THE IMPACT OF COMPUTER-BASED GRAPHIC ORGANIZERS WITH EMBEDDED SELF-REGULATED LEARNING STRATEGIES ON THE CONTENT AREA ARGUMENTATIVE WRITING OF TYPICAL AND STRUGGLING WRITERS

by

Andrea L. Boykin
A Dissertation
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of
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Education

Committee:

___________________________________________  Chair

___________________________________________

___________________________________________

___________________________________________  Program Director

___________________________________________  Dean, College of Education
and Human Development

Date:  ________________________________  Summer Semester 2015
George Mason University
Fairfax, VA
The Impact of Computer-Based Graphic Organizers with Embedded Self-Regulated Learning Strategies on the Content Area Argumentative Writing of Typical and Struggling Writers

A Dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at George Mason University

by

Andrea Boykin
Masters of Education, 2011
Bachelor of Arts
Old Dominion University, 2007

Director: Anna Evmenova, Assistant Professor
College of Education and Human Development

Summer Semester 2015
George Mason University
Fairfax, VA
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Dedication

For Granny, Grandparents, Uncle Toad, Mommy, Daddy, Kendra, and Ethan.

This dissertation is dedicated to my family; immediate and generations past, who are all descendants of a settlement built by freed slaves. My great-grandmother, grandparents, and great aunts and uncles, all came from very little and have taught me the values of hard work, kindness, and always doing your very best, regardless of your occupation or your circumstances, through their actions and words. This dissertation is also dedicated to the legacy of my great-great uncle, Stephen McBride, a freed slave who was unable to read or write, who developed one of the first colleges to educate newly freed African-American slaves. I also dedicate this dissertation to my mother, father, sister, nephew, and brother in law. Thank you for your love, always believing in me, always reminding me that I could accomplish anything, and providing me with the constant support to succeed.
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List of Abbreviations

Computer-Based Graphic Organizer.............................................................................. CBGO
English-Language Learners ......................................................................................... ELLs
High Incidence Disabilities............................................................................................ HID
Learning Disabilities...................................................................................................... LD
National Assessment of Educational Progress............................................................. NAEP
Self-Regulated Learning ............................................................................................... SRL
Self-Regulated Strategy Development........................................................................... SRSD
Abstract

THE IMPACT OF COMPUTER-BASED GRAPHIC ORGANIZERS WITH EMBEDDED SELF-REGULATED LEARNING STRATEGIES ON THE CONTENT AREA ARGUMENTATIVE WRITING OF TYPICAL AND STRUGGLING WRITERS

Andrea Boykin, Ph.D.

George Mason University, 2015

Dissertation Director: Dr. Anna Evmenova

This study determined the effects of a computer-based graphic organizer (CBGO) with embedded self-regulated learning (SRL) strategies on the argumentative writing performance by 4th- and 6th-grade typical and struggling writers in the science and social studies content areas. This study extended the research of the use of SRL strategies and CBGOs to support student writing about science and social studies text. This study employed mixed methods research design and included group true experimental research and qualitative methods to determine the effects of the CBGO with embedded SRL strategies as well as explore the possible explanations for these effects. Results from this study indicated that the CBGO with embedded SRL strategies positively impacted the argumentative writing of typical and struggling writers. The improvements were in the areas of holistic quality, number of transition words, and number of sentences. However, there were no statistical significant differences in number of words or accuracy across conditions. In addition, students who used the CBGO to write their argumentative
responses showed greater SRL strategy use in comparison to the control group. Students in the experimental condition were able to internalize the SRL strategies and maintain their performance when writing without the CBGO, outperforming the control group on most measures. Following instruction, students in the experimental group self-reported a greater sense of motivation to write than students in the control group. These findings add to the limited body of research on instructional strategies that support struggling writers in the content areas of science and social studies. Limitations and suggestions for future research are discussed.
Chapter One

Recent standards have placed an increased emphasis on cross-curricular writing, which encourages writing activities in content areas outside of language arts (No Child Left Behind [NCLB], 2001; National Governors Association for Best Practices and Council of Chief & State [NGA], 2010). Due to this increased emphasis on cross-curricular writing, responding to prompts in a written format is required on many state and national assessments in the writing subsections and the content areas of science and social studies (NGA, 2010). The written aspect of these assessments is used to measure a student’s writing ability and their understanding of specific topics. However, responding to questions in writing can be particularly challenging for struggling writers. Struggling writers are a group of students, which includes students with high incidence disabilities (HID), English Language Learners (ELLs), and at-risk students. These struggling writers have a greater chance of performing poorly on the written portions of standardized assessments and class activities, which could greatly impact their overall academic achievement.

Students with HID, including learning disabilities (LD), emotional and behavioral disorders, mild intellectual disabilities, and other health impairments have academic difficulties in comparison to their typically achieving peers. Specifically in writing, students with HID write fewer words and have difficulty in organization, spelling,
handwriting, grammar, and syntax in comparison to their peers without disabilities (Kulikowich, Mason, & Brown, 2007). Furthermore, students with HID also struggle with the metacognitive processes (Boudah & Weiss, 2002).

Many ELLs also face academic challenges and struggle with writing. ELLs are students whose academic achievement is impacted by their language proficiency (Sheng, Sheng & Anderson, 2011). Since these students are actively acquiring the English language while learning content in school, ELLs have difficulty acquiring content knowledge and demonstrating this knowledge in a variety of formats (Migration Policy Institute [MPI], 2014). Typically, ELLs perform lower than their native English-speaking peers in a variety of content areas because they are learning English and content simultaneously (USDOE, 2012). Specific to writing, ELLs write less fluently in comparison to their native speaking peers and typically overuse transition words and conjunctions to connect thoughts in their writing (Schleppegrell, 2004).

Students with HID and ELLs may have great difficulty in writing; however students neither diagnosed with a disability nor actively learning a second language may also have challenges in academic tasks, including the creation of written responses. At-risk populations include students who have high risk factors for school failure and may also include students with HID and ELLs. These high-risk traits include low interest, motivation, and poor academic performance, which can impact various academic outcomes, including writing. At-risk students also require long-term or temporary supports to prevent poor academic outcomes (Richardson, 2008). Since at-risk is an inclusive term that can include any group of student that exhibit risk factors for school
failure, reports on at-risk populations often include the performance of low performing students in specific groups, including students with HID and ELLs. There is limited research on the writing performance of at-risk students and the general causes of these writing challenges.

**Statement of the Problem**

Struggling writers may find writing tasks difficult; however, composing written responses from extended informational text or prompts is at the core of many writing assignments in the content areas, including science and social studies (Spivey & King, 1989). Writing in science and social studies requires students to explain, describe, or to present an argument in order to clearly express their knowledge of the content. Common writing activities in science and social studies include explanatory responses, summarization, reports, and the creation of articles. An additional and frequently required genre of writing in science and social studies is argumentative writing. Argumentative writing requires students to support a claim with substantive evidence based on topics or text (NGA, 2010). Since arguments are required to detail information and justify the results of investigations, argumentative writing is important for scientific writing and writing in the social sciences (De La Paz, 2005; Hand, Hohenshell, & Pravin, 2007).

To create argumentative responses in science and social studies, students are frequently required to read and then write about the informational text read. Reading text prior to writing supports a student’s ability to gain knowledge about the content (Berkeley & Taboda, 2014). In argumentative writing, students must develop a written
argument based on informational text or logical reasoning. These argumentative responses should contain a claim and the effective use of reasons and evidence to support the claim. Argumentative writing is required for students as young as the second grade and is a continuous standard for students from the 2nd-to 12th-grade in the Common Core and 5th- through 12th-grade on Virginia standards (NGA, 2010; VDOE, 2014). In addition, argumentative writing can be especially challenging for all students regardless of the ability level. Students typically have difficulty including appropriate evidence to support their claim in their written arguments (Bell & Linn, 2000; Kelly, Chen, & Prothero, 2000).

Although argumentative writing begins in the primary grades and is typically based on informational texts or prompts, informational texts are the least taught within the primary grades. Generally, primary teachers focus on the reading comprehension and textual elements of narrative texts and rarely incorporate strategies to support the reading or writing of informational text (Duke, 2000; Fisher & Ivey, 2005). An understanding of informational text structures is required to construct proficient written responses based on text or prompts. Although narrative texts are the focus of primary school instruction, 50% of texts on 4th-grade standardized assessments require students to answer questions, including short written responses, based on informational text or prompts. This percentage increases to 75% in the 8th-grade, which demonstrates a sharp increase in the type of text used in standardized assessments as grade levels increase (Jeong, Gaffney, & Choi, 2010; Moss, 2005).

The increased use of informational text in the upper elementary grades is often
associated with a decrease in achievement levels in content, such as science and social studies, as students transition from primary to secondary school (Bernhardt, Destino, Rodriguez, & Kamal, 1995; Chall, Jacobs, & Baldwin, 1990). This decline of performance is exemplified by results of elementary and middle school students on The National Assessment of Educational Progress (NAEP) assessment. The NAEP reports that scores in some content areas, including social studies, drastically decline from grades four to eight (USDOE, 2010). The increase in the use of informational text may play a role in the decreased student scores as grade levels increase (Chall, Jacobs, & Badwin, 1990). Students require specific instruction that targets the writing about informational texts, including science and social studies text, to perform proficiently on assessments.

However, teachers across grade levels spend limited instructional time teaching writing in the language arts and the content areas. Self-reports from teachers indicate that daily averages for teaching and writing activities are 15-minutes for teacher and 25-minutes of writing for students (Gilbert & Graham, 2010). Although teachers report spending 25-minutes daily on writing tasks, less than 15% of primary teachers assign cross-curriculum writing activities, which includes writing about science and social studies topics, daily in their classroom (Cutler & Graham, 2008; Gilbert & Graham, 2010). Most of the daily writing assignments in primary school focus on the completion of journal prompts and writing in response to materials read, not specifically related to science or social studies content (Gilbert & Graham). The discrepancy between the amount of time spent on daily writing activities, and the low percentage of teachers that report assigning cross curricular writing activities daily, indicates that teachers focus
most of their writing instruction and activities on general writing rather than content
specific writing strategies and practice. The limited emphasis on content specific writing
is not exclusive to primary grades, but also continues into middle and high school.
According to a recent national survey (Evmenova, Regan, Hughes, Chirinos, & Boykin,
in preparation) there is a statistically significant difference between writing strategies that
are taught in science and social studies in comparison to language arts. Although writing
is incorporated slightly more in language arts, there is a limited emphasis on writing
across content areas. However, the increased rigor of the updated learning standards
requires students to write in the content areas at a greater frequency. Teachers must
incorporate strategies to support student writing ability, especially struggling writers,
across content areas to prepare students to master these learning standards.

**Significance of the Problem**

Struggling writers, including students with HID, ELLs, and at-risk students are
required to compose written responses across content areas. This may be challenging due
to the cognitive deficits of students with HID and the limited English proficiency of ELLs
(Englert & Mariage, 2003). In writing tasks, students with disabilities write fewer words,
have greater grammatical errors, and write fewer complete sentences (Koutsoftas & Gray,
2005). In addition, ELLs often have difficulty writing about informational text. ELLs
typically write using personal narratives instead of utilizing textual or factual evidence
that supports the topic (Chandrasegaran, 2013). This population of students also writes
less fluently and includes less information in comparison to their non-ELL peers
(Reynolds, 2005).
Although students with HID, ELLs, and at-risk students have difficulty in writing, writing is frequently required in classroom activities and assessments. Responding to written text in the content areas is not localized to classroom activities, but is also required nationally as a component of national and state learning standards (NGA, 2010; VDOE, 2010). Specific state and national standards require writing tasks, including the creation of sentences, paragraphs, and essays, that are related to informational texts or prompts (Kulikowich, et al., 2007). The learning standards require that these writing opportunities occur across all content areas. Specifically for the area of science and social studies, the National Science Teacher Association, National Council of Social Studies, and the Common Core standards require students as young as the 3rd-grade to write informational texts. These written products include explanatory, informational, and argumentative responses, which require demonstrating their understanding of the content (Herczog, 2010; NGA, 2014; National Science Teacher Association, 2014).

The difficulty that struggling writers exhibit in writing about content read or learned may impact their performance on state assessments. Struggling writers, including students with HID, ELLs, and at-risk students, perform lower on national and state assessments in comparison to their typically achieving peers. The low performance on these assessments is exemplified by the students’ scores on the NAEP assessment. The NAEP requires students to read and comprehend informational text or prompts in writing, science, and social studies. According to NAEP, students with disabilities have lower scores on national standards in science, social studies, and writing in comparison to their peers without disabilities. For content areas, students with disabilities scored lower than
their typically achieving peers in science, 124 vs. 155, and in social studies, 134 vs. 160 (USDOE, 2010). In addition, students with disabilities also performed lower than students without disabilities on the NAEP writing assessment with an average score of 113 compared to 154 (USDOE, 2011).

In addition to students with HID, ELLs also perform lower on state assessments in comparison to their peers in science, social studies, and writing (USDOE, 2010; USDOE, 2011). On the NAEP science assessment, ELLs scored an average of 117 in comparison to non-ELLs who scored an average of 156. In social studies, ELLs also performed lower than their non-ELL peers, with an average of 186, compared to 211 (USDOE, 2010). Furthermore, in writing, the NAEP reports that ELLs also performed below their non-ELL peers. Fourth grade ELL students scored an average of 123 on the writing assessment, which is below proficiency, in comparison to non-ELLs, who scored an average of 156 (USDOE, 2011). Eighth grade ELLs also performed lower on the writing assessment, scoring 108 in comparison to non-ELL peers, who scored an average of 153 (USDOE, 2011). The differences in scores in 4th- and 8th-grade demonstrates a persistent gap between the writing abilities of ELL and non-ELL students throughout grade levels.

Dually identified students, ELL students with disabilities, performed even lower than non-ELL students without disabilities and students with disabilities that were not classified as ELLs. Dually identified students performed lower than their typically achieving, non-ELL peers in reading (151 vs. 230) and writing (114 vs. 159). In content areas, this population of students had an average score of 95 on the science assessment and 167 for social studies in comparison to non-ELLs who scored 156 in science and 211
in social studies (USDOE, 2010).

**Rationale for the Current Study**

Struggling writers, including students with HID, ELLs, and at-risk students, have difficulty writing about informational text. However, recent state and national standards require writing across content areas, including science and social studies, in which informational writing is frequently required. Although writing about content is required on state assessments, teachers of struggling writers and typically performing students spend minimal instructional time teaching writing strategies, and infrequently embed writing instruction in science and social studies. The challenges struggling writers have in writing across content areas, paired with limited instructional time for writing, may prevent students from accurately demonstrating their content knowledge on state assessments and classroom assignments. Poor performance on assessments and class activities, in which providing written responses to science and social studies content is required, may have detrimental effects on the academic performance of struggling writers.

Since struggling writers have difficulty constructing written responses, recommendations have been made based on reviews of effective writing instruction (Cutler & Graham, 2008; Graham & Herbert, 2011; Graham & Perin 2007). According to these reviews, effective writing instruction for all students should occur across content areas, incorporate specific writing strategies, and encourage process-oriented writing. Furthermore, specific product goals, graphic organizers, self-regulated learning (SRL) strategies, explicit instruction, and technology for writing can support writing across
content areas (Cutler & Graham, 2008; Graham & Herbert, 2011). Specifically, SRL strategies have the potential to improve the executive functioning of students with HID and guide the learning of ELLs, which may positively impact writing ability (Kahrizi, Farahian, & Rajabi, 2014). Additionally, several recommendations have also been made to support the writing of ELLs. Recommendations include explicit instruction, scaffolding, repeated review of concepts, and providing models for students before independent practice (August, McCardle, Shanahan, & Burns, 2014; Sengupta, 2000). These recommendations have the potential to support struggling writers, which could result in positive outcomes for writing across the content areas.

Currently, interventions that support writing of students with disabilities in language arts are validated by research (Cramer & Mason, 2014; Cuenca-Carlino & Mustain, 2013; Ennis, Jolivette, Terry, Frederick & Alberto, 2015; Evmenova, Regan, Boykin, Good, Hughes, Prickett & Sacco, in press; Mastropieri, Scruggs, Cerar, Allen-Bronaugh, & Regan, 2009; Mastropieri, Scurggs, Cerar, Allen-Bronaugh, Thompson, Guckert, & Cuena-Sanchez, 2014; Regan, Mastropieri, & Scruggs, 2005; Unzueta & Barbetta, 2012). However, limited research exists that validates writing interventions to support the writing of struggling writers in science and social studies (De La Paz, 2005; De La Paz & Felton, 2010; Hauth, Mastropieri, Scruggs, & Regan, 2013; Lee, Mahotieri, Salinas, Penfield, Maerten, & Rivera, 2009; Lee, Penfield, & Buxton, 2011). Research is needed to determine if practices that support struggling writers in language arts are effective in improving the writing outcomes of these students in science and social studies. Improving the writing outcomes of struggling writers in science and social
studies may improve their academic performance; and therefore, post-graduation outcomes.

