the preparation. And that's just one more burden for them to try to teach content as well as teach reading comprehension. There are certain things we have to do for the labs where they write something and you critique that and model what you expect - as to what should be included. But other than that, I see that as a problem.

Question 3: Describe your perception of the characteristics of good readers. In other words, what do struggling readers do to demonstrate they comprehend the science material?

Participant D: They can apply the information. If they cannot explain it to you or apply the content it in another situation then they don't understand it. If they cannot explain it to another student, then I assign them to peer study groups. When you teach someone else – that's one of the best ways you can learn.

Question 4: Describe your perceptions of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do to demonstrate they do not comprehend the science material?

Participant D: First thing they say is: "I read it but I still don't understand it." That's what they tell me. My motto is - to read the chapter 3 times, write notes, and do the questions at the end of the chapter. If you do all of this, there is no way you don't understand unless you're reading below a sixth grade level. But we have all those situations. They struggle when they cannot explain it to me. They learn in isolation instead of being able to connect the dots. One thing about science - you're telling a story.

They should be able to tell me the cause and then the effect and then what if…..If they're not able to do that – more than likely, they don't understand. They can memorize isolated facts but they cannot put it together - to tell a story. It's as if you're talking about the letters in the alphabet. Put those together to form a word, then a sentence, then a paragraph and then an essay. And then you have to talk about what type of an essay you want. All of these are different levels that are required for kids to be competent readers. Therefore, struggling readers simply read words. Their parents will always say: "He can read." They can call out words and most of the time, they're mispronounced. They don't want to read out loud. They cannot tell me what they've read and why. I tell them to put it in their word. They cannot put what they've read in their own words. But what they want to do is to go back and look at what I've given them to read and tell them to paraphrase what they've read. I have a word wall with: what does explain mean; what does tell mean; what does paraphrase mean; and what does summarize mean. So if they're not able to do that then they don't understand what it means.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant D: That's a good question. Well, I guess the strategies would be the techniques or the actual how to accomplish something. The skills would be…… I will use cooking because I like to eat. Anybody can go into the kitchen and prepare oatmeal. So that's a skill. However, the strategy would be to present it so that it looks appetizing so that someone would want to eat it. If it doesn't look good, I'm not going to want to eat it. So we're talking about a higher level of learning. Skills would be – to put it in terms of a lab situation would be – mix and pour. Strategy would be – now once you do that – evaluate what has occurred? What do you need to do differently?

Question 6: What reading comprehension strategies, if any, have you used in your classroom that helped all of your students improve their comprehension of science content?

Participant D: I use books that have lower level. In fact I use state approved physical; science book. But not all of our kids are reading at that level. As part of my differentiating strategy, I purchase online and have gotten from the schools whatever textbooks that another department (not called special education anymore) has used. Another teacher let me use about 15 of those books. I had 31 students last year and I went online and bought the same edition. Every day as part of their assignment was to read whatever the content was which was approximately one page during the first ten or fifteen minutes – on sixth grade level. They would answer five questions which was a fill-in-the blank or true and false. If it was a true or false – they had to write the word false and then write the word that would make it true. This was graded daily and they did this for the first six weeks. They were given a weekly grade. This helped their grade and it also helped them understand what was going on. Additionally – their lab work helped their grade. Since their reading is not good, there was a time when we used to have a lab based class and you were given a lab manual. You were told to read it and told to come prepared for lab. We don't do that anymore. Pre-labs are very detailed but not like they used to be. I show them the different techniques. I talk them through. I tell them to use various websites. I show them the different techniques and tell them to use their phones which are very expensive. I tell them to use all of this technology. I tell them to use all these different techniques and tell them to use their phones to help them. I give working notes. I took an eighth grade book and read it. I made the sentences very succinct. I put two viable answers – the one that's wrong and the one in bold print in parentheses and told them to highlight the correct answer. Many students in special education with IEPS required notes so I gave the notes to all the students. But notes were not in outline form because most students don't understand that. I use simple sentences with graphics. I take those same graphics and working note sentences and will go over them in fifth block. I do not go over the answers but I am available for fifth block to go over the information. I cut and paste from those working notes and use them for quizzes and tests. I also give them a study guide checklist at the beginning of every unit for my chemistry class and physical science class. There's a box that they check if they know how to do it and it also has page numbers from the textbook and put at the 4 essential questions at the top. I have some science language or words that they will see in the unit. But these are not vocabulary words, I call it language and not vocabulary words because I don't give vocabulary words. I tell them they're going to have to know how to use the language in order to use it. I teach and reteach. I enumerate. I tell them how many multiple choice questions, how many show your work and let them take out their camera of all of this. If someone flunks in my class, this means they are not doing their work.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content?

Examples are whole group, small group, one-on-one peer tutoring, a reading support specialist, or a combination of methods?

Participant D: A combination. I use a lot of whole group because it's easier. I'm good at it. Many times when the students you pair off – then when you give them an assignment – they drift off into non-science related conversations. So once I saw that going on, I don't allow it. Basically, the only time they have a chance to sit beside each other and talk is 15 minutes after they complete a lab or when they're sharing information that way or when they're in the lab. But otherwise I've gotten away from that within the last 5 years because this group of students is very talkative. Peer does help; I recommend it – for all kids really - if you get with someone who knows what they're talking about it and when someone else can share and even go to the blackboard and share and help each other; and they're receptive Sometimes kids will listen to teach other more than me. I have helped students one-on-one especially during fifth period. Sometimes I go around the class when they're working on something during guided practice – desk by desk. Sometimes I have them come to my desk – row by row- to see what they're doing. It's a combination. It depends on the class and the level.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness.

Participant D: I have not taught reading in this school district; I haven't taught reading at all. But I do know you have to have a ram in the bush. Many times those students who do have deficiencies in reading – their reading skills aren't good enough to get on the computer. By the time they get to high school they're – 16 or 17 – many of them are delayed - they're embarrassed. One thing I've learned is that in many homes you don't have parents reading in the home nor do you see magazines; you don't even see newspapers. In many homes, people don't even listen to the news. I ask the kids if they listen to the news and they say no. In terms of technology, I used to have them do more when there wasn't so much cheating but they cut and paste so much that I don't know whose work is whose. They have always had a way of getting around whatever you have them to do. Yes, I have a Promethean Board and I do Power Point. Power Point is good if they've already read. But if they haven't read – like in Physical Science where's there's a lot of calculations they need to see step by step how to get from point A to Point B so I draw on the board and I use Power Point for review. And I use Power Point as opposed to introducing the information.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach.

Participant D: We have to differentiate and I do several ways. I can't differentiate content because they have to take the Milestones. Before – my tests were 70 questions and those who had IEPs were given 50. And they were given more time – time and half. So if they didn't finish they could come back that day or the next day and finish it up. Or if they were in resource class for science, they could take there and finish it up. I really like them to take it with me to make sure no one else is helping them with it. So they get a shorter version. The Milestones is always lower level. One thing that helps them is the lab. I give them the questions ahead of time. Now we have credit repair so that at the end of the semester if they make a score at least 62 we give them a packet of stuff and if they finish all of that we give them a score of 70.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, a lack of background knowledge about various science topics, or a combination of problems?

Participant D: A combination of problems. Background because they truly haven't learned. I look at the ITBS I believe is more reliable in terms of the science and math reasoning – not the CRCT. I have Lexile scores and that gives me what their reading scores are. Some students feel they don't have to learn anything so they do minimum amount of work and they're going to be passed on.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant D: The working notes. It takes most students until the eighth week to realize they actually have the questions to the test. But those are the students who are the least likely to want to invest time outside of class. After the fifth week of school, I have told them I will have them read from the orange books on sixth grade level for assigned reading and have only 10 minutes to read and answer the questions. I told them if it takes them longer than that, they will have to come back after school and finish. Some will and some won't. They know if the assignment is not finished by the end of the week, whatever they have will be averaged in the grade book. Some kids have asked if they can come during their lunch period, and that's fine. I break down things and after I talk about something, tell them to look in their book and use their study guide checklist. I have them to organize and match information that was given that day and I tell them ahead of time what we're going to cover the next day.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant D: I tell them they need to read. I tell them to pick up a magazine and just read. I tell them to read during fifth block**.**

Question 13: How do you feel about a need for professional development or other education, in relation to reading comprehension?

