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An exploratory investigation of the effect of reading strategies on science assessment scores

Suzanne K. Lynch
Rowan University, suzanne.k.lynch@gmail.com

AN EXPLORATORY INVESTIGATION OF THE EFFECT OF READING STRATEGIES ON SCIENCE ASSESSMENT SCORES

By

Suzanne K. Lynch

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Dedication

I would like to dedicate this manuscript to my children.

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I would like to express my sincere appreciation to Professor Sydney Kuder for his guidance in this research. With his assistance and support I was able to complete this thesis while working and raising my children.

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Abstract

Suzanne K. Lynch
AN EXPLORATORY INVESTIGATION OF THE EFFECT OF READING STRATEGIES ON SCIENCE ASSESSMENT SCORES
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Sydney Kuder, Ed.D.
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The purpose of this study was to determine if the use of literacy strategies in a content area improves a summative assessment score. All of the students in this research had Individual Education Plans. Most of the students have specific learning disabilities that include reading comprehension, reading fluency, basic reading skills, and inferencing skills. Both pre-reading and during reading strategies were used for the study. Students were exposed to the use of graphic organizers and close reading strategies on given topics. Data gathered from the experiment showed that the use of a graphic organizer in addition to notes and labs did not increase scores on assessments, while the addition of the graphic organizer with close reading strategies did increase scores on assessments. This study found that the use of both graphic organizers with the addition of close reading strategies to a given topic can improve the scores on assessments of content area knowledge.

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Chapter One

Introduction

All students have the ability to succeed in science classes. Some students require more support strategies to assist them in being successful in science class. Science is embedded in modern society with everyday life activities and in work places. Students that are scientifically literate will be able to utilize the technology and be integral parts of society. This is a very exciting time to be a science teacher and utilize 21st century skills to benefit our students. There are new standards for teachers in New Jersey to meet according to the NGSS (Next Generation Science Standards). As the CCSS (Common Core States Standards) affirms, reading in science requires an appreciation of the norms and conventions of the discipline of science, including understanding the nature of evidence used, an attention to precision and detail, and the capacity to make and assess intricate arguments, synthesize complex information, and follow detailed procedures and accounts of events and concepts. Students also need to be able to gain knowledge from elaborate diagrams and data that convey information and illustrate scientific concepts (NGSS 2013). Many of the topics in science are abstract and conceptual, such as atoms and isotopes of elements. Students with a disability have a difficult time with abstract concepts. Students with reading disabilities also have difficulties with inference based skills. They struggle to make connections with the text and therefore abstract concepts really pose a challenge for them. Science also deals with math computations along with reading and writing. Students with disabilities often have processing difficulties and decreased reading skills. They are also hindered due to a lack of basic study strategies in reading, taking notes, developing vocabulary, organizing materials, writing, and other

study skills (Grumbine & Alden, 2006). Students with learning disabilities often struggle in science classes because they have difficulty comprehending complicated text-based information, may not utilize their background science knowledge as often as students without disabilities, and may need textual enhancements and reading comprehension strategies (Hedin and Mason, 2011).

Students are placed in the least restrictive environment to best meet their needs. For some students that is in a general education class and for others that might be in a small class size in a resource class. Each student that has an IEP has certain modifications and additional supports for the student to be successful. Students who are engaged in the classroom activities have shown an increase in academic achievement. One way students can be engaged is through the use of literacy strategies in a content area.

Purpose of the Study

The purpose of this study was to determine if the use of literacy strategies in a content area improves a summative assessment score. Reading, writing, and oral communication are critical literacy practices for participation in a global society (Krajcik & Sutherland, 2010). The students were in grades 9-11 in a suburban public school setting with 30 percent free and reduced lunch assistance. In the classes, I have students who have Individual Education Plans and they each need to meet a specific, targeted reading goal. Most of the students have specific learning disabilities that include reading comprehension, reading fluency, basic reading skills, and inferencing skills. The students who will be included in the study had reading levels that ranged from grade 1.1- 7.2. Both pre-reading and during reading strategies will be used for the study. The strategies were used for a unit topic during the spring quarters of the 18-19 school year. Students

were compared by class scores on summative unit assessments at the end of a given unit. Two classes learned and utilized the reading strategies and two classes were not be given the strategies. The overall average test scores was analyzed to determine if reading strategies in a content area such as Biology improved scores on a summative assessment.

Research Questions

1. Will the use of pre-reading, during reading, and post-reading literacy strategies within the notes, labs, and class graphic organizers for a given unit improve students' grade on the summative assessment at the end of the unit?
2. Will students continue to be successful in summative assessments at the end of the unit without the use of pre-reading, during reading and post-reading literacy strategies within the notes, labs, and class graphic organizers?

Significance of the Study

The significance of this study was to determine if the use of literacy strategies in a content area improved a summative assessment score if content knowledge. Assisting adolescents in reading involves utilizing different teaching strategies as compared to remediating elementary-aged children. As students are able to show their levels of understanding of the given topic the teacher can modify the lesson in real time to best fit the needs of the classroom and the individual students. These additional supports can give students multiple options for their learning styles. Allowing the teacher to make informed decisions on the ability of the students to be successful on the summative assessment.

Key Terms

For the purpose of this study, the following terms are defined as follows:

1. **Literacy strategies:** specific strategies when reading that show they understand or comprehend what they're reading.
2. **Academic achievement:** performance is the extent to which a student has achieved their short or long-term educational goals.
3. **Formative assessment:** informal assessment procedures conducted by teachers during the learning process in order to modify teaching and learning activities to improve student attainment.
4. **Summative assessment:** evaluate student learning at the end of an instructional unit by comparing it against some standard.
5. **Disciplinary literacy:** Literacy skills specialised to history, science, mathematics, literature, or other subject matter.