Purpose Statement and Research Questions

Therefore, the purpose of this current study is to extend the previous research to further investigate the use of strategy instruction, SRL strategies, technology supports, and graphic organizers to improve the writing performance of elementary students. Specifically, this study will determine the effects of a computer-based graphic organizer (CBGO) with embedded SRL strategies on the argumentative writing in science and social studies of typical and struggling writers in elementary school, including students with HID, ELLs, and at-risk students. In addition, this study will explore the impact of the CBGO on the writing and SRL processes of the student participants.

Research Questions

Specific research questions in the current study include:

1. What are the effects of the CBGO with embedded SRL strategies on the holistic quality, number of transition words, number of words, and number of sentences on the argumentative writing of 4th- and 6th-grade students in the social studies content area?

   1a. Is there a statistically significant difference between the holistic quality for struggling writers receiving support from the CBGO and typically achieving writers who wrote with and without the support of the CBGO at posttest?

2. To what extent are students able to transfer the ability to construct argumentative paragraphs in social studies using the CBGO with embedded SRL strategies into a
science content area?

2a. Is there a statistically significant difference between the holistic quality for struggling writers receiving support from the CBGO and typically achieving writers who wrote with and without the support of the CBGO during application?

3. To what extent does the use of the CBGO increase comprehension of content as measured by the accuracy of the argumentative written responses?

4. To what extent are students able to maintain the SRL strategies to write argumentative paragraphs without the support of the CBGO?

4a. Is there a statistically significant difference between the holistic quality for struggling writers receiving support from the CBGO and typically achieving writers who wrote with and without the support of the CBGO during maintenance?

5. What are the effects of the CBGO and related lessons on the use of SRL strategies of struggling writers?

6. Does the use of the CBGO with embedded SRL strategies change students’ self-efficacy and motivation to write?

Definitions of Terms

At-risk-students. At-risk students are students who have high risk factors for school failure, including low interest and motivation, as well as poor academic performance. These students also require long-term or temporary supports to prevent poor academic outcomes (Richardson, 2008).

Argumentative writing. Argumentative writing is a type of writing that requires
the student to investigate a topic, collect, generate, and evaluate evidence, and establish a position on the topic.

**Content areas.** Content areas refer to grade level subjects related to science, social studies, and math in which students learn content related to the subjects standards.

**Elementary school.** Elementary school, also known as primary school, indicates a range of grades from first to sixth grade.

**Emotional and behavioral disorder.** A condition exhibiting one or more of following characteristics over a long period of time. These characteristics also affects the child’s educational performance (a) an inability to learn that cannot be explained by intellectual, sensory, or health factors (b) an inability to build or maintain satisfactory interpersonal relationships with peers and teachers (c) inappropriate types of behavior under normal circumstances (d) a general pervasive mood of unhappiness (e) a tendency to develop physical symptoms or fears associated with school (IDEA, 2004).

**English Language Learners (ELLs).** Students who are unable to communicate fluently in English and are from non-English speaking countries or homes (Sheng, Sheng & Anderson, 2011).

**High-incidence disabilities.** This term is often used to describe the students that are typically receive instruction in the general education curriculum, which includes students with learning disabilities, emotional and behavioral disorders, and mild intellectual disabilities. These students are most often identified in early childhood and are the largest subgroup of students receiving special education services (Henley, Ramsey & Algozzine, 2009).
**Learning disability.** A neurological disorder that affects the brain's ability to receive, process, store, and respond to information (National Center for Learning Disabilities, 2007).

**Self-regulated learning strategies.** SRL strategies are strategies that are guided by metacognition, strategic action, and motivation to learn (Zimmerman, 2000).
Chapter Two

This chapter presents a literature overview of struggling writers, including students with high incidence disabilities (HID), English language learners (ELLs), at-risk students, and the difficulty this population has in science, social studies, and writing. The first section will provide a brief description of struggling writers and their challenges in writing, science, and social studies. The second section will provide findings from a systematic review on the literature of writing in science and social studies, and the third section will review the literature on the impact of graphic organizers and technology on writing. The fourth section will describe the relationship between executive functioning and academic success of students with HID and ELLs, the motivation and self-efficacy of these populations, and academic interventions that support motivation, self-efficacy and executive functioning.

Struggling Writers

Struggling writers are students who have difficulty with many aspects of writing, and include any student who has a challenge in writing. Challenges that these students face in writing includes poor organization, errors in spelling, grammar, and syntax (Kulikowich, et al., 2007). Struggling writers also face poor academic outcomes, especially in classes where writing is required to determine knowledge of content, such as science, social studies, and language arts. In addition to challenges in the classroom in
primary and secondary school, struggling writers face additional challenges in the workforce. Employment frequently requires clearly written documents that include memos, reports, and electronic messages (Graham & Perin, 2007).

**General Characteristics**

Struggling writers may include students with disabilities, ELLs, and at-risk students. Each group of these students faces unique challenges that could possibly manifest in writing difficulties. Although these groups have different characteristics, each demonstrates difficulties in writing (Kulikowich, et al., 2007). Although struggling writers commonly learn in inclusive settings, they require specific interventions to support their writing ability in the classroom.

**Students with High-Incidence Disabilities (HID).** According to the National Center for Education Statistics, learners with HID, including students with emotional disturbances (ED), learning disabilities (LD), other health impairments (OHI), and mild intellectual disabilities (mild ID) comprise approximately 7.9% of the total school enrollment for students aged 3 to 21 (UDSOE, 2015). Students with HID often have academic difficulties and perform well below the standard deviation in comparison to their peers in all academic areas, including writing, science, and social studies. This lower performance in comparison to typically achieving peers is due to learning difficulties that include deficits in cognitive processes. Students with HID are often served in the general education setting and are required to access and achieve within grade level standards.

Students with HID must receive special education services to improve their
academic performance. These students can receive services in a variety of settings, which includes the general education classroom, separate classrooms, separate schools, or pull out services from the general education classroom. General education placement refers to students who receive their education in a general education classroom for approximately 80% or more of the school day. Although there are a variety of placement options, students with HID have an increased placement in general education inclusive classrooms rather than more restrictive, self-contained classrooms (Mcleskey, Landers & Williamson, & Hoppey, 2012). This percentage is increasing, with approximately 65.8% of students with disabilities served in the general education setting for more than 80% of the school day, as opposed to 33% in 1990 (Mcleskey, et al). There is also a decrease in the rate of students with HID served mostly in pull out, separate classrooms and separate schools, with decreases from 36.43% to 25.34% for separate schools and 29.62% to 22.22% for separate classrooms. Although this population is usually served in the general education setting, these students require specific supports and interventions to access the general education curriculum in these inclusive settings.

**English Language Learners (ELLs).** ELLs are a group of students whose proficiency in the English language impacts their ability to learn in English without special support. Students who did not speak English as their first language can be classified as ELLs, which could include students who were born in non-English speaking countries and students who were born in the United States in non-English speaking homes. Classification of ELLs varies from state to state; however, limited proficiency and a first language other than English are traditional classification requirements.
Although one-fifth of the United States student population may speak a language other than English, not all of these students are considered ELLs. Many students who speak two languages may be proficient in English as well as their native language (USDOE, 2015). According to recent statistics, over 150 languages are spoken by ELLs. Seventy-seven percent of the ELLs in the United States spoke Spanish as their first language, with much smaller percentages of other languages including Vietnamese, Chinese, Creole, Hindi, Korean, and German (MPI, 2015).

ELLs are the fastest growing group of elementary and middle school students in the United States (Sheng, et al., 2011). According to the National Center for Education Statistics, 9.1% of the 4.4 million students in the United States are ELLs. In addition, cities have a higher percentage of ELLs. ELLs comprise approximately 10.9% of the student populations in small cities and 16.7% of larger cities. Overall, this group of students contributes to one-seventh of the total United States student population (USDOE, 2015).

ELLs receive instruction in an inclusive setting with their non-ELL peers and may receive some pull out services that supports the learning of English. ELLs may be proficient in their native language, but continue to struggle academically in comparison to their non-ELL peers in an English based curriculum. Also, ELLs face an even greater workload in comparison to their non-ELL peers because they are learning English as they are mastering core academic content (MPI, 2015). The increased workload for ELLs may result in difficulty passing state assessments and meeting graduation requirements.

**At-risk students.** At-risk students are students who exhibit high risk factors for
school failure or school dropout. At-risk is an inclusive terms that includes many classifications of students, including students with HID, ELLs, and students in neither population who have any of the at-risk factors. At-risk students require on-going or temporary intervention to succeed academically, to prevent drop out or failure, and to increase meaningful life options after graduation (Richardson, 2008). Several high risk factors were developed to determine if a student is at risk for school failure or dropout. These risk factors include poor academic performance, especially declining grades over a period of time, lack of interest or effort in their academic work, low socioeconomic status, and limited English proficiency (Richardson).

Students with HID and ELLs are two student groups who exhibit one or more of the high risk factors for school dropout and academic failure. High risk factors of ELLs include low socioeconomic status, limited English proficiency, and poor academic performance (Sheng, et al., 2011). ELLs have a 15 to 20% higher dropout rate and lower achievement in comparison to their non-ELL peers (Alfredo & Ortiz, 2002). Students with HID usually have more than one high risk factor for dropout and academic failure. This population has lower academic performance and effort in their academics in comparison to their typically achieving peers. These at-risk factors of students with HID has resulted in a school dropout rate that is twice the rate of their typically achieving peers (Thurlow, Sinclair, & Johnson, 2002).

**Content Learning**

Struggling writers, including students with HID, ELLs, and at-risk students, have difficulty in reading, writing, and the acquisition and understanding of science and social
Deficits in cognitive processes as well as low motivation may cause students with HID to struggle academically; whereas for ELLs, lack of proficiency in the English language can cause difficulty in accessing and succeeding within the curriculum. However, reading and writing are often essential parts of the general education curriculum, including classes in the core content areas such as science and social studies. Students with HID and ELLs that are placed in these inclusive classrooms must participate in all subjects, including science and social studies, and access and achieve within these grade level standards.

When science or social studies is taught in general education classrooms, all students, including struggling writers, access the content through lectures or text-based materials such as textbooks and worksheets (Berkeley, Scruggs, & Mastropieri, 2010). Due to poor reading skills of students with HID and the limited English proficiency of ELLs, these students often have difficulty accessing grade level text in the inclusive curriculum. Additionally, as students begin to transition from elementary into middle school, the demands upon reading and comprehension becomes even greater, especially in core content areas of social studies and science. This may be challenging for students with HID and ELLs as they may lack the decoding and vocabulary skills to read and understand text within the content areas, as well as ELLs who have difficulty with science and social studies vocabulary (Brown, 2007).

Students with disabilities often struggle in the content areas due to cognitive deficits. Many students with HID in upper elementary school may find content area text especially challenging to read, which directly effects student comprehension because of
the increasing difference between independent reading level and grade level content in addition to poor decoding skills (Fenty & Barnett, 2013). In addition, science and social studies concepts in school textbooks are often inappropriate and do not match what the student can learn at his or her grade level (Berkeley, King-Sears, Hott, & Bradley-Black, 2014). Due to these students’ challenges, the requirement of accessing grade level curriculum, and the difficulty of content in textbooks, students in special education accessing grade level curriculum require supports to access and succeed within the curriculum.

In addition, longitudinal studies have noted that ELLs have poorer literacy skills, including reading and writing, in comparison to their native speaking peers (Jackson, Schatschneider, & Leacox, 2014). The deficit in literacy skills is prevalent in language arts, as well as in the content areas of science and social studies. One of the main factors in the poor academic achievement for ELLs is the lack of technical vocabulary that these students have within the content areas (Brown, 2007). Technical vocabulary is the key vocabulary that is found within the content area that is essential for understanding content. Since ELLs are not proficient in their second language, they do not have as many opportunities to engage in discussions rich with technical vocabulary in the classroom. In addition, ELLs do not have as many opportunities to hear or use the technical vocabulary in their homes, as their families typically speak their first language. For ELLs, learning this vocabulary is difficult when reading content area text, since technical vocabulary is usually embedded within linguistically complex sentences (Brown, 2007). Problems that struggling writers may have with accessing and
succeeding in grade level content in science and social studies is expounded due to complicated technical vocabulary, linguistically complex sentences, concepts that are difficulty to understand, and texts that are written above the students grade level.

Regardless of the difficulties in science and social studies, students are expected to understand and demonstrate this understanding in various formats, which includes written responses. Students with HID, ELLs, and at-risk students, who may struggle in understanding these concepts, may also have difficulty demonstrating their understanding in a written format.

**Writing**

In addition to curriculum that is centered on text based material in science and social studies, struggling writers are also required to participate in various writing activities in these content areas. Students often read textbooks and other classroom materials and synthesize this information orally or in writing in their core academic classes and state assessments (Graham & Herbert, 2011). Composing written responses based on content or text may be challenging for students with HID because of underlying cognitive deficits, and difficulties in writing. ELLs also have difficulties writing about content due to limited proficiency in their second language.

**Productivity.** Several research studies have attempted to determine the writing characteristics of struggling writers, including students with HID and ELLs in comparison to typically achieving peers. According to research, students with HID produce less words than their typically performing peers in various types of writing, including narrative and expository. Narrative writing is the writing of stories and
expository writing is based on information. Writing productivity is typically counted as the total number of words in the produced text. In a study by Mackie and Dockrell (2004), the researchers compared the narrative writing of students with specific language impairment (SLI) and typical students. The study found that students with SLI produced fewer words in comparison to the typically achieving, chronologically matched peers. Similar results were found in a comparison study (Scott & Windsor, 2000), in which the narrative and expository writing of students with LD were compared to typical students of the same age. Results from this study indicated that students with LD produced fewer words in comparison to their peers without disabilities of the same age. Although students in the LD group produced fewer words in comparison to the typically achieving group, both LD and typical students wrote fewer words in expository texts as compared to the narrative texts.

Also, ELLs produced fewer words in comparison to their non-ELL peers. In a comparison study that analyzed the number of words written by ELL and non-ELLs on a curriculum based writing measure, the results indicated that there was a significant difference between the number of words written by ELLs in comparison to their non-ELL peers (Espin, Wallace, Campbell, Lembeke, Long, & Ticha, 2008). The results indicated that ELLs produced fewer words in comparison to their peers.

**Ideas and content.** In content area classes, including science and social studies, writing activities are typically assigned to assess students’ understanding of the topic. Ideas and content in writing become crucial in demonstrating understanding. However, students with HID often have difficulty generating ideas and adding content. The
difficulty in generating ideas may cause written responses to be incomplete. This may result in responses that do not thoroughly answer the writing prompt, which impacts the students’ ability to fully communicate their understanding of the topic in writing. Reflecting generated ideas is difficulty for both students with HID and ELLs. In a study conducted by Kousoftas and Gray (2012), students wrote both narrative and expository texts. The researchers coded the student texts and assigned a score of 1 to 6 for ideas and content. Results from the study indicated that students with LD had fewer ideas and weaker content in comparison to the typically achieving peers of the same age. This study also found that ideas and content were improved as the more words were written for typically achieving students and students with HID. In addition to students with HID, ELLs also demonstrate difficulty in writing their ideas in response to a topic to demonstrate understanding. In a qualitative study, ELLs used a think aloud protocol to talk through their process of writing an expository essay (Beck, Llosa & Frederick, 2013). Many of the ELLs included in the study stated that they did not know what to write about and did not have any ideas for their writing.

**Organization.** Organization can also be challenging for struggling writers. Results from the Kousoftas and Gray study indicated that students with LD have less organization in their narrative and expository writing in comparison to their typical peers (Kousoftas & Gray). ELLs also have difficulty with organization (Lee, et al., 2009). According to a research study, ELLs create written responses with less organizations in comparison to their non-ELL peers. In a comparison study conducted with adolescent students in science writing, the organization of written science responses by ELLs were
compared to non-ELLs at pre and post intervention. A rubric was developed by the researchers to evaluate writing form elements, including organization, style, voice, and writing conventions. Prior to the intervention, ELLs wrote responses with less organization in comparison to non-ELLs.