Participant D: No. I don't feel a need for professional development at this time. I feel as if my plate is already full with the content. I feel that's just additional work and at some point students have to step up to the plate and do some work on their own.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant D: No we haven't had any professional learning (on reading comprehension) at Amazing High School. As I said earlier, I took the reading program and I incorporate some of this. The majority of the focus is elementary; the majority of the people were elementary school. As science teachers we need to be shown how to do something and not just told.

Question 15: How long is your science period?

Participant D: Seventy-five minutes; it's a modified block.

Question 16: Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant D: We don't have a Saturday School; we used to have a Saturday School for discipline purposes. We have summer school for those students who are flunking; they're trying to get their credits. It's called credit repair. They're sitting at the computer trying to complete the modules effectiveness or ineffectiveness.

Name: Participant E

Date: October 12, 2015

Role: High School Science Teacher

Name of School: Amazing High School

Question 1: What are your feelings about teaching reading comprehension as well as science content?

In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not?

Participant E: I think it is my responsibility but I do not have time to do it. I have my reading endorsement along with being a science teacher. I see the importance but I don't time to fully teach the students to comprehend science along with teaching the science concepts. When I'm teaching science I always teach the roots because I think it's important because if they understand the roots of the science words and you understand how a certain things are named, you can interpret what the questions are asking or at least you'll have a better ability to interpret what a question is asking. One of the things I do in my teaching is always as I'm teaching science words – as I'm teach vocabulary- as I'm explaining for instance the difference between a prokaryotic cell and a eukaryotic cell, we talk about the fact that word karyo means nucleus and phyto means cell. We have to do that to improve upon student knowledge.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant E: The biggest problem right now is time. So much time is taken away from us now for testing so that to fully delve into the content and teach reading comprehension is almost unthinkable at this point. We give up anywhere from seven to 10 days – such as unit exams or benchmarks.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do good readers do to demonstrate they comprehend the science material?

Participant E: I think a good reader takes the time to read and when they come to words they don't know – they use context clues and sometimes they use a dictionary to look up words. They take the time to reread to make sure they comprehend what they're reading.

Question 4: Describe your perceptions of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do that demonstrate they do not comprehend the science material?

Participant E: A poor reader just glosses over words. If they see a word that's over 8 letters, it's not important to them to try to figure out what the word means. They don't try to break down a word phonetically. They get easily frustrated with words they don't know. And because science has a language of its own and trying to impart these words that are intrinsically a part of science (to these students) is a struggle.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant E: When a student goes back and rereads something they don't understand the first time- this is a learned skill. A strategy is the ability to enunciate and break down a word phonetically break down a word into parts and to be able to look at prefixes and suffixes and root words. If a child can do all of this – they can do well no matter what course it is.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that helped all of your students improve their comprehension of science content?

Participant E: I do warm ups at least 2 to 3 days a week. We read an article independently or if it is short enough we read it aloud. I tell them we are a family and not everybody will know every word. Because I want them to be comfortable; I make them feel comfortable enough so they will want to read loud.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples: whole group, small group, or one-on-one peer tutoring, a reading specialist, or a combination of methods?

Participant E: Over the years, it was easier to handle the reading and science concepts in the classroom where students were grouped according to ability. But now we have students all different levels – from the lowest level to students at the college level in one class. So I teach to the middle. I like small group instruction when possible. But it’s not always feasible because of the extremes of the different levels and with just one teacher.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness.

Participant E: I would love it all of our students had access to the Internet or laptops etc. True most of them have cell phones but we run into the issue of them having to have a plan or data plan to effectively use it is problematic. We have a technology issue. We have Wi-Fi but to get 1500 students hooked up to the Wi-Fi on their own devices has proven to be an issue. I would love to have the students use the Internet and technology more than we are. I feel it would help the students a lot. It would really help the students who are struggling readers because most of the textbooks are way above most of our struggling readers' reading ability. For the most part, the publishers have provided us with a digital version of the textbook but it does us no good when we don't have the technology to utilize it.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach.

Participant E: I understand the concept of differentiating instruction. But again it goes back to that wide range of ability and being honest with yourself about what you are able to do within a 75 minute block of time. I try to do it when possible. And I'm finding when I try to differentiate an activity, I find myself spending most of my time with the students who on the very low end of the spectrum. The students who are on the high end of the spectrum are usually left by themselves to do their work. I can't give them much time. I can't supervise what they're doing. I can't offer them any suggestions or advice. The kids at the higher end don't really ask questions. Maybe it's because they think they know it all.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, a lack of background knowledge about various science topics, or a combination of problems?

Participant E: I think it's a combination of problems. I've found over the years that a lot of students initially come to high school over age. This means they are older than they should be by the time they get to us. It is heart breaking to see students in ninth grade who are 16 and still not reading on grade level. And we lose quite a few of our students in ninth grade. And this is why I had to leave ninth grade after teaching it for 10 years because we were losing so many of them. It's a combination of problems. They don't come to us with a strong reading foundation at all - just the ability to break down a word down and be able to recognize the parts of a word. It's difficult for a child at this age. If they can't fully read by second, third, or fourth grade, by the time they get to us – it's difficult. I don't think reading is instilled enough early. If I saying as a high school teacher, that I don't give homework. I wonder if the teachers in the lower grades are starting to feel the same way. I know some teachers in the lower grades who have said don't give that much homework because they don't get it back. So if we're solely dependent upon what the students do when they're with us then we're missing a whole lot because work has to be done outside of class. I recognize I am held accountable for certain things that are being done in room during the school day.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant E: One thing again with Science having its own special language one thing I rely upon heavily is vocabulary. I make my students do vocabulary because it's a building block for understanding and comprehending. I have them to read aloud. I give them short answer questions where they write down answers. I give them short essay questions because they're so used to bubbling in on standardized tests. I give them articles to read that tie in to the content to make it more relevant to what we're doing.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant E: Most of my struggling readers are students in the program for exceptional students – our special education program. And these students are assigned to a support science class where they go to a special education teacher. It's called support science; they go to a special educator who supports my class. It's sort of like an extension of my class. Any time they need extra time or they need further explanation on something, they get it in this class. And that's good to help on my end because we've gone from a 90 block to now a 75 minute block. It's good to be able to rely on the fact that they go to the support teacher to get a little more time on something. I really wish we could – if no one was able to get funding for technology – I wish our lower level kids, our special kids and students not identified as special education and those with a 504 – I wish we could provide this technology for these students.

Question 13: How do you feel about a need for professional development or other education, in relation to reading comprehension?

Participant E: To some degree I do but to some degree I don't. I think we're getting away from the fact that I went to college to specialize in being a science teacher and then on the flip side of that – we have special education teachers went to school to specialize in helping students with special needs. But somewhere along the way the lines have gotten so blurred and they want me to do things I was not trained to do and they them to do things they were not trained to do. I have a bachelor's and master's degree in biology. I am not a special education teacher and a special education teacher is not a science teacher so to ask them to do things they are not trained to do is not fair to them and in the end the child will be short changed. Again as someone who has done reading endorsement, everything I've set through to help struggling readers has not been very beneficial. It's been very generic and nothing was provided that I could take away and use it with my students. It has not been there. I would love to have some things that are specifically geared for a science teacher could use to help a child who is struggling with reading. I don't need just basic reading strategies and skills that are thrown out as an umbrella.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant E: Yes. But they are not effective.

Question 15: How long is your science period?

Participant E: 75 minutes

Question 16: Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant E: I can see the concept of the fifth block and where it was supposed to help – and it used to help when there was bus transportation. But now we don't provide transportation and we don't get much participation because of the transportation issue. You don't get much participation when transportation is an issue. Therefore, fifth block doesn't help very much with a child struggling to read. We have what's called instructional focus. It's supposed to an extended learning time. They had to take fifteen minutes out each class period in order to embed this instructional focus into the school day. So in my eyes, it's not really an extended learning time because you've taken time to give it back. So it's not really an extended time. An extended time is to add 30 minutes to the end of the day – that's extended time. During this extended learning time that we have built into the day - I find that I have to finish work that I couldn't finish in class because that fifteen minutes was taken from me – or I have to use that time to have students to make up work because they can't stay after school to do or they won't stay after school. I teach juniors and seniors and most of them work and they have to work. It's not because they want to work but they have to work. So I have to be a teacher who understanding enough to know that this child can't stay after school so I have to find a way for students make up the quiz or a test. And this is done during the instructional focus time. Instructional focus is supposed to be used for enrichment and remediation but that's not possible because instructional time was taken from me so now I have to use this instructional focus time to teach concepts.