Chapter 2

Literature Review

Common Literacy Struggles for Students with Learning Disabilities

Students with disabilities often lack the strategies to be successful with reading in the content area. Instructional approaches to improving student reading in content classrooms include pre-reading strategies like connecting to past prior knowledge and completing a KWL chart. During reading strategies can include graphic organizers and close reading. For many students with learning disabilities, their literacy attainment has not kept pace with the increased demands. Compared with literacy demands that they had to meet in earlier grades, students now find that their texts are significantly longer and more complex, present greater conceptual demands and barriers, contain more detailed graphics, and demand a greater ability to manipulate and synthesize information across a broad array of text genres (Carnegie Council on Advancing Adolescent Literacy, 2010). As the complexity and volume of text demands grow, the expectations for students to apply higher order thinking and reasoning skills also increase. Secondary teachers often assume that most students bring to their classes the necessary prerequisite skills and knowledge, as well as appropriate dispositions, for engaging in challenging learning activities and discussions in their content areas (Biancarosa & Snow, 2006). However, secondary teachers have reported that they do not have confidence that students with LD can successfully master the required higher order thinking behaviors specified in increased academic standard policies (Bulgren et al., 2006).

Research suggests students with learning disabilities often have trouble connecting new and prior knowledge, distinguishing essential and nonessential

information, and applying comprehension strategies. Students with learning disabilities exhibit difficulties in processing and organizing written and oral information, drawing conclusions, comprehending relationships and connections, distinguishing main ideas from irrelevant information, and understanding the substance of a passage (DiCecco & Gleason, 2002). In addition, students with learning disabilities experience difficulties with problem-solving skills that contribute to problems with higher-order processing (Bulgren et al., 2013). Graphic organizers have been suggested as tools educators can use to facilitate critical thinking and prepare students for independent learning.

Improving Literacy Strategies

Laura R. Hedin, Linda H. Mason, and Janet S. Gaffney (2011) conducted a study with two students ages 10 and 11 who were identified by their general education teacher to have both poor reading comprehension and attention related disabilities. In the study the two students were instructed in how to include the TWA (Think Before Reading, Think While Reading, Think After Reading), strategy with science related articles. The TWA consists of 9 strategies: State Author's Purpose, What I Know, What I Want to Learn, Adjust Reading Speed, Reread, Link Knowledge, Identify, Main Idea, Summarize, and State What I Learned. Prior to the treatment students took reading probes to have a baseline to compare to. The students received 10 one- on-one sessions with a teacher using TWA. Although results of Justin's performance were promising after instruction, his performance did not maintain over time or generalize across teachers (Hedin, Mason, & Gaffney,2011). Maintenance reading probes collected 4 and 8 weeks later indicated that Justin did not maintain performance much above pre-instruction levels and definitely below what was noted during and shortly after instruction. Marshall's maintenance score

after 4 weeks returned to baseline levels. Despite impressive improvements in main idea identification achieved during instruction, Marshall did not maintain performance on short-term, generalization, or delayed readings. Overall, Marshall demonstrated excellent comprehension during instructional phases, a promising outcome. His retells included important information and reflected the organization of the passage showing that he had understood what he read. He did not sustain this level of performance beyond the instructional setting as shown by the post-instruction reading probes (Hedin et al., 2011).

Marcy Boudreaux-Johnson, Paul Mooney, and Renée E. Lastrapes (2017) looked at how the close reading strategy can benefit at fourth grade at-risk readers. Close reading is a literary practice that has been featured prominently in the promotion and implementation of the Common Core State Standards (CCSS) and the accompanying national assessments for example Partnership for Assessment of Readiness for College and Careers and PARCC. Close reading is the careful, sustained interpretation of a brief passage of a text. The stated goals of the inquiry by Boudreadux-Johnson et al. (2017) were to evaluate the appropriateness of the close reading instructional routine for use with elementary school students and to determine modifications that would be useful in implementing close reading with students in elementary school. Participants in the study were five fourth-grade boys and one girl who were recommended by their classroom teacher due to risk of academic failure. Risk status was determined by teacher recommendation and was based on previous poor performance on state accountability tests and at-risk scores on the fall benchmarking reading assessment (i.e., less than 70 words correct per minute on grade-level oral reading fluency [ORF] probes for the fall benchmarking period). All African American students were receiving Tier 2

supplemental reading intervention at the time of the study (Boudreadux et al., 2017) Two interventions were compared in the present study-close reading and CSR (Collaborative Strategic Reading). The researchers chose to make the comparison because at the time of the study, close reading was not an empirically validated intervention for elementary grades students. That made close reading an inappropriate choice for a Tier 2 intervention program, which is designed to utilize small group formats and research-validated interventions. In order to ensure that students received a validated intervention as part of the program, a decision was made to include CSR as part of the Tier 2 programming and compare it against a close reading instructional routine that was based on the description of Shanahan (2014) and the qualitative research of Fisher and Frey (2012).

To ensure treatment implementation fidelity observations were scheduled to be conducted once weekly over the course of the six-week study, for a total of 33% of the 18 sessions. Each intervention was to be observed three times by the author familiar with both interventions. Researcher-developed checklists were used during the observations. Each checklist contained a specific number of intervention components that were marked in terms of whether or not the component was implemented during the intervention session. The close reading checklist consisted of the 10 components. The CSR checklist included different forms to account for the four comprehension strategies that were implemented over the course of the experiment (Boudreadux et al., 2017). Data were reported as the proportion of components observed.

A single subject research alternating treatments design was utilized to answer the first research question. Use of an alternating treatments design allowed for a direct comparison of the effectiveness of close reading and CSR on students' reading and

writing performance. The outcome of the study showed evidence that four of the six students made significant gains in their pre vs. post assessments. There was 6 weeks of implementation of the close reading and CSR in between the pre and post assessments. Limitations within the study were the short time period of implementation, only 6 weeks, and not all of the 17 lessons originally slated for the experimental study were used.