**Spelling accuracy.** Spelling can also be a challenge for struggling writers, including students with HID, ELLs, and at-risk students. According to research, students with HID produce more spelling errors than students of the same chronological age (Apel, Masterson, & Hart, 2004; Masterson & Crede, 1999). Also, research has also indicated that ELLs produce more spelling errors in comparison to their non-ELL peers (Morris, 2001; Raynolds, Uhry, & Brunner, 2013). In a research study conducted with ELLs in kindergarteners, the researchers analyzed the number of spelling mistakes to determine if the students’ first language influenced the spelling of English words (Raynolds, et al., 2013). Results from the study indicated that ELLs made more spelling mistakes when constructing words with long vowel sounds. An additional study, conducted with 5th-grade students, demonstrated that ELLs had increased spelling accuracy when writing content words, such as technical vocabulary, rather than functional words such as how, is, or what (Morris, 2001).

**Writing in Science and Social Studies**

Writing in science and social studies is assigned to students in primary and secondary grade levels. In science and social studies, students write about information read or learned in class. These writing activities in science and social studies are used to assess the students’ comprehension of the information and increase understanding of the
topic. In science and social studies, students may encounter a variety of writing activities, which may involve creating a written response based on a prompt, journal reflections, written lab reports, or developing multiple paragraph essays. The focus of writing in science and social studies is expressing understanding of the content, and not spelling or mechanics. However, technical errors in writing may impact the ability for others to proficiently understand the students’ response. For this reason, writing interventions in science and social studies aim to improve the overall organization and content of the written response for students to demonstrate their understanding of the content (Cervetti, Barber, Dorph, Pearson, & Goldeschmidt, 2012; De La Paz, 2005; De La Paz, Felton, Monte-Sano, Croninger, Jackson, Desgracias, & Hoffman, 2014; Schuh & Farrell, 2006). Well-constructed written responses in science and social studies reflect the students’ concrete knowledge of the topic and improves scientific and social science reasoning.

Systematic Review

A comprehensive literature search was conducted to explore the types of writing interventions that occur in science in social studies for typically achieving and struggling writers. Electronic databases included EBSCO, ERIC, PsychINFO and Education Abstracts were searched. Two general searches were conducted to locate all science and social studies writing interventions. For the general searches, the terms science, writing; and social studies, writing, were used. Additional searches were conducted to ensure that studies for science and social studies for elementary and middle school students were located. The search terms included science, writing, primary; science, writing,
elementary; science, writing, middle school; social studies writing, primary; social studies, writing, elementary; and social studies, writing, middle school, were used.

Additional key words related to the subjects of science and social studies were also used. These terms included geography, history, civics, and health, chemistry, biology, earth science, and physics. The literature search included all students, including students with and without disabilities, in kindergarten through 12th-grade. Studies were included in the review if they (a) used an experimental or quasi experimental design (b) were science or social studies writing activities (c) included measures for writing and (d) included data for the writing measures. Studies were excluded from the literature review if they (a) were not an experimental or quasi-experimental design, (b) if there was no instruction for student writing, and (c) if the participants were in post-secondary education, including college, technical, or trade school. Studies were also excluded when only the experimental group had a writing task and if the measures included reading comprehension and not writing. There was no limit on the publication years for the search. The electronic search for writing interventions in science and social studies with writing measures for students with and without disabilities resulted in a total of 23 studies published in the years 1984 to 2014.

**Writing Activities and Interventions in Science and Social Studies**

Writing interventions have been implemented for students with and without disabilities in the core content areas of science and social studies. These interventions were developed to support various writing tasks including explanatory written responses, summarization, journal writing, the creation of wikis, persuasive written responses, and
written arguments. In both science and social studies, the interventions included graphic organizers, self-regulatory strategies, strategy instruction, reasoning instruction, and reading as a way to improve writing.

**Explanatory responses.** Explanatory responses are written products in which students attempt to explain concepts in science or social studies. Explanatory responses are typically guided by prompts and require students to answer the prompt in writing. Interventions that support students’ ability to create explanatory responses occurred in nine writing studies located in both science and social studies.

In a research study conducted by Schuh & Farrell (2006), the researchers investigated the impact of digital resources on the scientific explanations of typically achieving primary students. The research study included 56 participants, which included 5th- and 6th-grade students during a science instructional block. Students in the experimental group read digital resources from the Internet, while the control group read paper resources. Both groups composed written explanatory responses after reading the digital resources. The researchers found that although the students who read text on the Internet were more interested in the writing task, there was no difference between the Internet group and the paper text group on the holistic quality of the written explanations.

Reading of texts was also a component of a writing intervention that included eight typically achieving students in the 11th-grade. The participants wrote explanation essays after reading science and social studies texts (Newell & Winograd, 1989). The students read one passage from science and social studies text and then responded in writing to a prompt. The researchers found that reading science texts to gain previous
knowledge helped to increase number of words written in the experimental group. Therefore, previous knowledge gained through reading may improve overall writing quality.

Explanatory responses were also an aspect of an intervention conducted to improve the science writing of high school chemistry students. Researchers determined the impact of multimodal representation on the explanatory writing of 165 students, including students in the 10th- through 12th-grade (McDermott & Hand, 2013). During the intervention, writing prompts related to science topics were selected by the classroom teachers. Students responded to these writing prompts and embedded multiple modes of representing the science topic, including drawings and diagrams, into their writing. Students received feedback from peers and an evaluation from their teachers on their written responses. Students also used a checklist to self-evaluate their writing for elements of representing the content in multiple modes. In the control group, students received traditional instruction. Post-test writing measures indicated that students in the experimental group outperformed the control in text production in both the first experimental group \((M = 10.44, SD = 1.01 \text{ vs } 9.91, SD = .92)\) and in the second experimental group \((M = 9.98, SD = 1.35 \text{ vs. } M = 9.25, SD = 1.48)\). Students in the experimental group also outperformed students in the control group on the end of unit assessment of science concepts.

Explanation responses were also measured in an intervention study (Cervetti et al., 2012) with 4th-grade typically achieving students in a total of 94 classrooms. A science literacy intervention that focused on light and energy was conducted with the
participants. In the experimental group, the students completed hands-on experiments and wrote explanatory responses after the task. The students’ ability to construct explanatory responses were supported by the reading of text, creation of notes based on the text read, and discussion of key concepts. Posttest explanatory samples of the written responses indicated that the intervention had a positive impact on the quality of scientific writing of the 4th-grade students. After the intervention, students included more evidence and the responses were written with greater clarity. In addition, the post-test responses included a greater frequency of introductions and demonstrated greater understanding of science concepts. There were no improvements on vocabulary or use of conclusions.

Explanatory writing can also be improved by student engagement activities prior to writing (Hand, Hohenshell, & Prain, 2004). In an intervention developed to improve explanatory writing of 87 students, which included 10th-grade students in biology, students participated in planning or delayed planning activities to support their writing about DNA in their biology class. In the planning group, students planned before writing the first draft. In the delayed planning group, students wrote their first draft and then planned how to write their final draft. Results from the study indicated that planning was effective in increasing the writing quality and content by the students in both planning and delayed planning groups. There was no difference in quality and content between both the planning and delayed planning groups.

Planning was also effective in improving the explanatory writing of typically achieving students. However, additional supports may be needed for struggling writers, including students with disabilities. In a study by Guzel-Omen (2006), the researcher
determined the efficacy of explicit writing instruction on the explanatory writing of struggling writers in both science and social studies. In this explanatory writing intervention, four students in the 10th-11th-grade with mild intellectual abilities received a cognitive strategy instruction (CSIW) intervention, which was modified with components of the self-regulated strategy development (SRSD). SRSD is a six stage instructional strategy that teaches the writing process and SRL strategies to students. This modified version focused on CSIW for the writing process with an emphasis on think aloud strategies and modeling. The students wrote problem and solution essays based on science and social studies textbook passages. The passages were re-written in a problem solution format to provide students with the background knowledge to answer the prompts. After the intervention, students included more text elements, had increased planning time, and had improved holistic quality of their explanatory responses. Each participant demonstrated 100% PND on each writing measure. Thus, the results of this study indicated that explicit instruction can have positive effects on the explanatory writing of students with disabilities in science and social studies.

SRSD was also found to be effective in increasing the explanatory writing quality of students with disabilities in 6th-grade. In an intervention student conducted with typically achieving students and students with disabilities (Benedek, Wood, Mason, Wood, Hoffman, & McGuire, 2014), 78 students wrote informational essays about a science topic that they were currently learning in their classes with support of SRSD. During SRSD instruction, the teacher introduced the concept of informational writing to the students, modeled the strategy, and provided guided and independent practice. The
SRSD instruction was supplemented by the POW + TIDE mnemonics that students learned to support the structure their written responses. The letters of the mnemonic represented Plan, Organizer, Write and Topic Sentence, Important Details, Elaborate, and Ending Sentence. Several aspects of explanatory writing were improved, including organization, content knowledge, transition words, and number of words.

Two interventions were also developed to support the explanatory writing ability of additional populations that may have difficulties writing, including ELLs. In an intervention developed to support the explanatory writing of one hundred and ninety-one 3rd- through 6th-grade ELLs and non-ELLS, students engaged in a content literacy unit during science instruction (Shaw, Lyon, Stoddart, Mosqueda, & Menon, 2014). The intervention focused on the teaching and implementation of an inquiry based science unit on habitats. The students engaged in science literacy based activities, including reading and writing about the topic. At the end of the intervention, the students responded to prompts, which required the students to explain terrarium habitats in writing. At posttest, the students had an increase in clarity, arguments, and vocabulary use.

Reading instruction was also beneficial to the content writing of students in elementary school. In a research study conducted with 2,020 students in the 3rd- through 5th-grade across 17 schools, the students received a science literacy intervention, which had a positive impact on their quality of their explanatory writing (Lee, et al., 2009; Lee, et al., 2011). The student population included ELLs and students with disabilities. The control group schools received traditional instruction. In the experimental intervention, the students were taught how to read informational science texts and participated in
writing activities in which they responded to writing prompts. In this study, there was also an emphasis on key vocabulary, repetition of this key vocabulary, and pictorial representations of science concepts. The study resulted in increased content accuracy and organization of the student writing in response to science prompts.

**Summarization.** Summarization is an activity in which students summarize concepts learned in writing. Summarization was found in two writing interventions that required students to write about science or social studies topics. In a research study by Reynolds and Perin (2009) the researchers determined the effectiveness of explicit strategy instruction on the summarization of social studies content by 121 students in the 7th-grade in the general education classroom. Students in the experimental group read a series of essays in social studies and learned explicit strategies that supported the summarization activities. The instruction focused on setting goals and using the mnemonic PLAN and WRITE to create the written responses. The mnemonic PLAN represented the pre-writing process of Paying attention to the prompt, Listing your ideas, Adding supporting details, Numbering your ideas. WRITE represented the process of Working from your plan to develop a thesis statement, Remembering your goals, Including transition words, Trying to use different kinds of sentences, and Using exciting words. Students in the control group also had an explicit strategy instruction, but this instruction only focused on the structure of text. Specifically, students in the control group used a graphic organizer to structure text and received explicit instruction how to structure text through a series of lessons and activities. In addition, there was a neutral literacy control group, in which students did not receive any explicit instruction, but read
the same passages as the experimental and control groups and then completed writing activities. The results from the study indicated that both explicit instruction interventions increased the holistic quality of the summarization text produced by the students in comparison to a neutral literacy control group. Holistic writing scores for the PLAN and WRITE group as compared to the text structure group and the neutral literacy group were 9.76 ($SD = 1.69$), 8.98 ($SD = 1.66$), and 7.79 ($SD = 2.11$), respectively, indicating that explicit strategy instruction can be an effective strategy for students in the general education curriculum.

Text structure instruction was used to improve the summarization writing of 7th-grade typically achieving students in social studies (Taylor & Beach, 1984). Students in the experimental group learned how to summarize social studies text from passages from a social studies textbook. During posttest, students wrote a summary of social studies text. Students in the experimental group had an increase in quality of their summarization in comparison to students in the control group who did not receive instruction and a control group that received instruction in answering social studies questions.

**Journal writing.** Journal writing is a form of writing where students are able to write about a topic and are not restricted by the style or format of the written response. Journal writing was found in one of the writing intervention studies located (Wilson, Trainin, Laughridge, Brooks, & Wickless, 2011). The researchers determined the impact of observing live animals in the classroom on the journal writing of four hundred and ninety-six 1st-grade students, in comparison to a control who received traditional
instruction. In this research study, the researcher placed small, live, zoo animals in the classroom for students to observe, which included millipedes, guinea pigs, and hedgehogs. The researchers did not provide any instruction on writing informational text. Students observed the animals and recorded their observation on a recording sheet and then wrote informational texts about the animals in their journal responses. Results from the research study indicated that students in the observation group wrote longer, more cohesive texts in comparison to students who learned about the animals with traditional, lesson and text based instruction.

**Wikis.** Wikis are collaborative, electronic, writing environments in which students can write, comment, and alter their work as well as the work of their peers. In the search for writing interventions in science and social studies, wikis were found in one writing intervention. In an intervention study conducted with 119 students in the 5th- and 6th-grade, the students wrote in collaborative wiki environments for three months (Woo, Chu, & Li, 2013). In developing the wiki articles, students wrote science and social studies content including pollution, school hygiene, and a biography of a famous person. Peers were able to embed comments throughout the wiki articles. Students were able to respond to the feedback within the comments. Results from the study indicated that students revised their work based on the feedback provided in the wiki. However, data was not reported to indicate if the holistic quality of the articles were increased by the revisions.

**Persuasive.** Persuasive writing is a type of writing in which students persuade a reader of their opinion of a topic. SRSD was used to support the persuasive writing for
students with EBD in the social studies content area (Hauth, et al., 2013). In this single subject research study, eight students in the 8th-grade received SRSD instruction after six weeks of social studies instruction. During the six weeks of social studies instruction, students learned the responsibilities of citizenship. The writing prompts during instruction were embedded within the civics content. The SRSD intervention focused on planning and writing using the POW + TREE strategy; Plan, Organize, and Write, and then identify Topic, Reasons, Explanation, and Ending. After the intervention, the participants increased in the number of words, essay parts, strategy knowledge, and holistic quality of the essays demonstrating 100% PND on all measures.

**Argumentative writing.** Argumentative writing is a specific type of writing that was found in the writing interventions in both science and social studies. Argumentative writing is relevant for answering prompts in science and social studies, as it requires the use of a claim and evidence to support that claim. Argumentative writing with writing measures were found in 10 studies located in the electronic search and were in the content areas of both science and social studies (Table 1).

**Argumentative writing in social studies.** Argumentative writing occurred in four writing studies in the content area of social studies. These writing interventions took place with middle and high school students with a variety of writing levels, including low to high performing writers. The interventions to improve argumentative writing in social studies included SRSD, graphic organizers, reading text to improve writing, and reading strategies.
Table 1

**Argumentative Writing Interventions in Science and Social Studies**

<table>
<thead>
<tr>
<th>Study</th>
<th>Grade</th>
<th>Participants</th>
<th>Subject Area</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>De La Paz, 2005</td>
<td>8th</td>
<td>Typical and LD</td>
<td>Social Studies</td>
<td>Historical Reasoning and Argumentative Writing</td>
</tr>
<tr>
<td>De La Paz &amp; Felton, 2010</td>
<td>11th</td>
<td>Typical</td>
<td>Social Studies</td>
<td>Historical Reasoning and Argumentative Writing</td>
</tr>
<tr>
<td>De La Paz, et al., 2014</td>
<td>8th</td>
<td>Typical and LD</td>
<td>Social Studies</td>
<td>Historical Reasoning and Argumentative Writing</td>
</tr>
<tr>
<td>de Smet, et al., 2011</td>
<td>10th</td>
<td>Typical</td>
<td>Social Studies</td>
<td>Electronic Outlining</td>
</tr>
<tr>
<td>Joenghee, 2011</td>
<td>8th</td>
<td>Typical</td>
<td>Science</td>
<td>Science Writing Heuristic</td>
</tr>
<tr>
<td>Ponce, et al., 2013</td>
<td>4th-8th</td>
<td>Typical</td>
<td>Social Studies</td>
<td>Graphic Organizer</td>
</tr>
<tr>
<td>Monte-Sano, 2011</td>
<td>11th</td>
<td>Typical</td>
<td>Social Studies</td>
<td>Historical Reasoning</td>
</tr>
<tr>
<td>McNeill, 2011</td>
<td>5th</td>
<td>Typical</td>
<td>Science</td>
<td>Reading and writing instruction</td>
</tr>
</tbody>
</table>
In a writing intervention conducted by De la Paz (2005), the researcher determined the effectiveness on a historical reasoning strategy combined with writing instruction on the argumentative writing of students as compared to typical instruction. This intervention occurred with seventy 8th-graders, which included talented writers, typical students, and students receiving special education services. Students were placed in either the combined writing instruction and historical reasoning group, or a control group, which received traditional instruction. During the historical reasoning instruction, the students learned how to analyze primary documents, consider the author, compare details, and make notes. Students also learned to apply the writing mnemonic STOP and DARE as a reminder of the steps that should be taken to develop the argument, and the parts that should be included in their argumentative responses. STOP and DARE represents: Suspend judgment; Take a side; Organize ideas; Plan; and Develop a topic sentence; Add supporting details; Reject an argument from another side; and End with a conclusion. The duration of the historical reasoning instruction was 12 days and the writing instruction was 10 days. The historical reasoning group outperformed the traditional instruction group in the measures of length ($M = 339.8$, $SD = 87.6$ vs. $M =$
persuasiveness ($M = 4.1, SD = 1.4$ vs. $M = 0.8, SD = 0.2$), arguments ($M = 1.4, SD = 0.4$ vs. $M = 0.8, SD = 0.5$), and accuracy ($M = 3.9; SD = 0.7$ vs. $M = 3.4, SD = 0.8$).