Name: Participant F

Date: October 12, 2015

Role: High School Science Teacher

Name of School: Amazing High School

Question 1: What are your feelings about teaching reading comprehension as well as science content? In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not?

Participant F: I don't know how you can teach science without teaching some type of comprehension along with it. I don't know if it is specifically teaching reading comprehension but if you're teaching science, you have to make sure the students understand the content. In science there are diagrams and instructions to follow in labs – the students need to understand how to do it. I don't know if it's formal reading comprehension, but students need to understand directions and how to follow directions and they need to understand diagrams and how to interpret data. I don't have any formal training in reading comprehension but certainly students need to be able to read and interpret data…. And all of this is in my mind reading comprehension. When I'm teaching science I always teach roots because I think it's important particularly in science because sometimes may not understand what the question is asking – if you understand the roots of the science words and you understand how certain things are named, you can interpret what the questions are asking or at least you'll have a better ability to interpret what a question is asking. One of the things I do in my teaching is always as I'm teaching science words – as I'm teach vocabulary- as I'm explaining for instance the difference between a prokaryotic cell and a eukaryotic cell, we talk about the fact that word karyo means nucleus or phyto means cell. We have to do that to improve upon student knowledge.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant F: I don't see how you can separate the two; I don't do it in my classroom. The students have to comprehend the content to be able to do it. If you're teaching a concept, I don't see how you can separate them. I don't see how you can do it in isolation. It's kind of like how math and science are integrated. There are days when I'll spend an entire day teaching math. It's like math and reading – I don't see how you can separate the two. Depending on the particular subject, you're going to have to teach comprehension. Reading comprehension is embedded inherently in the content.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do good readers do to demonstrate they comprehend the science material?

Participant F: Good readers are not necessarily capable of taking science content and following directions and then taking something and going on their own. Sometimes they lack confidence in their comprehension. Sometimes they will ask if they are reading the information correctly or "am I understanding the instructions". Sometimes they're insecure in their ability to understand what's being asked of them. One of the goals I work on is to help my students to develop that that self-confidence. Yes, you are getting the information correctly but you're not processing the information; you're not answering the questions correctly. These are the skills we work on because my students are 10^{th} graders and they're getting ready to take the ACT and the SST – those kinds of standardized assessments. And they have to understand what kinds of questions are being asked.

Question 4: Describe your perceptions of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do to demonstrate they do not comprehend the science material?

Participant F: With my struggling readers, one of the things I work on is the fact that you don't get any better unless you practice the reading. And so a lot of times with my struggling readers they're too quick to come to me and say – "what do I do next". So I redirect them and say – where are you in this process. So it forces them to go back and see if they're following the directions, whether they're following a lab or if they're following directions on a worksheet, whatever they're doing. Then they have to reread it and put it in their own words and then I help guide them from there. A lot of it is a lack of self-confidence. I don't think they're getting a lot of exposure maybe because of all the technology. I think a lot of it is the lack of self-confidence in understanding what they're supposed to be doing. They're certainly capable but a lot of it is a lack of self-confidence in their ability to comprehend what they're reading.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant F: I don't know because I've never been in a formal reading program. But I think that skills would be the ability to dissect and understand like understanding the roots of a word. And strategies such as learning ways to identify a topic sentence, or finding ways to look at key points to improve upon reading.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that helped all of your students improve their comprehension of science content?

Participant F: One of the things I do is to work on essay writing because they're getting ready to take the ACTs. Sometimes students will get frustrated and say that I've answered that question completely. And I will put some examples on the board – I'll put the question on the board and then have the students - with the rubric - see if they have answered the question completely. And a lot of time in raising awareness, in terms of precision of their words or in terms of their writing or looking at what was written and how that was interpreted differently may be that from what the question was asking. I think this all of the students because this is a skill that almost all of them read. I also have all my students have to read books either novel or assigned book outside the textbook. In terms of reading comprehension, have a choice between fiction and non-fiction. I think it is important to understand that science is more than just the textbook.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples are whole group, small group, one-on-one peer tutoring, a reading specialist, or a combination of methods?

Participant F: It depends. I've only had 2 students in the past couple of years who haven't been reading at least on grade level. With those students, we find other ways to help those students to make sure they're getting the content. They're visual so a lot of times I have a demo set up in the lab to see it visually and then we go back to the room to help those students to understand the information. I am more on the upper end of the Lexile to help those students get ready for college based learning. In terms of instructional strategies, it depends on the content you're teaching. You modify your instruction based upon the content. Some content needs to be whole group, some needs individual or some peer tutoring; it just depends upon the content. I make sure whatever instructional method I'm using fits well with the subject matter and that it fits well with the students. Your classes of students vary from year to year.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness.

Participant F: I'm not knowledgeable about any of them so I don't know how to answer that question. My only concern is that we're currently moving instructional time with so many other things that we have to do in the classroom so I think that we should have the data to prove that it is effective for a large number of students. You have to weigh everything that you do in class. I'm not sure that every student would gain some sort of advantage from that other than students who are reading below grade level and are in need of this type of assistance. I don't agree with is that we tend to say every student is going to do this but we should look at students individually to see what things will best prepare them or to see where they have gaps.(In terms of technology), I do a variety of things on the Internet – my students do research on the Internet. We talk about primary and secondary sources; we talk about what are good sources and what are not good sources. Students access my web page regularly. We have laptops that we virtualize and they use them to do current events.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach.

Participant F: Even with gifted kids you have to differentiate. You look at the students in the class and sometimes you have to approach instruction from a different angle. You have to weigh what you do in terms of the importance of the standards.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, a lack of background knowledge about various science topics, or a combination of problems?

Participant F: Some of them exhibit all the problems you mentioned. When I'm teaching science I always teach the roots because I think it's important - because if they understand the roots of the science words and you understand how certain things are named, you can interpret what the questions are asking or at least you'll have a better ability to interpret what a question is asking. One of the things I do in my teaching is always as I'm teaching science words – as I'm teach vocabulary- as I'm explaining for instance the difference between a prokaryotic cell and a eukaryotic cell, we talk about the fact that word karyo means nucleus and phyto means cell. We have to do that to improve upon student knowledge - obviously they don't like to read out loud. I think that vocabulary is significant. Even with the gifted kids, I work on vocabulary.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant F: In the past, I've had students who repeated courses – like physical science. A lot of time we would take important passages and match the words up with the diagram. They would look at the word and follow the diagram. I have students pay attention to the roots of words and try to build their vocabulary. Sometimes we would take the passages and help them to take scientific language and have them state this is words they understand. And we continue work towards getting them to understand the scientific verbiage. I would also have them to read and write a lot in class and give them feedback. Then we talk about it in the whole class.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant F: I'm not 100% sure but I know they have a couple of programs at the high school called Read 180. We are working on working on using Lexile scores to figure out which students are reading on grade level. The goal is to improve those Lexile scores. I know that students who are reading several grade levels below where they should be, there are certain interventions that are put in place in their English classes to work on reading comprehension skills. I know it's not incorporated formally in science. You know within the first 2 weeks of school which students are reading on grade level and which ones are not - which - ones will need some extra help with learning the content.

Question 13: How do you feel about a need for professional development or other education, in relation to reading comprehension?

Participant F: Some professional learning is done quite well and some professional learning is not done very well. If the professional learning is done in a way that gives us specific examples of how to incorporate instructional strategies in the science classroom and it's done so that it doesn't drag out, then I think teachers will benefit from it. It doesn't do us any good if we aren't given specific examples of instructional strategies for science instruction would be beneficial. For an example when it comes to differentiated instruction, very often we aren't given specific examples to help us with science instruction. Sometimes they bring an elementary person to present professional learning workshops but there's a big difference in elementary classes and high school classes. Things that you can do in elementary classes, you can't do in high school classes.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant F: The teacher addressed this question in question 13.

Question 15: How long is your science period?