Most of the reading strategies and interventions for all students are geared towards elementary aged students. Research done on methods to improve the with content area reading of secondary students with disabilities is limited. Kathleen Seifert and Christine Espin (2012) examined the effects of three different reading strategies on twenty 10th grade students, 11 male and 9 female, with learning disabilities. The three approaches were text reading, vocabulary learning, and text reading plus vocabulary learning. The purpose of the study was to examine a reading intervention embedded in science text and focused on the skills of vocabulary, word reading, and reading fluency for adolescent students with LD.

The independent variable was type of reading intervention: text reading, vocabulary learning, and combined. These three approaches were compared with a control condition in which no intervention was delivered. At the end of each instructional session, three sets of measures were administered to test the direct and immediate effects of the interventions on the reading of science text. Each measure was designed to examine a different aspect of reading and understanding of text material. Each student participated in three instructional sessions (text reading, vocabulary learning, and combined) and one control session. Three different instructors (two graduate students and the lead author) implemented the treatment sessions individually with the students, using

an explicitly designed instructional sequence. Sessions were conducted over the course of 4 days; two conditions were delivered in the same week for 2 weeks (Seifert & Espin, 2012). Considering the exploratory nature of the study, the results imply that further investigation of a combined intervention approach in which reading fluency and vocabulary knowledge are emphasized is in order. In the study, this approach resulted in improved reading of instructional texts and greater knowledge of the vocabulary used in that text (Seifert & Espin, 2012).

Vaughn, Roberts, Schnakenberg, Fall, Vaughn, and Wexler (2015) focused on students who continued to struggle with reading in secondary school and their prospects for being successful in content-area classes when provided with long term, intensive reading intervention within the texts and topics of social studies (e.g., world history) and science (e.g., biology). Vaughn et al. addressed the following primary research question: To what extent does the reading intervention improve the reading comprehension of ninth and 10th graders with disabilities? The secondary question was whether students with disabilities in the treatment condition would remain in school at higher rates than those of students with disabilities in the comparison condition. Three diverse high schools in a large urban Southwestern U.S. district participated in the study, with approximately a third of the sample from each site. In the sampled schools, approximately 43% of the students were Hispanic; 25.51%, White; 19.44%, African American; 7.85%, Asian; and 4.06%, Native American or biracial. In addition, 42.6% of students in participating schools were economically disadvantaged. Approximately 8% of the schools' population qualified for special education services The students with disabilities were a subsample of the overall at-risk participant group. All qualified students (e.g., students at risk due to

low achievement) were randomly assigned to condition within schools. Interventions were provided to students during their ninth- and 10th-grade years (Vaughn et al., 2015). The sample of students with disabilities at the beginning of the intervention included 77 students. Of these 77 students, all but three were classified as having learning disabilities; the other three were identified as having behavior disorders. Students in the reading intervention participated in classes of no more than 10 students during their elective period. The treatment protocol focused on four areas: word study, vocabulary in content-area text, comprehension of content-area text, and engagement. All students in both conditions continued to receive the special education services specified in their individualized education programs. During their elective period, students in the treatment condition were provided with the reading instruction, whereas students in the comparison condition remained in their elective classes, which included subjects such as music, band, art, and cooking classes. The results showed students with disabilities in the treatment group scored significantly higher than students in the comparison group on the Gates–MacGinitie Reading Comprehension subtest. Although the observed improvements in reading comprehension are encouraging, the majority of treated students continued to read at levels well below average, suggesting ongoing challenges with the complex text that they are likely to encounter in high school (Vaughn et al., 2015).

Graphic Organizers

Students with LD need explicit content enhancements to assist in verbal (e.g., text or lecture) comprehension, and graphic organizers (GOs) have often been recommended as an instructional device to assist these students in understanding increasingly abstract concepts (Dexter & Hughes, 2011). Graphic organizers are often used to assist students in

reading comprehension within the content area. They are utilized to increase meaningful learning and assist in understanding and retention of new material by making abstract concepts more concrete and connecting new information with prior knowledge. Graphic organizers that are based on the task to be completed, as well as the thinking and learning needs of the student using the organizer, help foster critical thinking. Graphic organizers can reduce cognitive demands by providing a framework for students to create a visual representation of the most significant information in the text.

Dexter and Hughes (2011) did a meta-analysis of research done on graphic organizers and students with learning disabilities. Within their research they found several key findings are consistently replicated: (a) students with low verbal ability gain more from GOs than students with high verbal ability; (b) students with little or no prior knowledge in a subject gain more from GOs than students with an abundance of prior knowledge in a subject; (c) GOs are especially helpful in assisting students with far-transfer tasks, in addition to near-transfer tasks and factual recall; (d) GOs should be explicitly taught to students for maximum impact; (e) GOs should spatially group together or connect concepts so readers are more likely to perceive them as being interrelated and to draw perceptual inferences about their relationships; (f) GOs should not be clustered with a lot of information; readers should easily perceive the phenomena or relations that are important; (g) GOs are effective because of their computational efficiency, minimizing stress on the working memory; and (h) GOs can be effective when used before, during, or after a lesson.

Posttest effects were calculated for the subject areas of English/writing/reading, mathematics, science, and social studies. Science had a large maintenance effect (e.g.,

.80) that was significantly larger than the moderate effects for mathematics and social studies within the meta-analysis completed by Dexter and Hughes (2011). As was the case in previous research syntheses (e.g., Gajria et al., 2007; Kim et al., 2004; Moore & Readence, 1984), findings from this meta-analysis indicate that GOs improve the factual comprehension of upper elementary, intermediate, and secondary students with LD. Unlike these previous reviews, this analysis also indicates that GOs may improve vocabulary and inference/relational comprehension for students with LD (Dexter and Hughes 2011).