This study was extended by De La Paz and Felton (2010) to include one hundred and sixty 11th-grade students with low to high ability levels, and the inclusion of SRSD instruction. The SRSD lessons consisted of six stages that (a) activated background or content knowledge (b) discussed the strategy (c) modeled the strategy (d) encouraged students memorizing the strategy (e) supported of the strategy by the teacher and (f) provided independent practice of the strategy. In the intervention, students were taught how to analyze historical documents through a series of historical argument lessons. Students learned to consider the author of the source, understand the source, critique the source, and create a more focused understanding of the source. Their performance was compared to a group who received traditional text and lecture based instruction. Students in the experimental group showed increases in length, 327.86 ($SD = 101.38$) as compared to the control group who had a mean score of 281.57 ($SD = 123.17$). In addition, there was a greater probability of the high scores of holistic quality found within the experimental group, with a greater possibility of low quality essays to be found in the control. Researchers stated that explicit strategy instruction can help support the writing of students with low to high writing abilities, and the quality of writing can increase the understanding of the content.

In a more recent study, De La Paz and researchers continued to investigate the impact of interventions on written historical arguments (2014). In this research study
conducted with 1,330 students of mixed ability levels in the 8th-grade, including students with disabilities, low performing readers writers, and typically achieving students, students engaged in a reading and writing curriculum based on United States History standards. During instruction over a course of 18 days, the students conducted six historical investigations, and completed reading and writing activities in each content section. For each topic, the students read and annotated two primary source historical documents, discussed the topic, and then developed written arguments about the topic. To guide the students in the development of the arguments, the students viewed sample arguments and were guided to pay attention to the text structure of the arguments, which included the introduction, evidence, and conclusions. The students compared and contrasted the sample essays and brainstormed how to improve the samples. The researchers also guided students through the planning of their essays, by instructing students to read the prompt and take notes that included their reason and evidence to support their reason. These notes were then converted into an argumentative response.

There was no data collected on the instruction of the control group; however, teachers in the school district were expected to embed reading and writing instruction and the use of primary sources in their social studies instruction. The results from the study indicated that students in the experimental group had an increase in arguments and essay length, but not holistic quality. Effect sizes for arguments, essay length, and holistic quality for students in classrooms with high fidelity was .648, .602, and -0.076, respectively. For students in classrooms with low fidelity, effect sizes were .322 for arguments, .441 essay length, and -0.249 for holistic quality. Therefore, improvements in the use of claims and
evidence in the essays and essay length were not sufficient to impact the overall quality of the students’ writing.

Reading text with specific strategies can also impact the writing quality of students with various abilities and needs. In an observational study, the teacher provided instruction to 15 typically achieving 11th-grade students on reading historical documents (Monte-Sano, 2011). During the duration of the study, students read historical texts and produced a total of 13 argumentative writing prompts. The students did not receive explicit writing instruction. Rather, the students read historical documents, annotated the text, and then created argumentative response based on writing prompts. After each of the 13 writing assignments, the instructor gave written feedback to the student regarding the arguments and use of evidence. The researchers found that the reading of multiple historical texts over a period of time increased the students’ ability to develop arguments in writing at posttest. Although the results were positive, there was no control group included in this study and means and standard deviations for writing quality were not reported.

Graphic organizers have also been found to be beneficial in the development of arguments in social studies. In an intervention study that determined the impact on graphic organizers on the argumentative writing of 2,468 students in the 4th- through 8th-grade (Ponce, Mayer & Lopez, 2013), students read digital texts to gain background knowledge on texts and then used computer-based graphic organizers to plan essays. The students planned and wrote argumentative paragraphs in various content areas. The graphic organizers were used to brainstorm, organizer, and plan the written text. The
results indicated that students who used the graphic organizer for pre-writing increased their holistic quality of writing in comparison to a control group who had traditional language arts instruction, although means and standard deviations were not reported for experimental and control groups.

Organization was also an element of a writing intervention that examined the impact of digital outlining on the argumentative writing of ninety-three 10th-grade typically achieving students in social studies (de Smet, Broekkampt, Brand-Gruwel, & Kirschner, 2011). In the intervention, students in the experimental group wrote argumentative science essays with the support of an electronic outlining tool. Their performance was compared to the control group who wrote without the support of the outlining tool. The outlining tool used in this study was the outline view found in Microsoft Word 2007. The tool enabled students to visualize the hierarchal structure of their text. In this study, the students wrote argumentative texts about controversial social studies topics, including a politician and health care. Students in the experimental group received a 10-minute training on how to use the outlining tool without any additional instruction on developing an argument. Following the brief training, the students engaged in a five-minute practice session in which they described their homes. The control group did not receive any instruction or training. At posttest, both groups constructed argumentative essays about the social studies topics. Students who wrote with the electronic outlining tool improved in the organization of the paragraph, including argumentative structure. However, there were no effects for the elaboration of arguments. The researchers hypothesize that there was no effect on the elaboration of
arguments because no direct instruction was provided in developing arguments.

**Argumentative writing in science.** Argumentation is also an important aspect of science writing. Arguments in science require the use of evidence to support the scientific claim. In science, students develop written arguments for scientific topics or write arguments during lab activities. Argumentative writing in science was found in three of the studies located in the electronic search.

The science writing heuristic (SWH) is an argument based inquiry approach that focuses on increased learning of science concepts through oral and written communication during laboratory activities. Although SWH is used in many studies to determine the argumentation of student writing, many of these studies focused on the relationship between argumentation and student performance, or were analyzing change of argumentation over a period of time without an intervention. Only one SWH intervention study focused on the change of student argumentative writing. The science writing heuristic was used to support the summarization writing, which included arguments, of 345 typically achieving 8th-grade students at three school sites (Nam, Choi & Hand, 2011). In this intervention study, the teachers provided students about a discrepant event to engage students in the task, and then the students conducted a laboratory activity about the discrepant event. The teacher guided the students through the activity by asking guiding questions. The students received a writing template during the laboratory activities that contained sections for students to generate the question that they wanted to answer during the laboratory activities, interpretation of data, and developing a reflection on the results. In the control group, the students completed a
traditional laboratory activity in which students collected data, summarized the data, and created a discussion. Differences between the experimental and control group were significant, with the students in the experimental group performing higher for holistic quality, which included argumentation, big idea, and science concept in their responses, $M = 21.14, SD = 11.81$ vs. $M = 14.34, SD = 10.66$, in the first school site. In the second location of the study, the students had a mean holistic quality score of $M = 28.49, SD = 14.42$ for the experimental group and $M = 20.12, SD = 11.75$ for the control group.

Argumentative writing in science was also analyzed in a one group, pre-post, intervention study conducted by Sampson and researchers (2013). In this intervention study, the argumentative writing by two hundred and ninety-four 7th- through 10th-grade students was guided through a series of laboratory activities structured by the Argument-Driven-Inquiry (ADI) instructional model. During the ADI instruction, the students first identified their research question based on the laboratory activity and then identified the task for solving the research question. Next, the students worked in groups to design and implement the method to collect the data. After the students developed the method to collect the data, the students completed their laboratory activity, analyzed their data, and developed an argument with a claim and evidence. The students then shared their argument with their peers and received critique of their argument by their peers. Lastly, the students created a written argument of their scientific investigation, received a blind, peer review of their argument, and then revised their argument based on the review. The teacher ended the session by leading a discussion group with the students about what they learned during the investigation. Posttest writing assessment required students to create a
written argument based on a prompt containing background information. The prompts were scored by a 28-point rubric that assigned scores for content are the argument, complexity of the argument, and mechanics. The effect sizes of the intervention on holistic writing quality of the written arguments was .78 in the life sciences group, .76 in physical science, .91 for biology, and .69 in chemistry.

An intervention to support argumentative writing was also used in design-based research study with thirty-three 5th-grade ELLs and non-ELLs (McNeill, 2011). During the intervention, the researchers developed seven lessons to teach argumentative writing. In six of the lessons, the students wrote scientific arguments based the scientific investigation conducted during the lesson. In addition, during one of the seven lesson, the students did not complete a scientific investigation or write an argument, but rather selected the best claim and evidence out of a list of choices. The students’ writing was assessed during each lesson. Through the course of the semester, the argumentative writing of the students fluctuated. During the end of the year assessment, the percentage of students who included arguments in their writing increased from 28% to 83%.

Although this study analyzed the level of argumentation, the study did not include pretest measures of student writing prior to the teaching of argumentative essays to students.

**Writing to learn.** In the comprehensive search, most of the writing studies located in science and social studies did not include writing measures, but rather included writing activities to improve the students’ comprehension (Hand et al., 2007; Hayes, 1987; Langer & Applebee, 1997; Newell & Winograd, 1995; Nevell & Searls, 1985; Taylor & Beach, 1984; Wong, Kuperis, Jamieson, Keller, & Cull-Hewitt, 2002).
Although these studies required students to write, the focus of these studies was the impact of writing on student learning and thinking. These types of activities are typically referred to as writing to learn. Since reading and writing, for most stages in student’s development, are interrelated processes that develop in an interacting way, research has hypothesized that specific writing activities may increase students’ reading and comprehension abilities (Berninger, Abbott, Abbott, Graham, & Richards, 2002). Because of the interrelationship between reading and writing, teachers often use various language processes during instruction, such as responding to oral questions for comprehension and requiring students to construct written responses.

Recently, a meta-analysis was conducted to determine the overall effects of specific writing activities on the reading comprehension of students with and without disabilities in language arts, science, and social studies (Graham & Herbert, 2011). In the 51 studies included in this meta-analysis, students wrote about information either read or learned in class. Also, half of the studies included in the meta-analysis were in the content areas of science and social studies. Results from the meta-analysis indicated that the overall effect size of writing about text on student comprehension for norm-referenced measures was .37 and .50 for researcher created comprehension measures, indicating a moderate effect for writing activities on comprehension. However, 95% of the studies produced a positive effect size for comprehension.

Although writing about text and writing instruction can increase comprehension, specific writing activities have a greater impact on comprehension than others. Overall, the writing activities that have the largest effects on the comprehension of elementary
students are responding to text in writing and writing summaries (Graham & Herbert, 2011). Responding to text in writing includes activities where students are required to write a personal response, analyze, or interpret text. This occurs in activities where students write a letter to a friend describing the text, analyze characters in a novel, or develop argumentative responses. These writing activities could possibly increase text comprehension because they required students to respond to the text in an extended way through analysis, personalization, or interpretation, instead of simply rephrasing what was in the text (Langer & Applebee, 1987). According to the meta-analysis (Graham & Herbert, 2011), responding to reading in writing had an effect size of .77, a large effect, demonstrating that writing about text has a greater effect on comprehension than reading activities including reading text, repeating reading, studying, or reading instruction. Therefore, it is important that interventions target content writing. By targeting writing about content, students can have greater learning of the content as well as proficiently demonstrate their understanding of the topic in writing.

**Graphic Organizers**

Graphic organizers provide students with visual diagrams that represent ideas and concepts to help students in the development and organization of their writing. Paper-based graphic organizers require students to write words, phrases, or sentences into a diagram to represent relationships between these ideas and concepts. Although much is known about the impact on graphic organizers on student comprehension (Dexter & Hughes, 2011), there is very little research to support the efficacy of paper-based graphic organizers on writing. Paper-based graphic organizers have been used in one science
intervention to support report writing (Knaggs, & Schneider, 2012), a science and social studies explanatory intervention (Reynolds & Perin, 2009), and as a component of several SRSD studies to help students organizer their ideas in both narrative and persuasive texts (Cuenca-Carlino & Mustian, 2013; Hauth, et al., 2013; Mastropieri, et al., 2009; Mastropieri, 2014).

A form of graphic organizers, referred to as vee-maps, were used to support the scientific report writing of typically achieving middle and high school students (Knaggs, & Schneider, 2012). The vee-maps were paper-based diagrams that included connected boxes that represent conceptual and methodological ideas. Fifty 7th-12th-grade students at an all-girls preparatory school participated in study. The girls were split into three groups, one group was taught how to develop scientific reasoning in writing with the support of the vee-maps in biology, the second group developed written responses with the vee-map during a single activity, and the third group did not use the vee-maps. The students completed lab activities and then developed written reports with support of the graphic organizer. Students received scores for representation of the scientific process and concepts in the lab report. There was a significant difference between the experimental and control group for process scores ($F = 28.85, p < .001$), but not for content scores ($F = .93, p = .40$) in the first posttest. However, during the second posttest, there was a significant difference in both process scores ($F = 14.06, p < .001$) and concept scores ($F = 5.27, p = .01$) between groups.

Paper graphic organizers were also used in the previously discussed research study by Reynolds and Perin (2009). In this study, students in the experimental group
engaged in explicit instruction to construct explanatory responses of science and social studies topics. This instruction was paired with the mnemonic PLAN and WRITE. In addition, there was one control group who used a graphic organizer to plan their writing, and a comparison group that did not receive any writing instruction. Holistic writing scores for the PLAN and WRITE group as compared to the graphic organizer and the neutral literacy group were 9.76 (SD = 1.69), 8.98 (SD = 1.66), 7.79 (SD = 2.11), respectively, indicating that the graphic organizer improved the holistic writing quality of the students.

Paper-based graphic organizers have also been an integral component of SRSD writing interventions (Cuena- Calino & Mustian, 2013; Hauth, et al., 2013; Mastropieri, et al., 2009; Mastroperi, 2014). During SRSD instruction, students learn SRL strategies including setting a goal for their writing, self-monitoring, and evaluating their final constructed response. To support the organization and cohesion of the students’ responses, students used graphic organizers during SRSD instruction. The graphic organizers contained the mnemonic for the writing strategy learned for each part of their written responses and a section for students to write words, sentences, or ideas, for each of the essay parts. Although graphic organizers are combined with a strategy during SRSD interventions, the combined use of the strategy and tool has positive impact on various aspects of writing, including holistic quality and number of essay parts included, in a variety of genres, for typically achieving and struggling writers.

**Research on Technology and Writing**

Regardless of a student’s ability level, technology has the potential to support the
writing ability of students in a variety of areas including spelling and organization. Technology supports for writing can include computer-based graphic organizers that can support the organization of writing and typing with word processing software instead of writing by hand to support readability of the text.

**Computer-Based Graphic Organizers**

Similar to paper-based graphic organizers, CBGOs are digital forms of diagrams that help students to visually organize their ideas for writing. Currently, only seven research studies have analyzed the effect of computer-based graphic organizers on writing performance, and most of these research studies utilize the software program *Inspiration* for pre-writing. These research studies have examined the effect of CBGOs on various types of writing, including narrative and persuasive, and with populations that include typically achieving and struggling writers.