Participant F: It is 75 or 90 minutes depending on where we are.

Question 16: Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant F: Yes and no. Most of experiences are with the after school program. The after school program will occasionally have tutors that are knowledgeable in science. The problem is they don’t have an educational background and so they don’t necessarily understand that giving the students the correct answer and teaching the students have to find or work through a problem to come up with their own correct answer are 2 entirely different things. Sometimes they have some tutors in the after school program with some educational training and those are the tutors who are able to help the kids.

Name: Participant G

Date: October 19, 2015

Role: High School Science Teacher

Name of School: Amazing High School

Question 1: What are your feelings about teaching reading comprehension as well as science content?

In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not?

Participant G: I think it is important because I know that the literacy in every subject is totally different; reading comprehension is totally different. A lot of kids can go and read a book for English and it is pretty straight forward because it has a plot, setting, and characters. But science is a very technical and it doesn't flow like other contents. And you try to treat reading comprehension like you would in English you're coming to miss how you deal with and comprehend science since it is so technical. And any person who opens up a science book understands that it doesn't flow because you have to go back and forth between various charts or go to this table. So you have to teach kids how to do this. A lot of students come to high school and they've never had to do this before. So you have to integrate this into your science course. I also teach physics in the school and with physics half of course is word problems types of things – real life applications where they have to pull the important concepts. A lot of my kids have never done that before. So I have to spend a lot of my time at the beginning of the year so they can learn how to pick out the important stuff. They have to learn clues in the problem which lets me know what's important and what I need to know. In science it's extremely important to integrate it into your program.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant G: One of the problems is time; that's always the major problem. I have to spend a lot of time - like in physics - with reading comprehension to help them pull out things and figure out what's going on - when I need to be doing the content instead so I end up getting behind every year because of that. But yet you have to do it because if you don't spend that time with them they're never going to understand anything that's going on. They're never going to learn how to analyze and problem solve given a lot of words. So you have to spend time on it and the more time you spend on it the less time you have time to spend on the content you have to cover. That's probably my biggest issue in my physics class; it is difficult reading. I had a class 2 years ago which was a class of 35. And in that class of 35, I had a kid on a second grade reading level, one on fourth grade level, I had several gifted kids on college level and several kids in the middle and spread out. So how do you take one teacher and read to all of those levels at one time? I had a paraprofessional but she was only there for half of the class. And these were all seniors. When you have such a disparity in reading levels - trying to read and challenge and work with everybody is very challenging.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do good readers do to demonstrate they comprehend the science material?

Participant G: Well science readers, I've found that a lot of my students who do well with science content are people who are strong in vocabulary and can understand what's going on. One problem with science is that if you don't understand the vocabulary, you are totally lost. And one way to understand the vocabulary is to read a lot; the more you read, the better your But it's so hard to get our students to read outside of class especially technical science texts. I've noticed that several of our students who will read outside of school do so much better. I've work with some of them in certain and told them to underline this or circle this that you think is important. Several of mine do that do this with the science text seem to understand things better. I've also had some students to read things to me and they do so much better. Sometimes I've taken some passages science texts and tweaked it to my students' reading level. And that helps a lot of them tremendously. My good readers can answer questions about the text. They can spit it out very easily and they can apply it. They can take what they read and apply it to real world situations.

Question 4: Describe your perceptions of the characteristics of ineffective, struggling readers? In other words, what do struggling readers do that demonstrate they do not comprehend the science material?

Participant G: They're clueless; you can ask a simple question and they can't answer it. You can ask them to show you the answer in the book and they just stare at. It's obvious they're not getting it. You can just observe and know they're not getting it. I had a young girl one year and I knew she had trouble reading; she was on a third grade reading level. She was failing every single test. And she was a senior with no accommodations. We found out this early. And I pulled her out with some other kids and had the paraprofessional to read to them and the difference in her grades was amazing.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant G: I'm thinking comprehension skills versus strategies because skills-wise there are students who inherently read without being taught strategies; they already know how to apply them without knowing they're applying them. With poor readers – there are so many strategies out there that you can use. Not every strategy works with every kid of course. Your strong readers don't know a word – it's natural – they know the words around it they can figure out the meaning of the word – the context clues. With the low readers some of them are trying to figure out how to pronounce the words. Even some of them that can read it don't have the strategies to know what the text says; they don't even know what they're reading.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that helped all of your students improve their comprehension of science content?

Participant G: To be honest I don't do exact strategies that I expect all students to use. In my physics class which is not a tracked class but its more advanced class we talk about how to use those context clues. And how to pull out things we need to know; we talk about what's important. We talk about what the text is telling us and where we can go with the information. In my mixed classes where I have low and gifted classes, I don't expect my gifted students to do the strategies I use with my lower kids. I don't have my gifted kids circle the words you don't know or underline the words or take this apart. I really don't do an all student types of strategies approach. Sometimes I have all of them to identify the main idea. But for my higher kids I will ask them to tell me how to apply this; how does this relate to your life. But for my lower kids they would just identify the main idea.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples are whole group, small group, one-on-one peer tutoring, a reading specialist, or a combination of these methods?

Participant G: You can go in my class five days of week and we'll be doing something different everything. So I definitely use a combination of methods. Depending on the unit, I might use whole group method to introduce a unit. Sometimes I do an activity in centers where they have to perform an activity then explain what they're doing. So they use explanation sentences to explain this. Sometimes they are paired up so that a lower student can be helped by a student who comprehends better- kind of peer tutoring. But I don't always do this because the lower student will just copy the answers from the other student. But a lot of times I put the higher students together in groups and the lower students together. I want the lower students to figure out things amongst themselves - so they have someone to feed off of and talk to about it and not be relying on someone they know can do it for them.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness.

Participant G: I have used articles where it is a current events type of thing. It takes an article and you can actually choose the reading level and it changes the same article where it's higher or lower reading level. It's called Newsela. It will go all the way to 12th grade all the way elementary level. It's a current event type of thing. I use those sometimes when it fits in with my content. It gives them the reading but it's on their level. It can help because the more advanced kids aren't getting annoyed because they're not reading something on middle school reading level. It's something more on their level that they have to put forth a little effort. And it helps the lower kids who don't just set it down and totally give up because they don't understand anything they're reading. I do make students do basic research. In my forensic class, I use it quite a bit. Right not, I'm not that much because it's hard to get access to computers is really hard. Right now I only have one computer in my classroom. Right now in this school district, we don't have any Spanish teachers and so half of our computer labs are used for all the Spanish and foreign languages so we're down several computer labs because of this. Now we have Chrome books but the Chrome books don't have like PowerPoint or any of that on it. Sometimes I make them research and do PowerPoint but they can't use the Chrome books for this. Some of the other teachers are trying to get in the few labs we have. So it's sometimes really hard. But in the past – even with lower kids, although the grammar is really horrible, but I'll make them write a short passage about a topic and then they'll have to present the information through PowerPoint. And even with PowerPoint they have to pick out the main idea and give you snippets of what's important. I try to do topics I love like at the end of my forensics class- I don't teach forensics right now but I used to teach it every semester – they have to do a serial killer presentation. They had to research serial killers. They loved that. And even in the drug unit, I give them the names of different drugs and poisons to do research on. When you give them topics they're interested in they don't mind doing the research and they start clicking on sites and they'll want to learn more. For forensics are usually the lower kids. I try to do at least four research presentations for semester. Students in my physics classes do one major project where they have to write a whole paper. (Let me go to the question regarding giving homework that involved using the computer). No, because most of the students don't have a computer or don't have access to the Internet. I don't do much outside the classroom where they have to use the computer. However, the higher students will go to their neighbors to use a computer to get their assignments done or find some way to get it done but this is generally not the case with the lower students.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach.