The major implication of the Dexter and Hughes (2011) study was that more instruction intensive types of GOs are better for immediate factual recall while more computationally efficient GOs (e.g., visual display) are better for maintenance and transfer. This knowledge can help teachers in designing GOs for initial instruction and for re-teaching, studying, and retention purposes. For instance, a semantic map for initial instruction, followed by a simpler visual display for review and study will potentially maximize the effects of recall, maintenance, and far-transfer for students with LD (Dexter and Hughes 2011). Limitations within the meta-analysis research article are a) each of the studies took place in self-contained resource classrooms, which may not easily be replicated due to most secondary students are learning in general education classes. b) Only three articles in the meta-analysis were published in the past 15 years. More current group design, randomized control trials, is needed to fully validate the benefits of GOs across all secondary students with LD. c) the studies used in the meta-analysis did not have control if the students were using the graphic organizer to study or were the students utilizing the text in conjunction.

Dexter and Hughes went on to do another meta-analysis with Park in 2011 investigating specifically graphic organizers in the science content area since their prior meta-analysis provided evidence for increased posttest scores and carryover. Dexter et al. focused on the following questions: What are the overall effects of GOs on posttest science performance of students with LD? Do these effects maintain over time? Are there differential effects by type of GO on posttest and maintenance science performance?

Each of the studies included in the meta-analysis included instruction on the use of a GO. Instruction for the experimental groups included one to two sessions focused solely on how to use the GO, one to two sessions of prompted practice using the GO, and independent student use of the GO for the remainder of sessions. During the initial sessions the teacher or researcher presented the GO to students and described how it illustrated relationships. The following sessions generally included the instructor explicitly guiding the students in creating or filling out the GO. The following sessions generally included the instructor explicitly guiding the students in creating or filling out the GO. Duration of each of the interventions lasted between 1 and 5 weeks with an additional 1–4 weeks between posttest and maintenance measures. All of the studies were conducted in a resource classroom during or after the school day.

There was a large overall standardized effect of GOs on the posttest science performance (i.e., multiple-choice comprehension, multiple-choice vocabulary) of students with LD across all studies (ES = 1.052) and a 95 percent confidence interval of 0.88, 1.23 for the random effects model. Findings from this meta-analysis indicate that GOs improve the factual comprehension and vocabulary knowledge of intermediate and

secondary students with LD in science. Furthermore, the findings from this analysis also indicate that GOs help to facilitate maintenance of learned science material for students with LD. This finding demonstrates that, for science material, students with LD were not only able to learn new content for immediate posttest, but also to remember the content for longer periods of time. This finding is especially promising given the conceptually dense nature of science text. GOs may serve as a key to not only decoding, but also understanding this difficult text (Dexter et al., 2011). There were limitations with the study as well. Studies were completed in a self-contained resource classroom and the studies were 19 years ago.

In 2015 Sabrina M. Singleton and Hollie Gabler Filce wrote an article on how different graphic organizers could be used within different content areas and topics. When determining which graphic organizer to use with students with learning disabilities, teachers can benefit from knowing which organizer works best in organizing information and activating critical thinking. The different types of graphic organizers that will be used in this research study will be a Venn Diagram, Concept map, and a Problem-Solution map. A Venn Diagram assists in making comparisons between the relationship and differences between concepts using two or more overlapping circles. A concept map helps the user make connections between concepts and serves as a brainstorming tool to help organize ideas and enhance memory. Concept maps use images and symbols, are arranged according to the importance of the concept. Problem solution maps help depict information that contains cause-and effect problems and solutions. They also help students summarize text, identify the problems that occurred within the text, recognize

solutions used to solve the problem, and interpret the end results (Singleton and Filce 2015).

Conclusions

Teachers who teach students how graphic organizers are used and how they can benefit from them can expect greater efficiency by making and using it on their own. Teacher modeling is necessary to demonstrate the effectiveness of graphic organizers to students. But there are some limitations to graphic organizers as can be seen Singleton and Filce; such and student dependence on the teacher filling out the GO at all times. Teachers should also be aware that students may become dependent on teacher-generated graphic organizers. Encouraging students to create their own graphic organizers can lessen dependence (Vaughn et al., 2015).

Close reading strategies have the ability to improve reading comprehension when used over a period of time as seen in Seifert and Espin (2012). Another item to remember is that teachers should model how to effectively use close reading strategies with students. When teachers explicitly model the activity and strategy to the student with a learning disability there is increased carry over.

With this literature review in mind I will be using close reading strategies and graphic organizers in my research methodology to answer the questions set forth in chapter one. The first of which is "Will the use of pre-reading, during reading, and post-reading literacy strategies within the notes, labs, and class graphic organizers for a given unit improve their grade on the summative assessment at the end of the unit?" While the second question of "Will students continue to be successful in summative assessments at

the end of the unit without the use of pre-reading, during reading and post-reading literacy strategies within the notes, labs, and class graphic organizers?"

Chapter 3

Methodology

Setting

School. The study took place in a public school in a southern New Jersey school district. This is a single building regional middle and high school grades 7-12. Students enter into the middle school by four sending district elementary schools. The school follows an eight period schedule with 43 minute periods with an additional homeroom for 7 minutes and a lunch period for 25 minutes. The school district has a one-to-one Google Chromebook initiative for each student and implements a go green initiative to decrease the amount of paper used.

As of the 2016-17 New Jersey Performance Report, the school consisted of approximately 929 students in grades 7-12. In 2016, there were approximately 21% of students with disabilities and were receiving services. The school population is 82% Caucasian, 7.3% Hispanic, 5.4% African American, and 1.8% Asian. There has not been a significant change in population diversity since the last New Jersey Performance Report of 2016-17. Another enrollment trend in the New Jersey Performance Report is our economically disadvantaged students which was 31% as of the 2016-17 school year.

Classroom. The classroom where the study took place is a resource room for Biology students who have an IEP stating the need for a small class size, resource setting. The classroom consists of a teacher desk and chair along with 4 student lab tables that each seat 2 students. The desks face the side of the room where the whiteboard and SMART tv are located. The teacher has the capability to have interaction between her computer and the SMART tv for multimedia activities for the students and lecture

presentations. The students also have access to the materials through Google Classroom where the teacher posts the items for students to use during or outside of class.