Sturm and Rankin-Erikson (2002) compared the descriptive writing of twenty-seven 8th-grade students with and without learning disabilities that wrote with the support of a handwritten paper-based graphic organizer, a computer-based graphic organizer, and without a graphic organizer. At pretest, students created written responses prior to any instruction. All students then received instruction in creating handwritten graphic organizers and then using a computer-based graphic organizer to support their writing. The students were then broken into three groups, one that created written responses with a computer-based graphic organizer, another group that wrote with support of the handwritten graphic organizer, and a third group that wrote without support. *Inspiration* 4.0 was used as the software to generate their graphic organizers. With the software, the
students developed concept maps using the mapping feature in Inspiration. The students used shapes, images, and text, and lines to connect their thoughts. Students who created written responses with the support of either the handwritten graphic organizer or the CBGO outperformed students that did not write with a graphic organizer in number of words, holistic quality, and t-units.

Lin et al. (2004) conducted a group experimental study to determine the impact CBGOs on the persuasive writing by two hundred and seventy-eight 8th-grade, typically achieving writers. In this study, the experimental group planned using CBGOs while the control group planned using a handwritten graphic organizer. CBGOs were also generated with the software program Inspiration. Students learned to use a teacher generated persuasive concept map with Inspiration for pre-writing. In this concept map, students had areas to write thoughts about their topic, reasons, and explanations for their reasons. Students then wrote their essays in Microsoft Word. Results from the study indicated that the use of the computer-based graphic organizer had a positive impact of number of words written in the planning phase, $M = 12.27$ vs. $M = 10.26$. However, there was no impact on holistic quality of the written responses between the experimental and control group.

In an additional study, Lorber (2004) determined the effects of a computer-based graphic organizer in a group experimental study. The participants were sixty-seven 8th-grade general education students. After the pretest, students were trained on how to use Inspiration to plan their essays. At posttest, the experimental group wrote essays using Inspiration as a pre-writing strategy to construct their responses. Results from the study
indicated that students had an increase in organization in comparison to the control group.

In another group experimental research study that determined the impact of CBGOs of students with disabilities, twenty-four 7th- and 8th-grade students in the experimental group learned to write stories using the software program *Inspiration* by creating story webs with images (Blair, Ormsbee, & Brandes, 2002). In the control group, students learned to improve their writing by learning grammar and structure. At posttest, both groups created stories. Although the author reported that the experimental group increased the length of the writing, means and standard deviations were not reported for each group.

*Inspiration* was also used as the digital graphic organizer tool in a single subject study by Unzueta and Barbetta (2012). During the intervention, four 7th- and 8th-grade students with disabilities learned to plan and write persuasive essays with the support of the *Inspiration* software. Students were trained in using the software’s persuasive writing template, which allowed students to select images and write text that represented their arguments and supporting details. With the *Inspiration* software, the students were then taught to convert their diagram into an outline. The students then learned to copy and paste the outline into *Microsoft Office* and manipulating text to create their persuasive response. During the intervention phase, students wrote 125.7 more words, doubled their amount of planning time, had an average of 6.2 more supporting details, and a 1.67 increase in holistic quality.

This study was extended by Gonzalez-Ledo, (2012) to determine the impact of CBGOs on the narrative writing by four 4th and 5th-grade boys with learning disabilities.
Prior to baseline, students received instruction on narrative writing. During baseline, students planned and wrote narrative essays with paper and pencil. Students were then trained individually on how to use Kidspiration software to plan their essays with the narrative writing diagram from the software. Although the students planned using the software, the essays were written with paper and pencil. All students saw increases in number of words, with mean scores increasing from 20.25 to 41.86 more words, planning time, 1.00 to 5.00, and included more story elements (0.80 to 3.10 more out of a possible 6.00).

In addition to interventions determining the effects of CBGOs on persuasive and narrative writing, one intervention also analyzed the impact of CBGOs on writing specifically in science and social studies. In a previously mentioned study (Ponce, et al., 2013), graphic organizers were used to support argumentative writing of students in 4th- through 8th-grade in science and social studies. The study indicated that graphic organizers used as a pre-writing tool can increase the quality of argumentative writing in various content areas.

**Word Processors**

Although technology, including word processors, may be used in various research studies, meta-analysis have been conducted to determine the overall impact of technology on various writing measures including quality and quantity of writing. According to a research synthesis conducted in 2003 (Goldberg, Russell, & Cook, 2011), technology has a moderate effect size of \( ES = .50 \) on number of words written and a smaller effect size \( ES = .41 \) on the quality of student writing. The use of technology alone, unrelated to
interventions, can positively impact the writing of students. The results of this study were replicated in additional meta-analyses. Results from these meta-analyses indicated that word processors have a moderate to large effect on quality of student writing, $ES = 0.55$ and $ES = 0.79$ (Graham & Perin, 2007).

**Executive Functions and Struggling Writers**

Academic performance of some struggling writers, including students with HID and ELLs, are below their peers across all areas of academics. ELLs perform lower than their non-ELL peers because of their limited English proficiency, whereas students with HID have some cognitive deficits that makes success within the general education curriculum challenging. Students with disabilities typically have difficulty with executing functioning, which includes metacognitive processes and working memory. Although ELLs do not necessarily have difficulty with executive functioning and metacognition, active application of these strategies that support these functions can improve language learning and academic performance.

The term HID encompasses several disabilities and these disabilities share common traits related to cognitive functioning. Cognitive functioning includes executive functioning and encompasses processes such as working memory. It is an important aspect of several academic tasks because it supports organization and helps students to remember concepts and supports awareness of their own thinking (Johnson & Reid, 2011). When a student with HID has difficulties in executive functioning, academic tasks, including writing and comprehension, can become challenging (Englert & Mariage, 2003).
Executive functioning also plays an important role in the academic achievement of ELLs. ELLs usually have difficulty with various academic tasks, especially literacy related activities throughout various content areas. ELLs may have difficulty in school due to a variety of factors including limited proficiency in their second language in an English based curriculum, and lack of English materials and English language reinforcement at home. Because of their limited English proficiency, literacy across the content areas, including reading and writing, becomes very challenging (Sheng, et al., 2011). However, executive functions, including meta-cognitive strategies, can help ELLs become aware of their own learning, and make progress towards a learning goal.

Executive functioning is a set of mental processes that supports goal oriented behavior and is often related to planning and organization (Loring, 1999). Executive functioning is important to the achievement of students with HID and the language learning and academic success of ELLs. Executive functioning is influenced by working memory and metacognitive processes. Working memory is the ability to store and manipulate information, whereas metacognitive processes refer to a student’s awareness of their own thinking through the use of regulated strategies. Students who have difficulty with working memory may have difficulty remembering concepts learned. In addition, students with meta-cognitive process deficits have difficulty thinking about their own thinking, which affects their ability to effectively learn (Pullen, Lane, & Ashwoth, & Lovelace, 2011). These processes affect students’ ability to memorize, plan and, organize, which is important to many aspects of academics including writing.

SRL strategies can help struggling writers, including students with HID and
ELLs, achieve within the curriculum. SRL is a set of strategies that improve the metacognition of students by helping students to think about their own thinking (Zimmerman, 2000). Recently, recommendations have been made to support the cognitive processes of students with HID (Johnson & Reid, 2011). These recommendations include (a) direct and explicit teaching of a strategy; (b) provide information about the value of the strategy and; (c) continue steps until mastery of strategy. These are common components are interventions that have been found effective for students with HID, including interventions that embed SRL strategies. However, the strategies that support the cognitive processes of students with disabilities can also help ELLs in grasping the language to succeed within the curriculum. Recent research has reported that SRL strategies can be beneficial for ELLs in helping these students facilitate their own learning process (Kahrizi, et al., 2014). Since an important aspect of self-directed language learning is the ability to assess progress and reflect on their own learning, SRL strategies help ELLs monitor their own learning, progress, and their critical thinking, which can also improve academic outcomes.

**Self-Regulated Learning**

SRL is learning that is guided by metacognitive processes, strategic action, and motivation to learn (Zimmerman, 2000). SRL strategies are processes that some students naturally apply to their learning but may be difficult for students with disabilities. SRL strategies occur within a cyclical process that begins with the forethought phase and continues to the performance and the self-reflection phases. During the forethought phase, students engage in strategies such as setting goals for their writing, planning
strategically, and developing beliefs about their ability to complete a task and outcome expectations. In the performance phase, students use task strategies and monitor the completion of the task, and during the self-reflection phase students evaluate and react towards their work. Important parts of self-regulation during these phases are goal setting, self-monitoring, self-evaluation, and self-instruction (Zimmerman, 2000). Students who apply SRL strategies have more academic success and have a greater motivation to learn in comparison to students who do not apply these strategies (Pintrich & De Groot, 1990). Increased self-regulation helps students to monitor their thinking to achieve an academic goal.

Struggling writers can benefit from the active use of SRL strategies. Students with disabilities tend to have low metacognition and therefore, may have difficulty monitoring their tasks which impacts academic performance (Trainin & Swanson, 2005). The use of SRL strategies can help students with HID make progress towards the goal of an academic task. ELLs can also benefit from the active application of SRL strategies. Although ELLs may not have difficulty with the meta-cognitive process, active application of these strategies can improve language learning and critical thinking (Kahrizi, et al., 2014). These strategies, when used together, help students to set a goal for their learning and then to monitor their steps to make sure the goal is complete.

**Forethought phase.** The forethought phase of SRL process starts before the students actually begin the task. During this phase, students set expectations for their performance and decide how they will be able to complete the task. Task analysis is one aspect of the forethought phase and includes strategies in which students set goals and
plan how they will accomplish the activity. In analyzing a task, students set an outcome or process goals and engage in strategic planning activities, such as brainstorming, which can help the students have an understanding of what they will write about before they begin the task.

**Goal setting.** According to SRL theory, goal setting, a part of the forethought phase, is a key self-regulatory process that involves the determination of learning outcomes (Zimmerman, 2000). Students with high self-regulation tend to set outcome, or final, goals for their writing. Then, these students break the overall learning goal into process goals, which are smaller goals that are needed to meet the outcome goals (Zimmerman, 2000). Process goals are also important because they can demonstrate progress and achievement for the student. Goal setting is a process that begins before the students begins a task and can be regulated by process goals throughout the completion of the task.

In research, writing interventions have successfully integrated goal setting to improve the quality of writing of students with HID (Ferretti, Lewis, & Andrews-Weckerly, 2009; Patel & Laud, 2005). In a research study conducted by Ferretti (2009), ninety-six 4th- through 6th-grade typically achieving and students with LD learned to write persuasive essays with the support of elaborated goals. The elaborated goals were printed on sheets of paper and provided students with specific steps to meet the goal and complete a quality expository essay. Students who used the elaborated goals created persuasive essays with more rebuttals and reasons in comparison to students who did not use the elaborated goals.
Goal setting was also found effective for the vocabulary learning of ELLs. In a study conducted with ELLs in elementary school, the researchers taught the students SRL strategies, which included goal setting. The student participants set goals for how many new vocabulary words they would learn within one session. Results from the study indicated that goal setting played an important role in the vocabulary learning of ELLs (Woori & Thompson, 2013).

**Strategic planning.** Strategic planning is the process of thinking about the task before the task has begun and occurs during the forethought phase. During strategic planning, students can engage in activities such as brainstorming, which helps students plan what content they will be writing about in their paragraphs. Brainstorming has been used as a pre-writing strategy with the combination of additional SRL strategies in several writing studies (Cuenca-Carlino, 2013; De La Paz, 2001; Lienemann & Reid, 2008). However, in isolation, brainstorming was utilized by Voon in 2012 to determine the impact of the pre-writing strategy on the writing performance of 33 typically achieving students. Students learned how to brainstorm their thoughts before writing as well as engage in brainstorming discussions with other students in the classroom. Results indicated that brainstorming positively impacted the content of the persuasive essays that students wrote at posttest.

**Performance phase.** The performance phase occurs after the forethought phase in the SRL cycle and focuses on the learner controlling their performance (Schunk & Zimmerman, 1998). Students can also control their actions during a task through the process of self-instruction and self-observation. Self-instruction can help student
implement strategies to be successful within the task. During the process of self-instruction, students give themselves instructions on how to complete a task. In addition, another performance phase strategy, self-observation, can occur through strategies such as self-monitoring, in which the student monitors their progress of completing the task.

**Self-instruction.** Self-instruction is a process that occurs while the student is performing a task (Zimmerman, 2000). As students engage in a task, self-instruction is helpful in keeping students engaged in the task (Schunk & Usher, 2013). Self-instruction involves the student giving themselves responses on how to proceed as the task is completed. Students can participate in the self-instruction process by self-talk or guiding thoughts. These verbalizations help reinforce the steps that are necessary in order to complete a task. As students gain practice, these verbalization eventually become internalized. In a research study (Graham, 1988), self-instruction was used to increase the writing ability of students with HID. In this study, three 5th- and 6th-grade students with learning disabilities learned six steps to improve their writing. The six steps were reinforced during instruction and provided on a chart. These steps included (a) read your essay; (b) find the sentence that states your opinion, is it clear; (c) add two reasons that state why you believe it; (d) scan each sentence to see if it makes sense; (e) make changes on the computer; and (f) reread and make more changes. During instruction, the six step strategy prompt was faded. Students learned to apply these steps and self-instruction to create a written persuasive response. Students had increases in length and holistic quality of the responses.

*Mnemonics.* Mnemonics, memory supports that help learners to recall
information, help students to manage writing into a step-by-step process (Graham & Perin, 2007). Although not a specific part of the self-instruction phase of the SRL process, mnemonics are frequently used during this phase as a way for students to remember steps in the writing process. These steps can be internalized and used as a method of self-instruction by students. Mnemonics are frequently used in SRSD, the intervention package for writing based on SRL strategies, and are an important component of students remembering the steps to create a written response. Examples of mnemonics in SRSD instruction include POW + TREE (Little, Lane, Harris, Story, & Sandmel, 2010; Mastropieri, et al., 2009) and STOP and DARE (De La Paz, 2005; De La Paz; 2014; Ennis, et. al., 2015). POW + TREE represents; Plan, Organizer, Write, Topic, Reasons, Examples, and Endings. STOP and Dare represents; Suspend judgment, Take a side, Organize your ideas, Plan as you write, Develop a position statement, Add supporting details, Report and refute counter arguments, and End with a strong conclusion. In each of these studies, the mnemonic was used to help students remember the writing process and what parts should be included in their written responses. As a part of SRSD instruction, mnemonics were helpful in supporting the writing outcome of the participants in each of these research studies.

Self-monitoring. While performing a task, students with high self-regulation self-monitor their work (Zimmerman, 2000). During self-monitoring, students pay close attention to their task and focus on specific aspects of their performance. During the self-monitoring process, students with high self-regulation monitor their progress, then make changes to their performance as needed. In writing research, self-monitoring has been
used to support the learning needs of students with disabilities. Research has determined that self-monitoring can increase the number of words written and the overall quality of writing and interest in the writing task (Goddard & Sendi, 2008).

In a research study conducted by Goddard and Sendi (2008), four 4th-grade students with learning disabilities self-monitored their narrative writing. In this intervention, students used a graph and a checklist to monitor specific aspects of their writing. Using a graph, students counted and graphed the number of words written in each essay. The students also completed a checklist to self-monitor their writing. The checklist contained checkboxes for neatness, details, conclusion, punctuation, and neatness. By self-monitoring their work, the students increased their number of words written as well as the holistic quality of their writing.

Self-monitoring was also found effective for increasing the vocabulary of four 3rd-grade dually identified ELLs with HID (Woori & Thompson, 2013). In this study, the students utilized a variety of SRL strategies, including self-monitoring, to increase their vocabulary. The students self-monitored their progress in learning new vocabulary. To encourage self-monitoring, the instructor provided prompts to the students. Students were asked if they understood new vocabulary words that were printed on a list, and then the students were instructed to highlight the word if they understood the new vocabulary. By highlighting the vocabulary words to indicate they understood the word, the students were monitoring their progress of learning the new words.

**Self-reflection phase.** Self-reflection is the final phase of the SRL strategies process. During self-reflection, students develop ideas about their performance on the
task. This can occur through the process of self-evaluation after completing the task.

**Self-evaluation.** Self-evaluation is the process of a student checking their work. Students with high self-regulation tend to check their work and compare their progress to their intended goal. This happens when a student checks their procedures, such as re-examining their answers and compare it to a standard or their goal (Zimmerman, 2000). Interventions have successfully integrated self-evaluation to improve the writing performance of students with HID. In these studies, students increased in the quality of essays and number of words written (Cuenca-Carlino & Mustain, 2010; Hauth, et al., 2013).