Participant G: I have to differentiate in most of classes because if I don't my upper kids are just sitting there staring at the walls all day and still get an A. While my lower kids have no clue what's going on ever and they'll just sit there and try to copy off somebody every single day and do nothing. And so I try to differentiate in a lot of various ways. I told you about how I am constantly doing something every day – and some of the kids don't like it because they like that routine. But I am not a – come in everyday and we'll do this and then we'll do that kind of teacher. I'm not a huge routine person besides having a warm up the board to get us started. Sometimes I break them in groups and we'll have 2 or 3 labs or activities that are different in a single day just to get the movement in. They'll do an activity at one station – like a real lab – that takes only 20 minutes. And then I make them go to another station which is kind of like centers. For individuals that are struggling, I'll put them all in one group so that I can sit down with them more help or give them something more that is catered to what they need. As far as a final product, I let them choose – like if they want to do a PowerPoint or poster. As far as the requirement in a project, I make it a flat line because as high schoolers, they understand when you're giving some students a lot less work. And they all have to do the same requirements. Now for the higher achievers, I will tell them what I expect. I tell them if they want to get an A, I tell them I expect this and not bottom level work. I give them examples of things I've gotten in the past and I'll tell them if you give me something like this – we've got a problem. And they understand that. Now some students will give a presentation and they use bad grammar. They're not going to get an A but I won't grade them as hard. But as far as the rubric, they're given the same thing. I don't give students a different number of problems but I'll give them a different type of problems. As far as high achievers, they don't need more problems – they need a different type of problem – while the lower kids are doing the easier type of problems.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, a lack of background knowledge about various science topics, or a combination of problems?

Participant G: I think it's a combination of problems. A lot of them I think it goes back to when they were 2 and 3 years old. I've read the research that says parents that read to them helps them. A lot of them were never read to at that age – so it's obvious even from that they're already going to have problems. They don't understand vocabulary and they can't do context clues throughout the text. A lot of them don't have the background knowledge. I have a lot of students who've never ever been out of the area. So you talk about an ocean or you talk a chemical bond and they wonder what that has to do with them. They have no background to make a connection. And a big part of reading is making a connection. And they don't know how to read science texts. You don't read science texts the same way you can read history, or English or math.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant G: I've make note cards for these struggling readers. It helps them when they say certain words or phrases it helps them to understand the material better. I've also sent them a room where they had the content read to them. To get the grade up, I want to know if these students know the content they're supposed to know. So we've pulled these students out and sent them to a room where they had the content read to them. And this helps tremendously with several of them.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant G: Outside of the classroom – I don't really know. There is the after school program. I've some in tutoring but it's never those who are struggling who will take advantage of this program or tutoring. We have fifth block after school but the students who need it the most never come. I've found limited success with YES. But I've seen some improvement with those students who come after school and I can work on more what they need help with. In the classroom, I show videos of things they've never experience outside school such as virtual fieldtrips.

Question 13: How do you feel about a need for professional development or other education, in relation to reading comprehension?

Participant G: It wouldn't hurt but my problem with PD but every time they bring in somebody who's generic and they cannot apply it to science. When you ask them about science – they go off on some other topic.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant G: No, I do not feel the PD I've had on reading comprehension have been all that effective. I did take a course this summer on reading comprehension while working on my specialist; the teacher did try to gear things towards your subject area. With a lot of the strategies they're teaching for reading comprehension that's geared towards science, I don't have the time to teach all these strategies because of the standards. We have to set up labs and we don't have the time to do some of these things I thought was.

Question 15: How long is your science period?

Participant G: It used to be an hour and half but now it's about an hour and fifteen minutes because they added instructional focus last year. It's a 50 minute extra block. Each gets a 50 minute period for each of your classes once a week.

Question 16: Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant G: They have Saturday school but it's more of a detention sort of thing. Summer School – but I think it's mostly on the computers but it's only about 2 weeks or maybe 3 weeks and you get learn that much in that time.

Name: Participant H

Date: October 19, 2015

Role: High School Science Teacher

Name of School: Amazing High School (alias)

Question 1: What are your feelings about teaching reading comprehension as well as science content?

In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not?

Participant H: I think teaching reading comprehension is very important in the classroom so the students can understand the text and to be able to do research. I do feel like as a science teacher your job is to find that the students can adequately to able to comprehend the material they are reading and to be able to comprehend the labs they are doing. I feel it's not the science teachers' sole responsibility to teach reading comprehension; I feel it has to be a team effort. We have a reading teacher at the school if I noticed a teacher is struggling with reading comprehension in the science classroom.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant H: If we were told to teach reading comprehension along with all of the standards and everything else we have to do, I feel it could be a problem because a lot of teachers going to feel overwhelmed. We have a limited amount of time to teach science with reading comprehension in one period. If the program used the standards that were already set, it would be less problematic. If it was a part of the standards that are ready set, it would teachers out with implementing such a program.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do good readers do to demonstrate they comprehend the science material?

Participant H: There are 2 different levels that I look for in my students. Basic level is – can they read the information and pull information out to answer questions, to have information to do the labs – can they read through the text and just pull information. Can they understand the vocabulary used in the text. Can they use the information from the text to do the labs? On another level, for reading comprehension, I feel you should be able to read the text and make connections and inferences from things that are not explicitly stated in the text. I look for how well they can make inferences and to be able to give their opinion and explain what they think about what they've read.

Question 4: Describe your perceptions of the characteristics of ineffective, struggling readers? In other words, what do struggling readers do that demonstrate they do not comprehend the science material?

Participant H: Some of them struggle with pulling information from a text. Sometimes they have problems making connections between the texts or between the text and another idea we have read or discussed. The students are unable to make inferences from the text.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant H: I think your comprehension strategies are going to help your comprehension skills. When I think of strategies, I think of my students who don't have the best comprehension skills so we break up the text into smaller pieces. So I think strategies is a way of breaking down texts in smaller or more easily understood pieces whereas comprehension skills I feel that is going to support whether you can do that on your own or do you need someone along with you to help your break that down.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that helped all of your students improve their comprehension of science content?

Participant H: A lot of my students who are given a chapter to read, they're not able to comprehend the chapter. A lot of times I don't assign them to read the chapter so I will give them a set of questions for a section of the chapter to answer in order - to help them pull out the main idea – to help them break it down in smaller pieces and using discussion in class to help make connections across the chapters we've read. For an example, how does what we've read in section 1 effect what we've read in section 2. I try to do this with all of my students. With some of them I'll break it down even further. This is the main comprehension strategy we're doing right now.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content?

Examples are whole group, small group, one-on-one peer tutoring, a reading specialist, or a combination of methods?

Participant H: I use a combination of small group and one-on-one. I'm actually an inclusion teacher so I have another teacher in the classroom so it's easier to do one-on-one discussions and break them into groups.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness.

Participant H: No, I'm not very familiar with any reading programs because we're limited on technology at our school so if it came to some sort of computer based program where the students would need to work on a computer on a regular basis that might be difficult to do because of that limitation. However, I am not against using technology; I love it. I try to reserve the lab – to use I-pads – when I can -- it's just that it is competition to get them.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach.

Participant H: I do use differentiated instruction in my classroom. I try to do at least one lab or activity per chapter and they can be an actual lab or a modeling activity that we do. We've even done poster projects, art projects depicting the ideas that we are discussing. I've done a research project and that is what I've used the computer lab. I try to do some different things. This is my first year teaching so I'm trying to figure out what works and what doesn't. I've done jigsaw activities in my class where students are put into different groups according to whatever topic they're given and they become an expert on that topic. Then they divide into different groups where they're the only expert in the group on that topic and each of the other members of the group is an expert on their particular topic. Then they have to present their information; they get to choose how they're going to present or teach the information to the members of their group. One girl in a group used a poster to present her information. I do both formative and summative assessments. The assessment is also differentiated; all lot of times I'll let them choose which essay questions to answer. The tests are pretty similar but the length of the tests varies.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, a lack of background knowledge about various science topics, or a combination of problems?

Participant H: I would say it's a combination; there's a wide range in my classroom. I lot of students have problems with the vocabulary, with the background or prior knowledge about the topic. A lot of times when they're reading the text and they come to a word they don't know, they will just skip over that word. And also the ability to draw connections between topics or between the chapters is another problem. I'm an environmental science teacher and I know some of the topics we discuss I know are in the middle school standards. But some of them act as if this is the very first time they've seen this information. But other students are able to draw connections because they will remember seeing some of this same information in middle school. Some don't really know the vocabulary which is problematic. Most of the students can decode words but for some of them do have problems decoding unfamiliar words. Some of them will come across particular words and they will act as if they've never seen the words.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant H: I have a couple of student who I do one-on-one tutoring on a weekly basis because they need that extra help. I don't know that I do different strategies other than what I'm doing in class. One student didn't finish a lab assignment where they read a paragraph and they had to answer questions and graph the information because she didn't finish the assignment because she said she didn't understand it, she stayed after school for about 45 minutes and I broke the information and showed her how to draw connections between the text and the questions.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant H: We do have a reading teacher in ninth grade to help students who scored poorly in reading comprehension in middle school. So they have this support available coming into ninth grade.