Participants. A total of 32 students between the grades of 9th grade and 12th grade participated in this study. The students were divided into two groups. There were a total of 5 resource Biology classes. Three of the five classes utilized the literacy strategies and two did not utilize the literacy strategies. Students were based on being in a period together. All of the students in this study were currently enrolled in a Reading class at the public high school for the 2018/2019 school year. Table 1 has the student names removed but identified by numbers also included are their grades and Special Education classification code.

Nineteen students were in the intervention group. Included in the intervention group were 11 males and 8 females. The reading levels ranged from a 1st grade independent reading level to 7th grade independent reading level. There were 2 students, one male and one female who had the questions on assessments read to him/her along with having a text to speech option on a computerized test.

The second group that did not receive the intervention included 13 students. Eight males were included in this group along with five female students. The reading levels from the non-intervention grouping of students had a reading level ranging from 4th grade to 8th grade. None of the students in the non intervention group had text to speech or assessment items read to them.

Table 1

Demographic Data for the Experimental Group

Student #	Grade	Classification
1	10	SLD
2	9	SLD
3	9	SLD
4	9	AUT
5	9	SLD
6	10	MD
7	10	ED
8	11	OHI
9	11	SLD
10	9	SLD
11	9	SLD
12	11	MD
13	10	SLD
14	9	OHI
15	9	OHI
16	9	SLD
17	9	ED
18	9	SLD
19	10	SLD

Table 2

Demographic Data for the Control Group

Student #	Grade	Classification
20	10	MD
21	9	AUT
22	10	SLD
23	9	SLD
24	10	SLD
25	9	OHI
26	10	SLD
27	11	SLD
28	11	SLD
29	11	SLD
30	10	SLD
31	10	OHI
32	12	SLD

Research Design

Students in the intervention group received a graphic organizer along with the notes from direct instruction, labs and articles based on the topic for reading in the content area. The control group did not receive the interventions in addition to the normal classroom activities. A close reading strategy was also given to the original 19 students for the reading articles to make connections with the topic to be taught.

The graphic organizer was used for four weeks for the first unit of study and the results were measured through the grades of the unit summative assessment. The close

reading strategies were then added to the interventions for four weeks and the CER worksheets were given weekly. The results of the CER worksheets and the summative assessment grades for the second unit were measured and recorded.

Students who received the graphic organizer (GO) for the first time had the teacher model how to correctly fill it out. The teacher also explained to the students why she picked that type of graphic organizer, eg: compare/contrast or problem solve.

Students learned how to use close reading strategies for the articles that make connections with the topic for that unit. The close reading strategies that the teacher utilized are listed below:

1. Selected “compact, short, self-contained texts that could be read and reread deliberately and slowly” (Coleman & Pimentel, 2012).
2. Identified the purpose(s) for the close reading, which were used to understand the gist, note distinctive language, identify key ideas, infer author's craft and intention, analyze text structures and organization, or argue a position.
3. Prepared the text for presentation by numbering lines, paragraphs, or stanzas to support ease of reference, focus, and discussion.
4. Taught children how to annotate the text sparingly, because too much highlighting could cause children to lose focus. Students could annotate keywords or phrases, confusing concepts, inferences, main ideas, and so on, all related to the lesson purpose. They could highlight each in a different color, using colored highlighters or pencils. Pencils can also be used to circle and underline keywords or phrases that relate to the identified purpose.

5. Utilized text-dependent questions and prompts that would continually push the students back into the text for deeper analysis. Questions did require children to search, synthesize, infer, and make text-supported judgments.

Teachers and students then followed the following procedures for close reading articles:

1. First reading—Teacher shared purpose and process. Students engaged in the first reading and annotating, prompted by a posed question (e.g., What is the general information the author is sharing about...?).
2. Chatting and charting—Students shared responses and annotations with a partner. If students could not write in the text, annotations and information could be written on sticky notes or a graphic organizer.
3. Reading again—Based on insights from the conversation, the teacher asked additional text-dependent questions that returned students to the text multiple times to accomplish the lesson purpose.
4. Chatting and charting— Conversation occurred after each return to the text. Responses were deepened after each reading and conversation.
5. Independence—At the conclusion of the reading, students, independently or with others, engaged in a task illustrating their understanding of the text (e.g.. writing text- supported arguments such as a CER).

Assessments

This study used a Claim, Evidence, and Reasoning (CER) worksheet for the assessment to provide data for improved reading in the content area. Students did a close reading activity each week with a CER worksheet. Scores were earned via a rubric, (see

attached Appendix 1) students did have access to the rubric each week. The data was calculated to show the average for each student over the course of 4 weeks for the CER worksheets. This average was compared to the first CER given without close reading strategies.

Another assessment that was utilized is a unit test to provide data in this study. Unit assessments can be found in Appendix 2. Students completed the different graphic organizers within the unit of study. Students were encouraged to use the graphic organizers as study tools for the assessment. Student assessment scores were compared to those students who did not use graphic organizers during the unit of study.

Chapter 4

Results

The purpose of this study was to determine if the use of literacy strategies in a content area improves a summative assessment score. Students were all in a small resource science classroom, maximum of 9 students. Students were in grades 9-12 and all had Individual Education Plans (IEP's). Students were separated into 2 groups, the control group that did not receive the literacy strategies of graphic organizers and close reading strategies and one group did receive the previously stated literacy strategies.

Graphic Organizers

Students in the experimental group were given a graphic organizer for each of the three topics and given a quiz on each topic. Students in the control group were not given a graphic organizer for each of the three topics given. The same quiz was given to each of the groups. The fourth data set was based on the Benchmark summative assessment at the end of the unit. Table 3 represents the score for each assessment for each student.