In a research study that incorporated self-evaluation along with other SRL strategies (Hauth, et al., 2013), eight 8th-grade students with EBD evaluated the quality of their persuasive essays. Throughout the intervention, students learned how to use statements to evaluate their work as they created persuasive essays. This self-evaluation was modeled by teachers as the intervention was conducted and practiced independently by students. Students in this research study had an increase of several writing measures, including holistic quality and number of words.

**Motivation.** Motivation is the process that guides and maintains goal-oriented behavior. Although motivation is not an explicit SRL strategy, motivation is related to several aspects of SRL. When a student is motivated to complete a task, they monitor their progress to complete the goal. This could include the SRL strategies of goal setting, self-instruction, self-monitoring, and self-evaluation. However, motivation is often low in students with HID in comparison to their typically achieving peers (Hampton, 1998).
Although there is limited research that directly assesses the motivation of ELLs, ELLs may have lower motivation than their non-ELL peers if they are experiencing consistent school failure.

If a struggling writer, including ELLs or students with HID, is frequently unsuccessful in an academic task, they lack the motivation to complete all the steps required and finish the task successfully (Margolis & McCabe, 2006). Since most academic tasks require students to set a goal for completion, whether completing a math problem or writing a multiple paragraph essay, motivational skills are required for students to monitor their progress on the assignment and successfully complete the task. If a student with a learning disability does not have the mastery experiences of being successful in a task due to cognitive factors, their motivation decreases. This results in continual problems within academics, as motivation is a required component of success.

Therefore, it is important that academic interventions not only focus on increasing the academic outcome, but also increasing the motivation of students. This can be accomplished by targeting various aspects that influence motivation (Garcia & De Caso, 2004). SRL strategies could increase the motivation of students as students engage in mastery experiences and monitor their steps to complete the goal of the task. According to research, various components can increase the motivation of students with academic difficulties. These components are found in interventions that embed SRL strategies and include student choice, goal setting, positive beliefs, mastery experiences, and supportive environments (Mussen, Conger, Kagen, & Huston, 1990).

**Self-efficacy.** Self-efficacy is a student’s belief that they can or cannot achieve a
task (Brophy, 1998). Since motivation is the ability to maintain a goal-oriented behaviors, a student’s self-efficacy is directly tied to motivation. If a student believes that they cannot achieve in a task due to constant previous failures, they will have lower motivation and will not be able to maintain the behaviors to reach the academic goal. Students with low self-efficacy often give up or avoid academic tasks. In addition, students with disabilities tend to have low self-efficacy or overestimate their self-efficacy during self-report (Klassen, 2010).

**Self-Regulated Learning Strategy Interventions**

Components of SRL have been an effective component for improving the writing outcomes of struggling writers, especially students with HID. Research studies outside of the science and social studies content areas have determined the effectiveness of specific components of SRL strategies including goal setting, self-monitoring, and self-evaluation on the writing performance of students with disabilities. When investigated, these individual components of self-regulation had positive impact on the writing of students with HID. Further, recent research synthesizes have determined the overall impact of SRSD, an intervention package for writing that includes SRL strategies, on student writing performance.

In a meta-analysis conducted in 2012 (Graham, McKowen, Kihuara, & Harris), the researchers investigated the impact of writing interventions on elementary students in grades 1-6. The participant sample in the meta-analysis included a wide range of writers including typical writers, struggling writers, ELLs, as well as students with HID. A total of 115 writing studies were analyzed. The studies included within the analysis included a
wide range of writing interventions, including studies that utilized SRL strategies and SRSD. In the meta-analysis, SRSD was coded as the intervention package for writing that includes SRL strategies. According to the analysis of experimental and quasi-experimental writing studies, the researchers found that SRL strategies, such as goal setting and self-monitoring embedded in explicit strategy instruction had a moderate effect size on the writing performance of elementary students, $ES = .50$. Four out of the six studies that contained SRL strategies included students who were struggling writers. In addition, all of the SRL studies included in this analysis found positive results for SRL strategies for students with range of writing ability. Although SRL strategies embedded in explicit strategy instruction have a moderate effect on student writing, SRSD as an intervention package has a greater impact on the quality of writing compared to SRL strategies alone. This research synthesis included 14 SRSD studies and found that these studies has an effect size of 1.17, a large effect, on the writing quality of students with a range of writing ability. The effect size of SRSD studies is statistically larger than non SRSD studies, which have a weighted effect size of .56.

Additional meta-analyses have been conducted which determined the effects of SRL strategies on the performance of students with disabilities. However, these research syntheses do not analyze the effects of SRL strategies on the writing performance of students with disabilities. Rather, these research syntheses determined the effect of SRL strategies on mathematics, behavior, and comprehension. The research synthesizes found that SRL strategies can improve the on task behavior and overall academic achievement of students with HID (Reid, Trout, & Schwartz, 2005), can increase the comprehension
of students with disabilities (Berkeley, Scruggs, & Mastropieri, 2010) and can improve math performance (Miller, Butler, & Lee, 1998).

**Summary**

Struggling writers, including students with HID, ELLs, and at-risk students often access grade level curriculum within inclusive, general education classrooms. However, the writing abilities of these struggling writers impact access and achievement within the curriculum. In general education classrooms, including science and social studies, writing is often used as a method to assess a student’s comprehension. The problems in writing exhibited by struggling writers may impact their ability to demonstrate that knowledge in writing activity and assessments in content areas, such as science and social studies.

In review of research cross-curricular writing in science and social studies, writing was typically used to describe concepts or ideas and science and social studies. These writing activities included explanatory written responses, summarization, the creation of articles, and writing to learn activities. Argumentative responses were also common in both science and social studies writing, and required students to develop a claim and support their claim through the use of evidence. These interventions in science and social studies included a reading component as well as a writing component, demonstrating the need for students to be able to write in response to text explored in class. In these intervention studies, explicit strategy instruction, technology, and graphic organizers were beneficial to improving the overall quality of writing. However, most of these studies focused on improving the writing of typically achieving students and
excluded struggling writers. Specifically, only three of the argumentative writing interventions included struggling writers (De La Paz, 2005; De La Paz, 2010; De La Paz, et al., 2014).

Although there has been limited research in writing across content areas for struggling writers in science and social studies, the small number of conducted research shows benefits of interventions for improving the writing of struggling writers in science and social studies. This research has found that specific strategies can improve the written response of struggling writers. Specifically, the research indicates that explicit strategy instruction (e.g., SRSD) SRL strategies a (e.g., goal setting), and graphic organizers, have the potential to increase the writing ability of struggling writers, including length, number of parts, planning time, writing time, organization, and holistic quality. Still, there is very little research to how to use these strategies to support students’ writing aligned with a specific content area. It is important to explore the effective instructional strategies to improve the writing of students in science and social studies, specifically for struggling writers.
Chapter Three

This chapter describes the methods for the research study. The design of the study, description of the participants, and the setting are discussed. Dependent and independent variables, including student and teacher materials, are described. In addition, instructional, testing, and scoring procedures are described and fidelity is explained. Finally, the data analysis plan is presented.

Design of Study

A mixed methods design, with the incorporation of pre-post true experimental group research and qualitative methods, was used to determine the effects of a CBGO with embedded SRL strategies on the argumentative writing and writing processes of 4th- and 6th-grade typically achieving and struggling writers, including students with HID, ELLs, and at-risk students. All students included in the sample were randomly assigned to either an experimental or control condition. In the experimental group, students created argumentative written responses about science and social studies topics with the support of the CBGO. In the control group, students created written responses in science and social studies while applying the writing process and editing and revision strategies.

A true experimental group design was used in this study to determine a causal relation between the independent and dependent variable. Experimental research is the only type of research that can determine these interactions (Gersten, Fuchs, Coyne,
Greenwood, & Innocenti, 2005). Controlled, experimental research has the ability to verify educational practices (Cambell & Stanley, 1966). Random assignment of participants to groups was used to increase the quality of the research (Gersten et al.). Qualitative research methods, including interviews and document analysis, were used to investigate how students utilized the instructional methods during posttest and explore possible explanations about the effectiveness of the intervention (Greene, 2007).

**Participants**

Sixty-nine students and six teachers were participants in the study. The following section will describe the recruitment process, student and teacher demographics, and a narrative of the classrooms.

**IRB Approvals**

Institutional Review Board approval was obtained at the district level and George Mason University through a multi-year, ongoing grant. The researcher obtained teacher, parental consent, and student assent prior to start of the intervention (Appendix A). Student assent and parental consent forms were given to students in the participating classrooms two weeks prior to the start of the intervention. The forms were placed in the students’ Tuesday packets. The Tuesday packets were given to the students at the end of the school day and also included student work and papers that needed to be viewed, or signed, by parents. Incentives were provided for students who returned consent forms. Incentives included small candy bags that were given to students immediately after they returned the consent form regardless of whether they agreed or disagreed to participate in
the study. In addition, once 80% of the students in the classroom returned consent forms, the classroom earned a pizza party, which was given at the end of the study. All students participated in the research activities. However, data were only collected for students who provided consent for the study.

**Student Participants**

Students from two classrooms in 4th-grade and two classrooms in 6th-grade were invited to participate in the study. Based on teacher classification of student writing performance, the participants in this study included low, medium, and high performing writers. Teachers in this study completed writer classification rubric based on their students writing ability. Students received points for their general writing ability in the areas of organization, mechanics, and content, and were classified to a writer classification based on their overall scores. Participants in this study included 69 students across the two grade levels and included students with HID, ELLs, at-risk, and typically achieving students. Thirty-three percent of the students in the study were low, or struggling writers ($n = 23$), and included all students with the HID classification, dually identified students, and a percentage of ELLs (Figure 1). Fifty-six percent of the students were male ($n = 39$) and 44% were female ($n = 30$). Participating students had an average age of 10.40 ($SD = 1.02$).
**Figure 1.** Chart depicting the types of participants by writer type.

**Language and ethnicity.** Students included in this study had diverse ethnic and linguistic backgrounds.Sixty-two percent of the students were Hispanic \( (n = 43) \), 17.4% of the students were African-American \( (n = 12) \), 10.1% of the students were African \( (n = 7) \), 5.8% were Middle Eastern \( (n = 4) \), and 1.4% of the students were of mixed ethnic backgrounds \( (n = 1) \). Several languages were spoken by the students, including Spanish, Twi, and Punjabi (Figure 2) and 61% percent of the students were classified at ELLs \( (n = 42) \). For the purposes of this study, students were classified as ELLs if they were exempt from standardized testing within the last two school years due to limited English proficiency.
Figure 2. Chart depicting the percentage of languages spoken by student participants.

**Student achievement.** Achievement levels, including standardized test scores and IQ scores, were collected from the student files. Most students demonstrated limited English proficiency at the time of their state assessments. Therefore, many students were exempt from the science, social studies, or writing state assessments. For the state writing assessment, which was only administered to the 6th-grade participants during the previous school year, 15.9% of the students were exempt from the assessment during the previous school year due to limited proficiency in English. For content areas, 40.6% of the students were exempt from both the science and social studies state assessment. Only a portion of students passed the writing, science, and social studies standardized assessments. A higher percentage of students passed the reading assessment (Figure 3). In addition, the fluency subtest of the Woodcock Johnson Achievement Battery was administered to students prior to the start of the intervention. Overall, students had a
mean fluency score of 11.25.

**Figure 3.** Percentage of students with passing scores on state assessments.

**Student assignment.** Students were stratified by grade level and randomly assigned to experimental and control groups. Students were also matched by disability and writing achievement and then assigned to either group. After random assignment, 36 students were assigned to the experimental group and 33 students were assigned to the control group.

**Experimental group.** Participants randomly assigned to the experimental group included ELLs and students with and without disabilities. This included high, medium, and low writers (Table 2). Among the 36 students in the experimental group, there were a total of four students with disabilities that had current IEP’s, and one participant with a
504 plan. In addition, the experimental group included 26 ELLs and a total of 13 low, 21 medium, and four high performing writers.

Performance scores were also collected from the World-class Instructional Design and Assessment (WiDA) Access assessment for ELLs. The WiDA assessment assigns an English proficiency rating from 1 to 6 representing a range of a minimal ability to communicate in English to the ability communicate proficiently with minimal errors. The ELLs included in the experimental group had an average WiDA score of 4.73 ($SD = 1.03$). This indicates a moderate ability to communicate in English. The students in the experimental group had an average Naglieri index of 126.03 ($SD = 121.54$). The mean Naglieri scores indicate that the student participants were in the average range of general ability. State assessment scores were also collected. The average SOL reading, social studies, science, and writing scores for the experimental group were 399.96 ($SD = 58.37$), 435.31 ($SD = 50.91$), 410.70 ($SD = 43.56$), and 377.11 ($SD = 55.25$) respectively, with average scores in the passing range for all subjects except for writing (Table 2). The overall WJIII fluency score for students in the experimental group was 10.03 ($SD = 4.99$); a grade equivalent of 3.0. Students in the 6th-grade had a mean WJIII score of 12.44 ($SD = 4.31$), which is a grade equivalent of 3.6. Fourth grade students had a WJIII mean score of 7.61 ($SD = 4.53$), which is a grade equivalent of 2.5.

Twelve students in the experimental group participated in interviews at pretest, post-test and maintenance. The interviews included four struggling writers, six medium performing writers, and two high performing writers. These students were randomly selected based on their writer classification to ensure that students of all writer
Clarke. Clarke was a struggling writer in 6th-grade. Clarke was a dually identified student, receiving special education and ELL services. Clarke’s native language was Spanish. Clarke was on grade level in language arts. In the previous school years’ state assessment, Clarke failed the language arts and social studies state assessment, but was exempt from science and writing assessments due to limited English proficiency.

Johnny. Johnny was a 4th-grade struggling writer who receives special education services. Johnny was an ELL student and his native language was Spanish. Johnny was diagnosed with a learning disability and had difficulty attending, and staying focused, with a task. He passed the alternate form of the language arts state assessment, and was except from science and social studies assessment during the previous school year due to limited English proficiency. He performed below grade level in language arts.

Gia. Gia was a high performing 4th-grade student. She is an ELL student whose native language is Spanish. Gia passed the language arts state assessment from the previous school year, but was exempt from science and social studies due to limited English proficiency. She performed on grade level in language arts.

Jack. Jack was a 4th-grade medium performing writer from Sierra Leone. His native language was Kreo, a form of broken English spoken in his home country. He passed the previous school years’ language arts state assessment, but was exempt from the science and social studies state assessment due to limited English proficiency.
Mary. Mary was a Hispanic, 4th-grade medium performing student. She passed the previous school years’ language arts, science, and social studies state assessment and was on grade level in language arts.

Kevin. Kevin was a struggling 6th-grade grade writer. Kevin was an ELL student, and his native language was Spanish. He passed the language arts and science state assessments, but failed the social studies and writing assessments. He was on grade level in language arts.

Kaden. Kaden was an African-American male. He was a medium performing writer. He passed the previous school years’ language arts and social studies state assessment, but failed science and language arts. He was on grade level in language arts.

Danny. Danny was a medium performing writer in 4th-grade. He was an ELL student and his native language was Spanish. He passed the language arts assessment, but was exempt from the science and social studies state assessment. Danny was on grade level in language arts.

Andrew. Andrew was an African-American high performing writer in 6th-grade. He passed the language arts, science, social studies, and writing state assessments. He was above average in language arts.

Harry. Harry was a medium performing 6th-grade student. Harry was an ELL student whose native language was Punjabi. Harry performed below grade level in language arts and did not pass the language arts, science, or social studies state assessment from the previous year. He was except from his 5th-grade writing state assessment due to limited English language proficiency.
David. David was an African-American medium performing 6th-grade student. He passed all of the state assessments from the previous school year, including writing. He performed above grade level in language arts.

Sara. Sara was a 4th-grade ELL student, whose native language is Spanish, who receives special education services. Sara is diagnosed with a learning disability and has difficulty staying focused on academic tasks. She passed the alternate form of the language arts state assessment and was except from science and social studies assessment. She performed below grade level in language arts.