Question 13: How do you feel about a need for professional development or other education, in relation to reading comprehension?

Participant H: I would say yes if there was professional learning for specific strategies that research has shown helps with reading comprehension especially in science. The problem with reading comprehension or any kind of reading that has been imposed on teachers I feel is that a lot of things I've gone to are geared towards literature or English. I feel like if there were reading comprehension workshops that could give specific examples to help science teachers that would be very beneficial. I've never been to a reading comprehension workshop where it was specifically geared with step-by-step strategies with how to help students.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant H: This question was answered in question 13.

Question 15: How long is your science period?

Participant H: Our science period is 75 minutes. Because we have instructional focus which is 50 extra minutes for remediation.

Question 16: Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant H: I don’t know if it’s specifically designed to address reading comprehension but we have an after school program. They do some tutoring with the students. Volunteers come in and tutor some of the students. The school offers that. And we also have an extended year option as well; but I don’t know the specifics of this. All teachers have a fifth block after school where students can come in and get extra help. It’s one on one or small group. Not a lot of students come to that but the school does require that teachers offer that once a week. Most of my students who come to fifth block are m y struggling students who are not passing or who did not do well on something or have not completed things. For those students who can’t come after school, I write them a pass to come down the hall so they can come to my room for 30 minutes.

Name: Participant I

Date: October 20, 2015

Role: High School Science Teacher

Name of School: Amazing High School

Question 1: What are your feelings about teaching reading comprehension as well as science content?

In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not?

Participant I: I want to start by saying that I feel like a holistic education in every classroom is part of the overall child's success. So I do feel like it is my responsibility as a content area teacher to address reading comprehension for my content which includes anything from content specific vocabulary to understanding passages at a Lexile level where the child can understand the background knowledge necessary to complete my content. I know we have the State Standards that require us to address certain literacy - reading and writing - standards within our curriculum. I try to meet the needs of all of my students and if that includes differentiating my text - coming up with different strategies as far as getting the child to understand the content through reading then this is something that I do.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant I: I feel like – I want to back up for just a second - with reading comprehension – when they come to me, the biggest issue I find is that the level the students are reading on when they come to me effects how I teach the content. It's kind of a domino effect if you will. A lot of the students – especially in our school district – are rather low Lexile level students and that effects how I teach my students. I've had everything from students who were in 10th grade reading on a first or second grade level to students who reading on 12th grade or college level. The span or range of reading readiness is a big issue in my classroom. And some of the other issues I've found other than readiness is the ability to read something and write about it which to me is basic to reading comprehension; if you can write about something you've read, you have pretty much comprehended it. And I've found that that's a big issue because of the writing skills of the students. So I try to target all of these features in my instruction. And it's not necessarily integrated everyday but I do try to do it over a period of time especially with certain topics where the vocabulary is more challenging than others. And so I try to tie in vocabulary to build up what they know. When I teach biology and with biology they have more vocabulary words than most of the other classes combined because it's new vocabulary that they've never heard outside my course. And I think that is the issue with teaching reading comprehension in science; the vocabulary is not everyday vocabulary or vocabulary that you read in a regular type passage; it's very specific – and the readiness for that is rather far behind for our county as well. So I try to scaffold that vocabulary so that they are a little better prepared to read a passage.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do good readers do to demonstrate they comprehend the science material?

Participant I: As I explained before, if you can write about what you've read then you've understood it. Good readers- those who are more successful in my classroom tend to have higher scores. They did analyze questions more closely. They're able to use the vocabulary or content vocabulary and use the vocabulary in discussions. Good readers do work at home – whether it's homework or reading from the textbook or reading from websites that I've given them. They come with more classroom questions about what we've been discussing in class. They're able to verbalize their questions very well with any of the content they didn't understand. These are the things that my good readers do. They also summarize what someone else has read.

Question 4: Describe your perceptions of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do that demonstrate they do not comprehend the science material?

Participant I: Most of my struggling readers don't volunteer to read; they don't volunteer to answer any questions in class. And when I ask them to read, they stumble over words or they have to ask me what a word is. When I ask them to explain to me what they've read, they can't tell me anything beyond what's written on the paper. These are red flags to me.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant I: Comprehension skills is what the students can show me what he or she can do – how well they can analyze the content we're reading; how in-depth they can analyze content. Comprehension strategies are how the student breaks down the text – do they break down the text mentally – how they read the text. Do they read it in chunks or do they vividly imagine while they are reading? Comprehension strategies also mean what I am doing as a teacher to help that student understand the content that we are working on.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that helped all of your students improve their comprehension of science content?

Participant I: One strategy that I've found that works overall – it may not work directly with reading comprehension - is to pair a student with a lower Lexile level with a student with a higher Lexile level. After that they pair/share a read aloud and take turns reading and summarizing what they've read. By pairing these students like this way, the student with the higher Lexile level can explain the information to the student with the lower Lexile level in a way he or she understands rather than having them getting in front of the class trying to summarize something they've just read and not be able to put it together. I also have the students to highlight their answers to questions I've given them is another strategy I use.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content?

Examples are whole group, small group, one-on-one instruction, peer tutoring, a reading specialist, or a combination of methods?

Participant I: I use a combination of strategies. If something doesn't work then I'll try it again. If it still doesn't work then I'll try something else. As far as reading comprehension goes, I almost never find that whole group instruction works. By whole group instruction I mean if I tell them to go home and read a passage and we're going to talk about it as a group. I find out that students don't open up about what they've read so I can tell very little about how much they actually comprehended in a large group or I'll have one or two students to take over. So I've found that small group or peer tutoring is much more effective.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness.

Participant I: I have worked with SRI and Read 180; those are the only two I have any experience with. I have found that the students in my classes who were in a Read 180 class that over the course of the semester their literacy skills in my class improve because of what they learned in Read 180. I feel that if the district has invested in that technology that if they would invest in training a teacher or teachers on that technology and on how to incorporate that technology into their classroom then it can be very, very valuable. But without that training, and this is where our district falls short on – the technology by itself is not as valuable. I am very tech savvy. I use a lot of technology such as the chrome books. I use technology in in all my instruction. Technology is extremely prevalent in my classroom.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach.

Participant I: I differentiate in various ways. I would say I weigh more heavily on differentiate by content and process. I am not as good as differentiating by product yet. On a daily basis I differentiate by content.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, a lack of background knowledge about various science topics, or a combination of problems?

Participant I: It's a combination but I lean more heavily on vocabulary. I don't just do content vocabulary; I use words like analyze, evaluation. They have problems with verbalizing what these words mean. It's not just a lack of specific vocabulary but vocabulary in general. They also have problems expressing themselves in clear, cohesive ways.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant I: If I identify a student who is truly at risk – someone who has all their work turned in, a lot of times I will get the students enrolled in fifth block and the YES. A lot of times I will meet with these students after school once a week and will read through this content together. I will paraphrase directions.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant I: If I identify a student who most definitely not reading on a grade level then they're going to struggle with understanding the content in my course. So I assign them a middle school level life science book at home. And they read passages that correlate to what we're doing in class and with what the other students are reading in the regular textbook. From the middle school textbook, they have to write about what they've read to the best of their ability and then give me a summary of the passages I've assigned them to read – it's not verbatim. And then they read this same information from the regular textbook and then compare what they've read from the regular textbook to what they read in the middle school textbook. Then we meet after school in fifth block and discuss what they've read from the 2 texts and see what little increases they've made with the vocabulary and see levels of increase in reading.

Question 13: How do you feel about a need for professional development or other education, in relation to reading comprehension?