Table 3

Difference Between Experimental group and Control group in each assessment

	Quiz 1	Quiz 1 Diff	Quiz 2	Quiz 2 Diff	Quiz 3	Quiz 3 Diff	Benchmark	Benchmark Diff
Experimental	*77.44*	*+0.19*	*78.38*	*-0.78*	*78.27*	*-2.73*	*73.77*	*-1.98*
Control	*77.25*	*-0.19*	*79.16*	*+0.78*	*81*	*+2.73*	*75.75*	*+1.98*

Table 4

Results for Students in the Experimental Group

Student #	grade	classification	Biomolecules quiz	Enzymes quiz	cell organelle quiz	Benchmark #3
1	10	SLD	57	67	75	63
2	9	SLD	71	60	19	34
3	9	SLD	71	83	88	84
4	9	AUT	86	100	94	83
5	9	SLD	71	67	69	61
6	10	MD	71	100	44	83
7	10	ED	86	68	75	65
8	11	OHI	86	83	100	86
9	11	SLD	86	83	75	63
10	9	SLD	57	83	81	80
11	9	SLD	71	67	100	83
12	11	MD	100	67	94	84
13	10	SLD	71	83	88	76
14	9	OHI	57	100	95	70
15	9	OHI	71	67	81	81
16	9	SLD	71	83	94	74
17	9	ED	71	83	94	84
18	9	SLD	86	67	43	74

Table 5

Results for Students in the Control Group

Student #	Grade	Classification	Biomolecules quiz	enzymes quiz	Cell organelles quiz	Benchmark #3
20	10	MD	71	83	37	54
21	9	AUT	86	83	100	81
22	10	SLD	71	100	65	63
23	9	SLD	71	67	100	97
24	10	SLD	86	83	94	74
25	9	OHI	57	67	94	74
26	10	SLD	57	83	69	74
27	11	SLD	86	67	94	66
28	11	SLD	100	83	94	80
29	11	SLD	100	67	75	80
30	10	SLD	71	100	100	92
31	10	OHI	71	67	50	74

When looking at the mean of each group and comparing them, the control group overall had higher scores than that of the experimental group. Two students with autism, one in the experimental group and one in the control group, had the highest overall scores. The OHI students tended to have the lowest scores in both the experimental group and the control group.

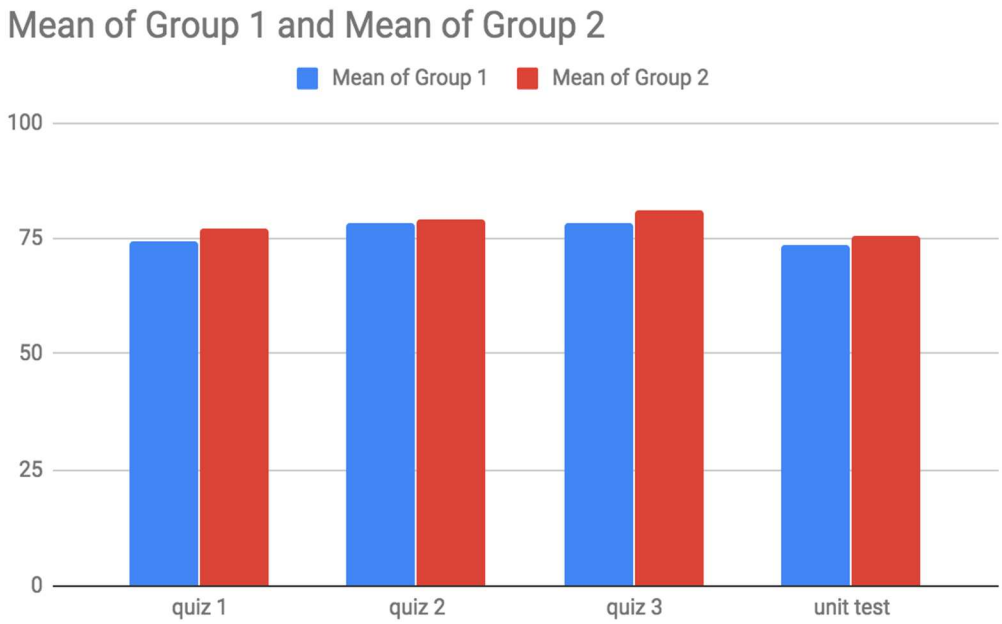

Figure 1. Mean score for the experimental and control groups on assessment grades

Figure 1 represents the mean scores for each assessment for each student. The data from figure 4 shows that the control group mean is slightly higher than the experimental group in all 4 assessments.

Close Reading Strategies

After the summative assessment for the unit test was completed then the second part of the research was initiated. Students in the experimental group continued to get graphic organizers with the different topics learned but they also got close reading strategies for a reading assignment on that topic. All students completed a Claim, Evidence, and Reasoning (CER) assessment at the end of each topic. Students in the experimental group were able to use the graphic organizer on the given topic along with the close reading skills to complete the CER assessment. Whereas control group students were only given the CER and clarification to questions as per their IEP's.

Table 6 represents the scores for each assessment for students in the experimental group. Table 7 represents the scores for each assessment for each student in the control group. The data in table 6 for the experimental group shows improvement in 2 out of the 3 CER assessment for 17 out of 18 students. The data from table 7 shows 0 out of 11 students improved 2 out of 3 of the CER assessment scores compared to the original CER assessment score.

Table 6

Experimental group results for CER

Student #	Original CER	DNA Structure CER #1	DNA Replication CER #2	Mutations CER #3
1	70	65	100	85
2	75	65	65	70
3	60	55	80	75
4	70	70	95	85
5	70	70	75	75
6	60	65	0	80
7	75	70	100	85
8	50	65	55	100
9	65	55	80	85
10	75	80	85	85
11	75	80	90	55
12	85	100	90	95
13	75	80	30	90
14	65	70	65	85

Table 6 (cont.)