Control group. Thirty-three participants were randomly assigned to the control group and included three students with HID and 19 ELLs. The control group also included 13 struggling writers, 19 medium performing writers, and three high performing writers (Table 3). The ELLs in the control group had an average WiDA score of 4.77 (SD = 1.17). Students in the control group had an average Naglieri index of 97.95 (SD = 15.32). The average SOL reading, science, social studies, and writing scores were 399.96 (SD = 58.37), 432.56 (SD = 38.83), 434.60 (SD = 40.65) and 383.90 (SD = 60.99) respectively, with average scores in the passing range for all subjects except for writing. The mean overall WJIII fluency score for students in the control group was 17.37 (SD = 17.37), which is a grade equivalent of 5.3. Students in the 6th-grade had a mean WJIII score of 14.94 (SD = 3.53), a grade equivalent of 4.6. Fourth grade students had an average WJIII score of 13.83 (SD = 3.76), a grade equivalent of 4.2.

Ten students from the control group were interviewed at pretest and posttest. The control group included two struggling writers, seven medium performing writers, and one
high performing writer. These students were randomly selected based on their writer classification.

_Sue._ Sue was a medium performing writer in the 4th-grade. She was an ELL student from Ghana and her native language was Twi. She failed the language arts state assessment, and was exempt from science and social studies standardized assessments due to limited English proficiency. She was on grade level in language arts.

_April._ April was a 4th-grade medium performing writer. April was an ELL student, and her native language was Spanish. April failed her language arts state assessment, but is classified as above grade level in language arts due to her performance in the classroom. She was exempt from her science and social studies state assessment due to her limited English proficiency.

_Jani._ Jani was an African-American 4th-grade medium performing writer. She passed the language arts state assessment and failed the science and social studies assessment. She performs below grade level in language arts.

_Vino._ Victor is a 6th-grade struggling writer in Ms. Scott’s classroom. Vino is also an ELL student whose native language is Spanish. Vino had low English proficiency. He failed the language arts and social studies state assessment, but passed the science assessment. He is on grade level in language arts.

_Katy._ Katy is a Hispanic, medium-performing student is the 6th-grade. Katy passed the language arts and science state assessment, but failed social studies. She is on grade level in language arts.
Lisa. Lisa was a struggling writer in the 6th-grade. Lisa was dually identified student and received both special education and ELL services. Her native language was Spanish. Lisa failed the state language arts assessment, but passed the alternate forms of the state science and social studies assessment. She performed below grade level in language arts.

Selah. Selah was an Eastern Indian medium performing writer in the 6th-grade. She passed all of her state assessments, including writing, and was above grade level in language arts.

Cliff. Cliff was a Hispanic, high performing writer in the 6th-grade. He passed the reading and science state assessment, but failed the social studies assessment. He performed above grade level in language arts.

Raul. Raul was an African-American medium performing writer in the 6th-grade. He passed the language arts, science, and social studies state assessment, and is above grade level in language arts.

Jason. Jason was a medium performing Hispanic 6th-grade writer. He passed the science and social studies state assessments, but failed language arts. Based on classroom activities, he performed above grade level in language arts.

Teacher Participants

Four general education teachers and two special education teachers participated in the study. Sixth grade teachers were suggested by the principal of the participating school. Fourth grade teachers were recruited by the researcher. See table 4 for teacher demographic data.
**Sixth grade experimental.** Ms. Scott was the teacher of the 6th-grade experimental classroom. Ms. Scott was a Caucasian female with five years total teaching experience and two years of teaching the 6th-grade. Ms. Scott has a Bachelor’s degree in Education and is licensed to teach students in kindergarten through the 8th-grade.

Ms. Lechery was the special education teacher for the 6th-grade and typically provided support for all the special education classrooms. Ms. Lechery had Master’s Degrees in Elementary Education and Special Education and is licensed to teach K-12 special education. She had 20 years of experience of teaching and 14 years’ experience in teaching special education in the 6th-grade. She provided support to the students in special education in the experimental group and provided suggestions to the teacher and researcher in the control group for working with students in special education that were assigned to that condition.

**Sixth grade control.** Dr. Samm was the teacher of the 6th-grade control classroom. Dr. Samm was an African American male with 22 total years of teaching the 6th grade. Dr. Samm has an Ed.D in Education and was also licensed to teach students in kindergarten through the 8th-grade.

**Fourth grade experimental.** Ms. Truly was the teacher of the 4th-grade comparison classroom. Ms. Truly was an African American female with six years of total teaching experience and four years of experience in teaching the 4th-grade. Ms. Truly has a Master’s degree in Elementary Education and is licensed to teach elementary students.

The 4th-grade special education teacher was Ms. Red. Ms. Red supported students
in special education in Ms. Roes classroom, which was the only participating classroom that had students with special needs. However, during the study, Ms. Red provided support to the students in special education in the experimental group. Ms. Red had 10-years of teaching experience and taught special education in the 4th-grade for four years. Ms. Red had a Master’s degree in Special Education and was licensed to teach students in special education from kindergarten to the 12th-grade. Ms. Red was a very energetic, fun, and caring teacher. She also set high expectations for her students. There were four students in special education in Ms. Roes classroom. Ms. Red would also pull students independently or in small groups and work with them in her resource room.

**Fourth grade comparison.** Ms. Roes was the teacher of the 4th grade comparison classroom. Ms. Roes was Caucasian female with five years of teaching experience and was teaching the 4th-grade for the first time. Ms. Roes had a Master’s degree in Curriculum and Instruction and is licensed to teach elementary students in kindergarten through the 3rd-grade.
<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th>Grade 6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Y/M (SD)</td>
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<td>11.34 (.25)</td>
<td>10.36 (.97)</td>
</tr>
<tr>
<td>Participants</td>
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</tr>
<tr>
<td>Disability</td>
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<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Low Writers</td>
<td>5</td>
<td>8</td>
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</tr>
<tr>
<td>Medium Writers</td>
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<td>21</td>
</tr>
<tr>
<td>High Writers</td>
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<td>4</td>
</tr>
<tr>
<td>ELL (SD)</td>
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<td>11</td>
<td>27</td>
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<tr>
<td>WiDA (SD)</td>
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<td>5.2 (.54)</td>
<td>4.7 (1.01)</td>
</tr>
<tr>
<td>IQ (NNAT) (SD)</td>
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<td>158 (162.27)</td>
<td>139 (141.89)</td>
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<td>WJIII (SD)</td>
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<td>12.44 (4.31)</td>
<td>10.33 (4.99)</td>
</tr>
<tr>
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<td>388.89 (65.02)</td>
<td>397.39 (58.82)</td>
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<tr>
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<td>377.10 (52.09)</td>
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<tr>
<td>Science State Assessment (SD)</td>
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<td>409.84 (44.82)</td>
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<tr>
<td>Social Studies State Assessment</td>
<td>423.00 (50.91)</td>
<td>434.67 (62.00)</td>
<td>419.67 (48.84)</td>
</tr>
</tbody>
</table>

Table 2
Experimental Group Student Characteristics
Table 3

*Control Group Student Characteristics*

<table>
<thead>
<tr>
<th></th>
<th>Grade 4</th>
<th>Grade 6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age Y/M</td>
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<td>Participants</td>
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<tr>
<td>Disability</td>
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<tr>
<td>Low Writers</td>
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<td>9</td>
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<tr>
<td>Medium Writers</td>
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<td>9</td>
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</tr>
<tr>
<td>High Writers</td>
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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>ELL</td>
<td>11</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>WiDA</td>
<td>4.63 (SD = .90)</td>
<td>4.84 (SD = 1.58)</td>
<td>4.7 (SD = 1.17)</td>
</tr>
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<td>IQ (NNAT)</td>
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<td>98.34 (SD = 14.89)</td>
</tr>
<tr>
<td>WJIII</td>
<td>13.38 (SD = 3.76)</td>
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<td>383.90 (SD =60.98)</td>
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<tr>
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<td>420.19 (SD = 53.34)</td>
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Table 4

*Teacher Demographic Data*

<table>
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<tbody>
<tr>
<td>Gender</td>
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<tr>
<td>Male</td>
<td>1 (16%)</td>
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<tr>
<td>Female</td>
<td>5 (83%)</td>
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<tr>
<td>Licensure</td>
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<tr>
<td>Special Education</td>
<td>2 (33%)</td>
</tr>
<tr>
<td>K-8 Teaching</td>
<td>5 (83%)</td>
</tr>
<tr>
<td>Degree Earned</td>
<td></td>
</tr>
<tr>
<td>Bachelors</td>
<td>1 (16%)</td>
</tr>
<tr>
<td>Master’s</td>
<td>4 (66%)</td>
</tr>
<tr>
<td>Doctorate</td>
<td>1 (16%)</td>
</tr>
</tbody>
</table>

**Setting**

The study occurred at a high-needs public elementary school that serves students with and without disabilities on the East Coast of the United States. The school served approximately 500 students from pre-kindergarten to the 6th-grade. Most of the student population was Hispanic, 55.4%, with a higher representation of African American students, 32.4%, and a small number of White (2.3%) and Asian (7%) students. In addition, 22.2% of the students lived in low income households. This school was a Title 1 school and received additional funding for serving low-income students. This school provided services to students with disabilities in the least restrictive environment. Students with disabilities in this school received most of their instruction in an inclusive
classroom.

In this elementary school, students received instruction in the core content areas from their classroom teacher. Content was taught in language arts, mathematics, social studies, and science. The teachers across each grade level determined when to teach science and social studies and were required to cover specific learning standards within these content areas prior to the end of the year. Teachers taught science as a separate subject and incorporated social studies content during their language arts block. Science and social studies were taught throughout the week, although both subjects were not taught on the same day.

Classroom Narrative

In the following section, descriptions of the experimental and control classrooms are included. This information was collected through researcher observation prior to the first week of instruction for the intervention. All names are pseudonyms to protect the identity of the participants.

Sixth grade experimental class. Ms. Scott was a friendly teacher who had a very good rapport with her students. Students were often sociable with Ms. Scott throughout the day and were very playful towards her. However, Ms. Scott’s classroom was also very structured. She set behavioral expectations for the students and students were reminded of these expectations throughout the day. These expectations included reading a book after any work was finished and only asking to use the restroom at certain times during the day. The students also had certain freedoms in the classroom, including getting water, tissue, or hand sanitizer without asking for permission.
The intervention occurred during the language arts period in the second block of the day. This block started at 9:00 am after the students returned from specials, such as Art, Chinese, Technology, and Physical Education. After the students returned from specials, they placed their backpacks on hooks in the room, sat down at their desks, and immediately gave their attention to Ms. Scott, who began instruction. Students always settled quickly and there were minimal behavioral issues in the classroom. Ms. Scott stated that the only difficulty she had with her students was that they were sometimes talkative.

During the language arts block, Ms. Scott taught the class of 22 students as a whole group. Ms. Scott usually stood at the front of the classroom and used the overhead projector to present text for the class to read and to guide the completion of worksheets. Ms. Scott often completed activities along with the students. She would read a text, ask students questions about the text as she read it, and completed an activity with the students. Typically, Ms. Scott would ask a question on a worksheet, give the students a few minutes to answer the question, and then ask a student to share their answer. The students were always engaged with an activity; therefore, students were rarely off task.

**Sixth grade control class.** Dr. Samm was a very stern, but friendly, teacher to his classroom of 21 students. He set behavioral expectations for his students and followed through with them strictly. Dr. Samm expected quiet in his classroom and required students to read when finished with their work and whisper quietly when talking to their peers. Dr. Samm would state his behavioral expectation and then wait until it was followed through by the whole class.
The intervention in Dr. Samm’s class also occurred after specials during the second block of the day. The students came back from specials and then immediately settled in for the language arts block. When teaching, Dr. Samm presented lessons at the front of the classroom with an overhead projector or had the students meet at the back of the classroom and sit on a decorative carpet as he taught from a chart board. He would read or present the lesson to the students and then require students to work on a worksheet or task independently at their seats. In comparison to Ms. Scott’s classroom, the students in Dr. Samm’s classroom spent more time working independently on assignments.

**Fourth grade experimental class.** Ms. Truly had a very structured classroom, but frequently provided students with opportunities for breaks throughout the day. During the language arts block, Ms. Truly often taught at the front of the classroom while the students were sitting at their desks. The students would complete worksheets or other independent assignments after Ms. Truly provided direct instruction. She also conducted small reading groups at an instructional table at the back of the classroom while other students work independently at their desks. During transitions, Ms. Truly would provide the students 10-minute breaks to talk to a neighbor, draw, dance, or walk around the classroom.

The intervention occurred after lunch during the language arts period. Ms. Truly would typically create rotating stations in her classroom during the language arts block, which included small groups working with the teacher, students working independently at desks, and reading on the carpet.
Fourth grade control class. Ms. Roes was very approachable and caring towards her fourth grade students. Ms. Roes had a very flexible, but structured, classroom. When students finished their work, they were allowed to read a book anywhere in the classroom. During down time in the language arts period, the students were often reading books on the floor, under their desks, or with an adult volunteer or classroom aide at a table. She frequently tried to find strategies that helped to support her students, especially the ELLs and low performing students in her classroom.

The intervention occurred after lunch during the language arts period. Ms. Roes would often incorporate various types of technology in the language arts period. During language arts, Ms. Roes would use the smart board, video clips, and the projector while teaching. Typically, Ms. Roes taught a lesson at the front of the classroom using technology, and then would split the classroom into small, rotating groups. Students would either work at their seat on an independent activity, or work in a small group with Ms. Roes at her teacher desk.

Independent Variable

The intervention investigated in this study includes three components to support struggling writers in the creation of argumentative written responses in the content area of social studies and science. The components of this intervention included the IDEAS strategy, a CBGO with embedded SRL strategies, and related lesson plans. The original intervention, including the IDEAS strategy, CBGO, and lesson plans, was developed as part of the Stepping-Up Technology Implementation grant (Evmenova & Regan, 2012) for a persuasive essay genre (Evmenova, et al., in press). The original intervention was
adapted to address argumentative written responses for science and social studies in the current study.

The intervention contains several components; the IDEAS strategy, related lessons, and the CBGO. The IDEAS strategy is a mnemonic reinforced in the CBGO and related lessons. The mnemonic was developed to help students recall the important parts of an argumentative paragraph, and the CBGO was developed to provide the student with a tool to structure their essay. The graphic organizer contained strategies to encourage the SRL process, which would support students in the self-regulation of their writing. The lessons plans introduced arguments in writing, the IDEAS strategy, and how to use the CBGO to construct an argumentative paragraph. These three components provided the students opportunities throughout the lesson to learn how to use the CBGO, engage with a strategy to remember the components needed to create a quality argumentative paragraph, and utilize the tool to develop the paragraph and engaged in the SRL process. Each of the components is described in detail below.

**IDEAS Strategy**

The mnemonic IDEAS was used to guide students through the required parts of an argumentative paragraph. IDEAS represents: I = Identify your claim; D = Determine three facts; E = Elaborate with evidence; A = Add transition words; and S = Summarize your claim (see Appendix C for the visual representation of the IDEAS strategy). The mnemonic was embedded into the CBGO and was reinforced throughout the related lessons and student activities.
Computer-Based Graphic Organizer with Embedded SRL Strategies

The CBGO is a two-page document created in Microsoft Word 2010-2013 that includes five parts representing the specific steps required to develop a complete argumentative paragraph (Appendix D). These parts include goal setting, brainstorming, a table which guides students to complete sentences for each paragraph part, self-monitoring, and self-evaluation. This graphic organizer also guides students through the three phase cyclical process of self-regulation (Zimmerman, 2000).

The graphic organizer consists of five sections, each of which relates to one of the three phases of SRL process. For the forethought phase, students complete the first two parts of the graphic organizer. The first part requires students to set a goal for their writing. In the CBGO, students can select three goals from a drop down menu. The goals consist of; (1) I will create an essay with three facts and one elaboration; (2) I will create an essay with three facts and two elaborations; and (3) I will create an essay with three facts and three elaborations. Students then completed the first step in the second part of the graphic organizer, which prompts students to brainstorm what they will write about. The process of brainstorming corresponds to the SRL strategy of strategic planning, in which students think about and plan what they will write about in their paragraph. The combination of goal setting and brainstorming encompass the task analysis portion of the forethought phase. Motivation is also a part of the forethought phase. By setting a goal for their writing, students may become motivated to complete the writing task.
The second part of the SRL process, the performance phase, is represented in the graphic organizer by the third and fourth parts of the graphic organizer. These two steps appear in a four column, six row table below the brainstorming box. In the third part of the graphic organizer, students are prompted to utilize a strategy to structure their brainstormed ideas from the second part. The IDEAS mnemonic appears on the left side of the column, with each letter of the mnemonic in a row. The mnemonic in the table guides the students through self-instruction. By reminding students of what should be included in their essays through the visual mnemonic and the structure of the table, students could potentially internalize these steps and practice them as self-instructions to complete the task without the graphic organizer. Beside the mnemonic column is a main points column for students to structure their brainstormed ideas, in words or phrases, to relate to one of the needed parts for the paragraph as represented by the mnemonic. Beside the main points column, is a sentence column, which is the fifth step of the CBGO. Students write complete sentences here based on the words written in the main points column. The column to the right of the sentences is the fifth part of the CBGO, the self-monitoring column. In this section, the students check boxes that indicate if they have complete sentences that are related to each part of the paragraph as represented by the IDEAS mnemonic and their goal and if they have included transition words. Once students have completed sentences in the sentence column and self-monitored their process, they copy and paste sentences into a box below the table. This created a complete paragraph that can be revised and edited by the student.
The final phase of the SRL process is the self-reflection phase in which students review their work to form opinions about their performance on the task. This is represented in the CBGO as the self-evaluation section, the sixth part of the graphic organizer. The self-evaluation part prompts students to review their paragraph and answer questions about their writing, form an opinion about their performance, and set a goal for the next time they write.