Participant I: Absolutely! I was selected last year to be on a grant committee for Striving Readers Literacy Grant for the state. We're working with writing that grant and we analyze all kinds of data on where our students were within the district as far as reading comprehension and literacy strategies and skills where our teachers were. I've been teaching 4 years and I can tell you that I have never once been offered or been to a reading comprehension or literacy based professional development. And I think there is an extreme need because I think at this point teachers are lost and confused as to how when we get these students who are already behind and struggling with readiness for our content. How we are as teachers going to effectively - without over working we as teachers; or over working students- bring these students up to reading on grade level in our class while teaching our content? I think it is a huge struggle for teachers and I think it's because we have not been given valuable tools and we have not been given valuable professional development. I don't think that just needs to come from a reading specialist or something like this. I think it would be more effective to have teachers from different districts come and share successful reading strategies that they are implementing in their classrooms. Just offer a variety of ways we can implement these strategies in our classroom within reason. And help us walk through what it would be like to do it in our own classroom. That would be the most valuable type of professional development for me as a teacher. Look at my lesson plans and help me come up with a way I can feasibly do this in my classroom. That's a big need for our county.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant I: This question was covered in question 3 for the most part.

Question 15: How long is your science period?

Participant I: We have a block period. Right now it's a block to incorporate instructional focus and that's an hour period that the students come to us for supplemental instruction once a week. Our regular block now is seventy-five minutes.

Question 16: Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant I: I worked with the after school program which is a program run through our local college here that helps students after school every day with a tutorial to five or six o'clock. It goes through the summer a well. I worked with them in the summer as well I also worked directly with eight graders to help get them ready for ninth grade especially in the area of science – for reading comprehension in science. And I found that program has made a world of difference for those students coming into our ninth grade program. You can definitely tell those students versus from those students who weren't in that program – and their dedication level to continue the program during school and to keep their grades up has really benefited many of them. They're reading on grade level now so I'm very proud of that program.

Name: Participant J

Date: October 20, 2015

Role: High School Science Teacher

Name of School: Amazing High School

Question 1: What are your feelings about teaching reading comprehension as well as science content?

In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not?

Participant J: In my opinion by the time they reach ninth grade that should already have been addressed.

Question 2: What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?

Participant J: I think we need extra time for it. Science is our content area and even though we can read and comprehend doesn't mean we know how to teach reading comprehension.

Question 3: Describe your perceptions of the characteristics of good readers. In other words, what do good readers do to demonstrate they comprehend the science material?

Participant J: I think that they understand and they answer questions better; they're more correct with their answers. They comprehend the reading.

Question 4: Describe your perceptions of the characteristics of ineffective, struggling readers. In other words, what do struggling readers do to demonstrate they do not comprehend the science material?

Participant J: They give up, they get bored, and then they don't answer correctly. They don't want to look for it because they don't understand what they're reading.

Question 5: What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?

Participant J: Comprehension skills – comprehension strategies. I've never really thought about it.

Question 6: What reading comprehension strategies, if any, have you used in your classroom that helped all of your students improve their comprehension of science content?

Participant J: We read aloud, and we discuss it after we've read it. That's essentially all I've done.

Question 7: What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples are whole group, small group, one-on-one, peer tutoring, a reading specialist, or a combination of methods?

Participant J: A reading support specialist would be good and one-on-one would be good. At my school, the groups tend to stray too far and too fast.

Question 8: What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness.

Participant J: No mam. Probably about 20% of my time is devoted to technology; I use it to do research, projects, and PowerPoint.

Question 9: What are your perceptions about differentiating instruction in your classroom? Have you used this teaching method? If so, please explain your feelings about the results of this approach.

Participant J: I taught in private schools for 31 years and this is only my second year in public school - and we didn't do any of this stuff so I feel like I'm brand new and was never taught any of this and I have to pick it up. I do differentiate; we do group activities, we do projects, we take notes, we have review games. I try to incorporate a lot of different things. I differentiate through formative assessments; summative assessments are all the same. I feel I have been somewhat successful. One problem I've had with it is student apathy; this is a huge one. In everything we do, this is a big factor.

Question 10: What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, a lack of background knowledge about various science topics, or a combination of problems?

Participant J: All of them – a combination.

Question 11: What reading comprehension strategies, if any, have you incorporated to help at-risk students comprehend science content?

Participant J: Not with reading comprehension – no ma'am.

Question 12: What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?

Participant J: None that I'm aware of. That doesn't mean they're not offered but not anything I'm aware of.

Question 13: How do you feel about a need for professional development or other education, in relation to reading comprehension?

Participant J: If it's going to be implemented then we need it.

Question 14: Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?

Participant J: I have not.

Question 15: How long is your science period?

Participant J: An hour and 30 minutes. Instructional focus is an hour a day. Instructional focus is for remediation, make up work, make up tests, and things like that.

Question 16: Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.

Participant J: Not that I'm aware of.

Appendix E: Open Coding and Axial Coding Results

Interview Questions	**Open Coding**	**Axial Coding**
1. What are your feelings about teaching reading comprehension as well as science content? In other words, do you feel it is your responsibility to teach reading comprehension? Please explain why or why not.	Teaching reading comprehension is a part of their science instruction. Comprehension involves comprehending content, charts, tables, and lab assignments. Teaching reading comprehension is not the sole responsibility of science teaches. Teachers must make sure students understand the content. Reading comprehension is inherently embedded within the science content. One teacher felt that reading comprehension should have been addressed before students entered the ninth grade.	Teachers cannot teach science without some type of comprehension. Comprehension in science classes involves students being able to comprehend content, charts, tables, and lab assignments. Teaching reading comprehension is the responsibility of teachers across the content areas and not just science teachers.
2. What do you perceive as problems, if any, with teaching reading comprehension along with teaching science content?	Time constraints are a major issue. Most science teachers have not been formally trained to teach reading comprehension. Students' reading level	Time constraints are the major reason why more time is not devoted to incorporating reading comprehension instruction into the science program. Most science teachers have not been formally trained to teach reading comprehension. Students' reading level affects how the science teachers teach the content.

Appendix E: Open Coding and Axial Coding Results (continued)

Interview Questions	Open Coding	Axial Coding
3. Describe your perceptions of the characteristics of good readers. In other words, what do good readers do to demonstrate they comprehend the science material?	Good readers do a good job of summarizing what they've read. Very loquacious; have very engaging conversations with the teacher and other students. Good readers analyze and dissect questions very carefully. Good readers have higher order thinking skills. Good readers can effectively and accurately write about what they're learning. Good readers can extract meaning from the content and use this information to do the lab assignments. Good readers think outside of the box; use higher order thinking skills Good readers can apply what they've read to another situation. Good at using context clues and the dictionary to figure out unknown words. Good readers have strong vocabulary and read a lot beyond the regular classroom assignments.	Good readers have the ability to summarize what that they've read. Good readers can verbally articulate what they've read by using the science language, science vocabulary in meaningful ways. Good readers generally have excellent writing skills. Good readers possess higher order thinking skills which can be seen in their writing and through oral expression. Good readers read a lot beyond the regular classroom assignments.

Appendix E: Open Coding and Axial Coding Results (continued)

Interview Questions	**Open Coding**	**Axial Coding**
4. Describe your perceptions of the characteristics of ineffective, struggling. In other words, what do struggling readers do to demonstrate they do not comprehend the science material?	Struggling readers rarely volunteer to read. They often do not volunteer to answer questions. They have a difficult time comprehending the science lessons. They tend to stumble over words when they do read. They give up quickly; they are easily bored in class. One teacher said that the struggling readers are clueless; they have no idea what's going on. Struggling readers have a difficult time extracting meaning from the text. Struggling readers have difficulties making connections between the text and real world situations.	Struggling readers have a difficult time comprehending the science content. Struggling readers tend to struggle with decoding issues as well as comprehending the science content. Struggle readers have difficulties summarizing information. They don't read very much. Struggling readers generally do not volunteer to participate in the science discussions.