Student #	Original CER	DNA Structure CER #1	DNA Replication CER #2	Mutations CER #3
15	85	100	90	100
16	73	100	70	80
17	50	65	25	85
18	80	85	100	90

Table 7

Control group results for CER

Student #	Original CER	DNA Structure CER #1	DNA Replication CER #2	Mutations CER #3
20	90	100	90	90
21	90	100	90	85
22	95	95	100	90
23	90	100	90	90
24	75	75	55	95
25	90	100	90	70
26	65	65	70	65
27	90	90	65	80
28	95	90	95	95
29	70	75	70	100
30	85	90	50	90
31	65	50	85	65

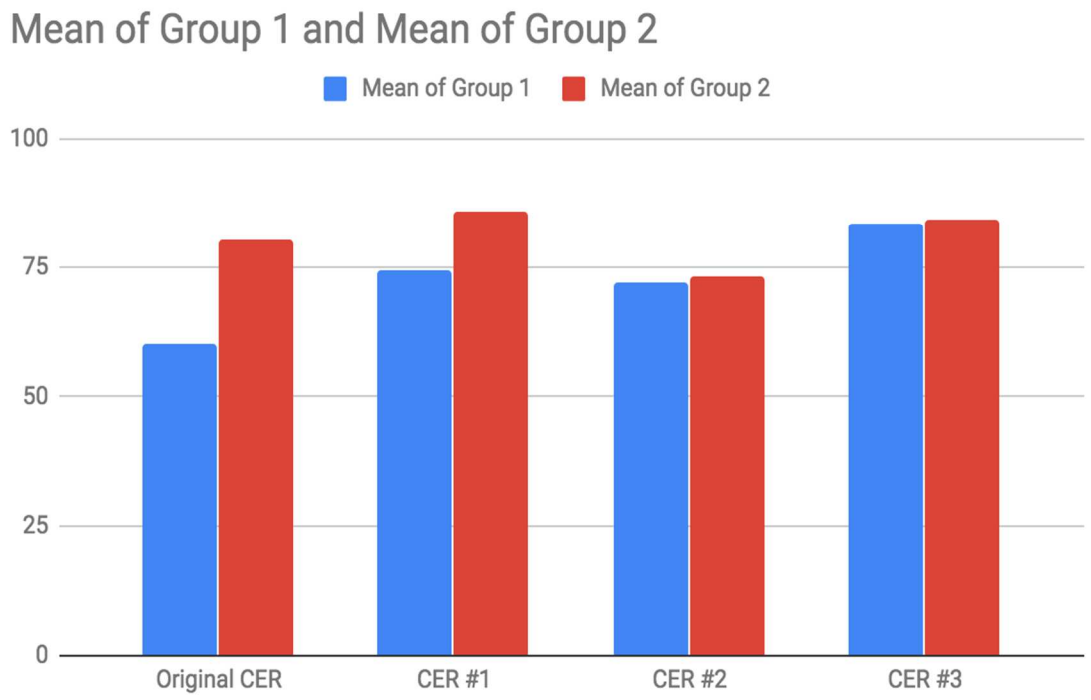

Figure 2. Mean scores for the experimental group vs control group on assessment grades

Figure 2 is able to provide data comparing the original CER to the mean of each of the following CER topics. As per figure 6 students in the experimental group were able to produce higher scores in the following CERs compared to the original. The control group means only improves a maximum of 5 points on CER# 1 where the experimental group improved by 14 points. In CER #2 the control group decreased by 7 points and the experimental group mean grade improved by 11 points. CER# 3 with the control group improved by 4 points and the experimental group improved by 13 points.

Chapter 5

Discussion

The purpose of this study was to determine if the use of literacy strategies in a content area improves a summative assessment score. Reading, writing, and oral communication are critical literacy practices for participation in a global society (Krajcik & Sutherland, 2010). The students who were the subjects of this study were in grades 9-11 in a suburban public school setting with 30 percent free and reduced lunch assistance. Most of the students have specific learning disabilities that include difficulties with reading comprehension, reading fluency, basic reading skills, and inferencing skills.

Students were compared by class scores on summative unit assessments at the end of a given unit. Two classes learned and utilized the reading strategies and two classes were not given the strategies. The overall average test scores were analyzed to determine if reading strategies in a content area such as Biology will improve scores on a summative assessment.

The first part of the study was to see if there was an increase in summative scores on assessments with the utilization of graphic organizers. The experimental group had a mean of 74.4 on quiz #1 verses the control group with a mean of 77.3. The difference between the two groups was 2.9 in favor of the control group. Quiz #2 mean for the experimental group was 78.4 verses the control group mean score of 79.2. The difference between the two groups was 0.8 in favor of the control group. The mean of assessment number three of experimental group 1 was 78.27 verses the control group mean score of 81. The difference between the two groups was 2.73 in favor of the control group. The final assessment was an end of the unit assessment given to both the experimental and

control group. The experimental group mean score was 73.7 verses the control group score of 75.7. The difference between the groups was 2 points in favor of the control group. From the data collected there is not a significant score difference to support the use of only graphic organizers to improve assessment scores.

The second part of the study was to include a close reading strategy for a reading item along with a graphic organizer to each topic learned. The following data were collected and analyzed for this study. In the original Claim, Evidence, Reasoning (CER) assessment experimental group 1 had a mean score of 60.1 while the control group of the original CER had a mean score of 80.3. When comparing the scores of the original verses assessments 1,2, and 3 there was an increase in scores for both groups. The larger increase in improvement of overall mean scores was in the experimental group. CER #1 versus the original had in experimental group one had an increase of 14.3 points while the control group increase was 5.5 points. CER #2 had an increase in 11.8 points for experimental group one verses and decrease in 6.9 points for the mean of the control group. The last CER, number 3, had an increase in the experimental group one mean by 23.6 points versus the control group having an increase of 4.2 points. The prior results are able to provide data to support the use of both graphic organizers with the addition of close reading strategies to a given topic can improve the scores on assessments.