Appendix E: Open Coding and Axial Coding Results (continued)

Interview Questions	Open Coding	Axial Coding
5. What do you consider to be the difference, if any, between comprehension skills and comprehension strategies?	Several of the participants were unsure of how to answer this question. One participant explained a skill as the ability to go back and reread something they didn't understand the first time; a strategy is the ability to enunciate and break down a word phonetically. Another participant explained a skill as being the ability to dissect and understand the roots of a word; she explained a strategy as such things as the ability to identify a topic sentence and finding key points to improve reading. One participant described a comprehension skill as the ability to actually read a passage and understand what it says; she described a comprehension strategy as the ability to apply what they've read to a life skill or life lesson.	Several participants were unsure about how to answer this question. No common agreement about the difference between comprehension skills and comprehension strategies.
6. What reading comprehension strategies, if any, have you used in your classroom that have helped all of your students improve their comprehension of science content?	Teach roots of words to build vocabulary Teach students how to comprehend the textbook, charts, tables, and lab assignments. Have students read science-related articles to read to make connections between the textbook and real world situations.	Teachers spend time teaching the roots of words to help build vocabulary; understanding science vocabulary is essential to understand science content. Using science-related articles to help students make connections between the textbook and real world situations

Appendix E: Open Coding and Axial Coding Results (continued)

Interview Questions	Open Coding	Axial Coding
7. What type of instructional or teaching models do you perceive might be the most effective in order to help all students with comprehending science content? Examples; whole group, small group, or one-on-one instruction, peer tutoring, a reading specialist, or a combination of methods.	Modify instruction based upon the content; some content needs whole group, one-on-one or small group A combination and each student is an individual. Peer tutoring helps a lot in one participant's classroom. Example: grouping 2 good students together or 2 moderate students.	Instructional model depends upon the content being taught. The participants all used a combination of instructional models.
8. What are your feelings about incorporating reading comprehension programs through the Internet or other types of technology? If you have used any of these programs, please explain their effectiveness or ineffectiveness?	Most of the participants stated that they were not aware of reading comprehension programs delivered through the Internet Promethean Boards; these can be used to write comprehension answers on the board One participant reported a reading comprehension program used in her third grade son's classroom; this program reads the passages to the students. One participant reported using a program called Newsela where students read current event articles; program adjusts the program based upon students reading level. Several participants reported that technology is limited at their school – too many students with not enough	Most of the participants reported that they are not familiar with any reading programs delivered through the Internet.

	computers available.	

Appendix E: Open Coding and Axial Coding Results (continued)

Interview Questions	Open Coding	Axial Coding
9. What are your perceptions about differentiating instruction in your classroom? How you used this method? If so, please explain your feelings about the results of this approach.	Differentiated instruction is important because all students don't learn the same way. Lack training in what differentiated instruction is and is not. It is used but difficult to do in some classes because of the wide range of abilities in one classroom. Content is not differentiated but the finished product is differentiated Several teachers differentiate the assessments – tests are similar but the length of the tests varies based upon ability.	Differentiated instruction is important because all students don't learn the same way. Differentiates instruction is used to varying degrees in all the science classrooms. Teachers differentiate instruction in various ways.
10. What do you feel are your struggling readers' greatest comprehension problems? For an example, do they struggle with poor oral reading skills, weak vocabulary knowledge, lack of background knowledge about various science topics, or a combination of problems?	A combination of problems One participant stated that poor vocabulary knowledge was the greatest problem of struggling readers. Several participants stated that a lack of background knowledge was the greatest problem.	A combination of problems. Poor vocabulary knowledge and lack of background seem to be the greatest problems.

Appendix E: Open Coding and Axial Coding Results (continued)

Interview Questions	**Open Coding**	**Axial Coding**
11. What reading strategies or r beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?	Provide working notes of the information covered in class. Prepare note cards with key words and phrases Having the content read out loud to struggling readers. Provide one-on-one tutoring on a weekly basis for struggling readers Using lower level science textbooks One participant stated that she has not used any reading comprehension strategies with struggling readers. Breaking down the content in smaller, easy to understand terminology.	Providing working notes for struggling readers Providing one-on-one tutoring on a weekly basis. Using lower level science textbooks. Having the content read out loud to struggling readers Breaking down the content to help students comprehend the information in the textbook.
12. What strategies or interventions beyond the classroom have been used to help struggling readers improve their comprehension abilities? If no strategies or interventions beyond the classroom have been used, what strategies or interventions beyond the classroom do you feel might be beneficial for these struggling readers?	An after school tutorial program Special education students receive additional help from a support science class. Read 180: Used to determine the students' Lexile scores to determine which students are reading on grade level. One participant assigns her struggling readers passages to read from a middle school science textbook.	An afterschool tutorial program.

Appendix E: Open Coding and Axial Coding Results (continued)

Interview Questions	**Open Coding**	**Axial Coding**
13. How do you feel about a need for professional development or other education in relation to reading comprehension?	Professional development (PD) is needed but most PD offered has not been beneficial to science teachers Need research based reading comprehension for science instruction Science teachers have not been given effective instructional tools to bring struggling readers up to grade level. Bring in teachers from other districts who can share how they have implemented successful reading comprehension strategies in their science classrooms. Professional development courses are too generically based and not content centered	Past reading comprehension PD workshops have not provided specific examples of how to incorporate instructional strategies in the science classroom Need content specific PD rather than the generic type of PD; science has a language all of its own. Science teachers would benefit from hearing how high school science teachers from other districts who have successfully implemented science strategies to meet the needs of all students especially those who are reading below grade level.
14. Have you had professional development training or workshops on reading comprehension strategies? If so, please describe the training you have received. Were they effective or ineffective?	Most participants stated they have had a few PD on reading comprehension but said they were not effective. Two of the teachers stated that they have never had any reading comprehension PD.	Most teachers stated they have had a few PD on reading comprehension but said they were not effective. Two of the teachers stated that they have never had any reading comprehension PD.

Appendix E: Open Coding and Axial Coding Results (continued)

Interview Questions	Open Coding	Axial Coding
15. How long is your science period?	It used to be an hour and half but now it has been cut to 75 minutes. Some of the content area minutes- including science – were taken to add an extra period called instructional focus (IF). IF is for remediation or make up work.	It used to be an hour and half but now it has been cut to 75 minutes. Some of the content area minutes- including science – were taken to add an extra period called instructional focus.
16. Are there additional services such as summer school, after school tutorial, or Saturday School for students who are struggling to comprehend science content due to reading comprehension difficulties? Please explain in detail.	Summer School is offered for students who are failing - for credit recovery and credit repair Saturday School is sometimes offered but it is used as detention.	Summer School is offered for students who are failing - for credit recovery and credit repair Saturday School is sometimes offered but it is used as detention.

Appendix F: Summary of Key Findings Document

The purpose of this phenomenological study was to address how high school science teachers perceived their responsibility to teach content related reading comprehension strategies particularly for students who struggle to comprehend science texts. This study was important because research has shown that other than teaching English, very few subject area teachers are equipped to teach subject-related reading comprehension strategies (Goldman, 2012).

The key findings of the study revealed that the majority of the participants felt that it is their responsibility to teach reading comprehension as well as to teach the science content. However, several of the participants stated that teaching reading comprehension is the responsibility of all content area teachers and not just science teachers. Several of the participants stated that reading comprehension is inherently embedded into the science instruction and that you cannot separate the two. The findings revealed that all 10 participants provide varying levels of reading comprehension instruction as an integral part of their science instruction. The following are some of the common comprehension strategies that the participants reported using: teaching the roots of science words to help students learn the science vocabulary, breaking down the science content into smaller, more understandable terminology, and teaching students how to read and interpret data, charts, and tables. Additionally, all 10 participants reported that they spend a large portion of their science instruction devoted to helping students learn how to extract information from the content in order to successfully perform the lab assignments.

In terms of strategies to assist struggling readers, the findings revealed that teachers do their best to provide additional support to help these students with their comprehension issues. One teacher stated that she uses a lower level science textbook along with the regular grade level science book to help struggling readers. However, several of the teachers expressed that they have not had any formal training in reading comprehension and felt they lacked the skills needed to meet all of the reading and comprehension needs of these low performing readers; only two of the 10 teachers have reading endorsement certification. In terms of professional development (PD) training in reading comprehension, all 10 teachers reported a need for content specific professional learning rather than the generic type of professional development.

After reading the summary of the findings, please indicate below whether you agree or disagree with these results. If you disagree, please explain why. Please complete the bottom of the form, then sign and date the form.

I agree with the results of this study; indicate by circling: Yes or No

If you disagree with some or all of the findings, please explain what part/s of the results you disagree with. Please offer suggestions on what you think needs to be changed. I will consider making any reasonable, justifiable changes to the results if I can determine that these changes need to be made. Explain any areas of disagreement below.

Print Name:

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Signature:____

Date:____

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