Previous Research

Marcy Boudreaux-Johnson, Paul Mooney, and Renée E. Lastrapes (2017) looked at how the close reading strategy can benefit at fourth grade at-risk readers. Close reading is a literary practice that has been featured prominently in the promotion and implementation of the Common Core State Standards (CCSS) and the accompanying

national assessments for example Partnership for Assessment of Readiness for College and Careers and PARCC. Close reading is the careful, sustained interpretation of a brief passage of a text. The outcome of the study showed evidence that four of the six students made significant gains in their pre vs. post assessments.

In my study students who completed the close reading activity in the experimental group were able to improve their grades on the CER.

Dexter and Hughes did a meta-analysis with Park in 2011 to investigate specifically graphic organizers in the science content area since their prior meta-analysis provided evidence for increased posttest scores and carryover. Findings from their meta-analysis indicate that GOs improve the factual comprehension and vocabulary knowledge of intermediate and secondary students with LD in science. Unfortunately, in my study there were not significant differences in scores between students who did complete a graphic organizer in the experimental group and those who did not in the control group.

Students, as per the study in Dexter and Hughes of 2011, with low verbal ability gain more from GOs than students with high verbal ability; students with little or no prior knowledge in a subject gain more from GOs than students with an abundance of prior knowledge in a subject.

Limitations

Students were asked to complete a graphic organizer (GO) in the first part of this study to assist in studying and then take an assessment on the given topic. Students were guided as to how to fill out the graphic organizer and the teacher did model an example for them to follow if needed. In the end the students had to choose to complete the graphic organizer. The teacher also has to expect that the students will utilize the graphic

organizer to study for the assessment. If the student chooses not to study or use the graphic organizer to assist in studying this could have an effect on the outcome of the score of the assessment.

There was not an assessment in the beginning of the study to assess how much background knowledge each student had on a given topic. There was not a separation of groups due to the amount of past knowledge for who received the graphic organizer and who did not. The level of prior background information of each student could have had an effect of the outcome of the assessment grade.

Students in the second part of the study were given not only the graphic organizer but also a close reading strategy activity for each topic. Students in the experimental group were reminded on how to complete the activity with the close reading strategy including highlighting the reading and after discussion to re-read the information again. This is based on the assumption that the students followed through with the highlighting and re-reading. To avoid some of these limitations the teacher could have the highlighting and re-reading count as a grade. Students are more likely to complete an activity if it counts as a grade for the close reading strategies. Another way to decrease a limitation could be to give a pre-assessment. Based on the amount of background knowledge the students could be separated into the experimental and control groups.

Practical Implications

The participants in the experimental group of this study were exposed to graphic organizers and close reading strategies in conjunction with the traditional notes and inquiry activities for a given topic. Students in the experimental group had an increase in CER assessment grades greater to those in the control group with the addition of both the

graphic organizers and the close reading strategies than those in the control group on given assessments.

Close reading strategies can be used in History, Social Studies, or English classes. Teachers utilizing document based questions (DBQ's) as an assessment could use the close reading strategies on an article or document to assist students on the DBQ. In English, teachers could have students use the close reading strategies to further read into a document or section of a given chapter.

Future Studies

Future research into the topics of graphic organizers and close reading strategies could group the students differently. With the research of Dexter and Hughes (2011) making mention of how students will limited background information will have a greater impact from the GO versus the student will increased background, I would group the students based on background knowledge. Another research topic could be the reading levels of the students and how that affects the correlation between the GO and the assessment score. In this study the reading levels of students had a range from grades 1.1-7.2. Grouping students by reading level may have impacts of the effectiveness of the graphic organizer.

Conclusion

This study sought to answer the following questions: Will the use of pre-reading, during reading, and post-reading literacy strategies within the notes, labs, and class graphic organizers for a given unit improve their grade on the summative assessment at the end of the unit? Will students continue to be successful in summative assessments at the end of the unit without the use of pre-reading, during reading and post-reading

literacy strategies within the notes, labs, and class graphic organizers? The data in part one of the study was not able to support only the use of graphic organizers in increase the scores on summative assessments. However, when students used both graphic organizers and close reading strategies, student scores on summative assessments did improve. Students in the experimental group asked for a graphic organizer for the next topic that the class covered in the class after this study was concluded. Some students in the experimental group have gone as far as to request a highlighter as we read different articles during class time without prompting from the teacher. Students will be more likely to continue to use the strategies learned in Science class in other classes if the interventions are continued.

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Appendix A:

CER Rubric

	15	**10**	**5**	**0**
Claim 1	Claim specifically answers the question asked.	Claim is related to question asked, but could be more specific.	Claim is vague and/or an incomplete thought.	Claim not present
Claim 2	Claim is valid according to the evidence provided.	Claim is related to evidence but relationship could be more clear.	Claim is unrelated to evidence presented.	Claim not present
Evidence 1	Evidence is adequate to address the claim. When applicable, evidence is drawn directly from lab data.	More evidence is needed to adequately support the claim. When applicable, more lab data should be included as evidence.	Evidence is unrelated to claim or is not drawn from lab data, when applicable.	Evidence not provided
Evidence 2	Evidence is formatted appropriately. (Tables and graphs have titles, labeled axes, and units. Researched information is cited.)	Evidence format could be improved to increase clarity by including labels, titles, and citations as-appropriate.	Evidence lacks formatting needed for clarity.	Evidence not provided

Reasoning 1	Reasoning links the claim and evidence and clearly explains the logical thought process behind development of the claim.	Reasoning links the claim and evidence but could be more clearly explained or clarified.	Reasoning fails to connect the claim and evidence in a meaningful way and/or discusses a claim not supported by the evidence.	Reason not provided
Reasoning 2	Scientific concepts and vocabulary are used correctly to explain the reasoning behind the claim.	Some scientific vocabulary is included but could be more clearly defined in order to demonstrate understanding of science concepts.	Reasoning does not include reference to the science concepts behind the claim and evidence.	Reason not provided