Additional supports are also embedded throughout the CBGO. When hovering the mouse over the IDEAS mnemonic and all other headings in the table, pop-up windows appear which provide students with cues as to what to include in each part of the graphic organizer. Also, clickable images of lightbulbs, which provide audio comments, are incorporated beside the main points, sentence, and check your work columns, and each letter of the IDEAS mnemonic. The comments include recorded human voices as audio that explain how to complete each section. The CBGO is also compatible with Microsoft Word’s text to speech software. Students are able to highlight any text, including their final paragraph to hear the text read out loud. The use of text to speech supports students who are unable to read the text in the CBGO and students who benefit from hearing text out loud to edit and revise their work. Drop-down menus are used throughout the CBGO to help the students select from a set of options for goals and transition words. This set of options supports students that may have difficulty independently thinking of words or goals for their writing.

Lesson Plans

Four lessons were developed to introduce argumentative writing, SRL strategies,
and the CBGO to the students. These lesson plans were modified from lessons
implemented and refined in previous research (Evmenova et al., in press). The lessons
include the following topics (1) introduction to argumentative paragraphs and using the
IDEAS strategy for writing (2) SRL strategies (3) guided practice in writing an
argumentative paragraph using the CBGO and (4) independent practice of writing the
argumentative response with the CBGO. Each lesson was planned to last approximately
one hour. An additional lesson taught students to maintain SRL strategies to writing
argumentative responses without the CBGO. These lessons were sequential, with the
maintenance lesson taught after the posttest and application assessments. Each lesson
plan had an accompanying PowerPoint presentation and various student activities.
Lesson plans and activities are described in more detail in the Materials and Procedures
sections below.

**Materials**

Teachers in both conditions received binders that contained all the materials used
for the intervention, including lesson plans, printed PowerPoint presentations with notes,
student folders, pencils, and digital copies of all materials on a flash drive. Teachers also
received a video camera and tripod to video record all teaching sessions during the
intervention. The following section provides details about the teaching materials for both
experimental and control conditions.

**Experimental Group: Teacher Materials**

Teachers in the experimental condition received binders containing all the
materials needed for teaching the lessons. Tabs and page dividers were used to separate
the lesson plan, printed copies of PowerPoint presentations, student activities, teacher
answer sheets, and student notebooks.

Lesson plans and recommended scripts were included in the binders. These
lesson plans were formatted to align with the school systems lesson plan format and were
related to grade level standards. The lesson plans contained mandatory and
recommended scripts and actions. Visual cues supported teacher actions, for example
blue font and brackets signaled teacher actions. Lesson plans were provided in both
digital and printed format. Printed PowerPoint presentations were included in the binder
for lessons 1-5. The PowerPoint printouts also include notes that contained the
mandatory and recommended script as well as suggested actions. Printouts of the paper-
based and computer-based student activities were also included in the teacher binder.
Teachers also received a numbered list of topics that needed to be covered during the
lesson. This was used as a support to guide teachers through the needed components of
the intervention incase teachers opted to not read the recommended script in the lesson
plan.

Fidelity checklists for each lesson were included in the teacher binders. The
checklist contained a list of steps that must be completed by the teacher for delivering the
intervention with high fidelity. These checklists were the same as the researcher fidelity
checklists (Appendix E). Finally, posters were provided to the teacher that presented the
IDEAS strategy and the meaning of each letter. These posters were hung in the
classroom as reference for the students and teachers during the intervention. Posters were
approximately 18” x 24” inches and laminated. The posters were hung prior to the start of the lesson daily and removed after each session.

**Control Group: Teacher Materials**

Teachers in the control group received binders containing all materials needed to teach the writing process. The binders included lesson plans, printed *PowerPoints* with notes, fidelity checklist, and student materials. The binders contained lesson plans with suggested and recommended scripts. The lesson plans were also aligned to state and grade level standards. Printed *PowerPoints* were included with a notes section with suggested and recommended scripts and actions.

Fidelity checklists for each lesson were shared with teachers in the binders. The checklist contained a list of steps that must be completed by the teacher for delivering the intervention with high fidelity. These checklists were the same as the researcher fidelity checklists (Appendix F). Posters were also given to teachers in the control group. These posters contained the steps to the writing process and the editing and revision strategies. These posters were hung in the classroom as reference for the students and teachers during the intervention. Posters were approximately 18” x 24” inches and laminated. The posters were hung prior to the start of the lesson daily and removed after each session.

**Experimental Group: Student Materials**

Students in the experimental group received folders with all required paper-based materials. Materials included the IDEAS strategy card, student agendas, and materials
specific for lessons 1-5 (Appendix F). Paper dividers were used to separate the materials for each lesson. All computer-based materials were provided to students on individual flash drives. Students received directions from the teacher to complete either computer-based or paper-based activities to reinforce the concepts throughout the intervention.

**IDEAS strategy card.** Students received a reference card with the IDEAS strategy with the visual cue of a light bulb. On the left side of the 4x4 card, the IDEAS strategy was listed vertically explaining which part of the strategy each letter represents. On the right side of the card, there was an image of a light bulb. During lesson 1, students were instructed to draw a line from the letter in the mnemonic to the related section of the light bulb to reinforce the mnemonic and the importance of each part of the strategy for the structure of an argumentative essay. Transition words were also included on the back of the strategy card. Students could reference IDEAS strategy card throughout the lessons.

**Student agenda.** Student agendas were used in each lesson. The student agenda included the purpose of the lesson, the agenda for the lesson, and the vocabulary terms for the lesson. During each lesson, students checked off each part of the agenda as it was completed.

**Lesson 1 materials.** Lesson 1 worksheets included a sample argumentative paragraph and an argumentative paragraph to be labeled individually (see Appendix F). Both sample paragraphs represented an argumentative paragraph in the science content area. In both paragraphs, a blank square was at the end of each paragraph. This blank square was for students to write in the letter of the mnemonic that each sentence
represented. These activities were used to support the students’ knowledge of the parts of an argumentative essay.

**Lesson 2 materials.** Lesson 2 worksheets included a warm up activity and a scavenger hunt worksheet (see Appendix F). The warm up activity required students to match the part of the mnemonic with the related part of the visual cue of the mnemonic. The purpose of this activity was to reinforce the mnemonic and the paragraph parts that are important to an argumentative essay. The scavenger hunt worksheet required students to open the CBGO, look for specific parts within the graphic organizer, and then answer questions about the CBGO. The purpose of the scavenger hunt activity was to help students learn the various parts of the graphic organizer and become familiar with the embedded supports throughout the CBGO.

**Lesson 3 materials.** Lesson 3 student worksheets included a warm up activity and a worksheet. The warm up activity for Lesson 3 required students to answer multiple-choice questions about the sequence of completing the graphic organizer and the use of the SRL strategies. The purpose of this activity was to reinforce the parts of the graphic organizer to support the students’ ability to complete those parts during writing activities. The worksheet contained a screenshot of a partially completed graphic organizer. In this worksheet, students were required to find the parts of the CBGO that are missing and answer why those parts are important to completing a quality argumentative essay. In addition to paper-based worksheets, students used the CBGO file during Lesson 3 in order to complete the guided practice of using the graphic organizer to write an argumentative paragraph.
**Lesson 4 materials.** Lesson 4 student worksheets included a warm up activity. The warm up activity in Lesson 4 is a review of the IDEAS strategies. This activity reinforces the mnemonic prior to independent practice of writing an argumentative essay using the graphic organizer. In addition to the paper-based worksheet, students used the CBGO during Lesson 4 in order to independently practice completing the CBGO.

**Computers.** Students in the experimental group used computers during lessons and when using the CBGO to respond to prompts. Students used a combination of 16-inch Toshiba laptops and 11-inch Acer notebook laptops for pretest, instructional activities and practice, posttest, application, and maintenance.

**Control Group: Student Materials**

The control group received instruction in the writing process, including editing and revision strategies. The writing process intervention was modified from a writing intervention by Troia and Graham (2002). The writing process instruction focused on the components of drafting, revising, editing, and publishing. All control group activities and materials mirrored that of the experimental groups, but were altered to focus on writing with the writing process and editing and revision strategies. Students in this group received notebooks containing the writing process intervention materials. The notebooks included student worksheets and two writing process cards.

**Student agendas.** Student agendas, containing a brief overview for the lesson, were used in each lesson. The student agenda included the purpose of the lesson, the agenda for the lesson, and the vocabulary terms for the lesson. During each lesson, students checked off each part of the agenda as it was completed.
Writing process cards. Two writing process cards were given to each student. The first 4x4 card listed the steps of the writing process. The second card included the revision and editing strategy that the students used throughout the intervention.

Sample argumentative paragraphs. Sample argumentative essays were used throughout the intervention. These example essays were a single paragraph in the science and social studies content areas.

Lesson 1 materials. Lesson 1 student materials consisted of one paper-based activity. The worksheet contained five paragraphs representing a paragraph at each phase of the writing process. The students were required to cut out the paragraphs, order them in the steps of the writing process, and then paste on a sheet of construction paper.

Lesson 2 materials. In lesson two, students completed a warm up activity and an editing activity. The warm up was a paper-based matching activity that required students to draw lines to connect the terms of the writing process to their definition. Students also completed an editing and revising activity where they applied the ARMS and CUPS strategy to change mistakes in a paragraph in the social studies content area.

Lesson 3 materials. Lesson 3 materials consisted of a warm up, guided practice, and wrap-up activity. The warm up activity was a paper-based worksheet that required students to recall and write the letters of the editing and revision strategy. The guided practice activity required students to use the writing process and the editing and revision strategies to write a paragraph with guidance from the teacher. This activity was completed on the computer. The wrap-up activity was a true and false paper worksheet where students answered questions about the writing process.
Lesson 4 materials. Lesson 4 materials contained a paper-based warm-up activity and an independent computer-based writing activity. For the warm-up activity, students received a worksheet that contained questions about the writing process. The students had to answer the questions in sentences or phrases in the line beneath each question. Lesson 4 also contained a computer-based activity, where students used a Microsoft Word document to respond to a prompt while using the writing process.

Computers. Students in the experimental group used computers during lessons and when using the CBGO to respond to prompts. Toshiba and Acer laptops were also used in the control group during pretest, instructional activities and practice, posttest, application, and application.

Dependent Measures and Data Sources

Holistic writing quality, number of transition words, number of words, number of sentences, and accuracy were the dependent measures for the writing outcomes. In addition, a questionnaire and interviews were used to explore the SRL strategy use of a sample of participants. Document analysis was also conducted to determine the sections completed of the CBGO and the planning steps that occurred during maintenance.

Holistic Writing Quality

A holistic writing quality rubric was developed by the researcher to score the overall quality of the argumentative paragraphs in science and social studies (Appendix G). The rubric was used to score the paragraphs generated at pre and posttest, and during application and maintenance phases. The quality of the argumentative paragraph was
defined as the students’ ability to clearly express their knowledge of the topic in writing. The holistic quality rubric was tested for reliability and validity prior to the intervention. Students could score a minimum of 0 points to a maximum of 60 points with portions of the scoring related to number of sentences, paragraphs, capitalization, number of transition words, number of t-units, consistency, and accuracy. These points were then compartmentalized into ranges within a five-point scale for holistic quality, ranging from unsatisfactory to excellent paragraph. Points ranging from 1-11 were categorized as an unsatisfactory paragraph and points from 12 to 22 were insufficient. Twenty-three to 33 points was an uneven paragraph, 24-44 points were sufficient paragraphs, and 44-45 points were excellent paragraphs. A score of 0 indicated no response.

**Design and validation.** To develop the scoring rubric, existing writing samples from students with disabilities were reviewed. In addition, existing validated expository rubrics used in previous research were located. Rubrics and existing writing samples were used to develop scoring constructs.

First, three writing samples in science and social studies were obtained from 6th-grade students with HID. It was noted that these students did not write complete sentences. Therefore, the accuracy of the essay were not scored as complete sentences, but rather t-units, so that students would not be penalized for accuracy if they did not punctuate their sentences. It was also noted that students did not include many facts, or elaboration of these facts, and often had spelling mistakes.

Next, existing rubrics were reviewed to determine constructs that measure quality of writing. These included rubrics developed specifically for writing interventions and
the writing assessment for the National Assessment of Educational Progress (NAEP) (Kulikowich, et al, 2007; USDOE, 2012). From review of the research, it was determined that constructs of accuracy, organization, depth of content, grammar, and syntax were important constructs to measure the quality of informational paragraphs (Kulikowich, et al, 2007; USDOE, 2012). These constructs would also measure the skills taught within the developed argumentative writing intervention. However, in each of the rubrics reviewed, ratings were subjective and did not include any quantification of the constructs; therefore the decision was made to quantify each construct. Quantification of constructs would help to reduce scoring bias. According to research, six-point writing rubrics are effective (Wolcott & Legg, 1998). Each construct was broken into quantifiable components on a six-point scale. To determine how each construct should be quantified, existing research was reviewed for the average amount of words students write in paragraphs and the number t-units included in a paragraph for students in upper elementary school. Ranges for number of parts, quality of topic and conclusion, accuracy, and consistency was based on the ideal achievement after the CBGO intervention.

The completed rubric was sent for review to two special education teachers including a special education middle school science teacher and an elementary special education teacher. In addition, the rubric was sent to an educational assessment writer with experience in developing and revising writing rubrics. The rubrics were emailed to each reviewer with instructions to (a) review for content, (b) note if any construct should be added or deleted, (c) recommend changes in phrasing or format, and (d) judge if each
quantifiable construct accurately measured the high, medium, or low rating. Changes were made to the phrasing of some scoring constructs. For example, ‘discrete conclusion sentence’ was changed to ‘discrete conclusion sentence that clearly and effectively summarizes topic’.

After the rubric was reviewed and edited, 11 writing samples were obtained from students of mixed abilities, including students with disabilities, students without disabilities, and high and low achievers in a 7th-grade science class. The students responded to a science prompt. Five additional informational paragraphs were located online. The science and informational paragraphs essays were scored using the revised scoring rubric. Construct validity was determined through convergent validity by scoring the essays using the developed rubric and also the NAEP expository writing quality rubric. Reliability was determined through inter-rater reliably with a second rater scoring thirty percent of the essays. Inter-rater reliability was at 86% after training with the second rater. The scorer for inter-rater reliability was an assessment writer. This second rater did not score written responses during the intervention.

**Number of Transition Words**

Number of transition words was counted by determining the total number of transition words included in the paragraph. Transition words were counted as any word of phrase that signal a transition of thoughts at the beginning of a t-unit. Examples of transition words or phrase include; also, therefore, for example, however, and furthermore.
Number of Words

The number of words for the student essays was calculated by using the word count feature in the *Microsoft Word*. All words, including articles, were counted for the number of words in the student essays. Number of words was calculated at pre, post, maintenance to writing without the CBGO, and application to another content area tests.

Number of Sentences

Number of sentences was used as an additional measure. A sentence was considered a complete sentence if it contained a noun and verb and represented a complete unit of thought. The number of sentences was determined by counting all sentences that ended with a period and/or other ending punctuation mark. Sentences did not have to begin with a capital letter to be counted as a complete sentence. Number of sentences was calculated at pre, post, maintenance, and application phases. Although number of sentences was counted, accuracy of content was not determined by the accuracy of a sentence, but rather the accuracy of t-units, in case students did not use punctuation in their writing.

Accuracy

Accuracy of the topic was measured through accuracy of the text written. Once the students respond to the argumentative writing prompt at pre and posttest, the responses were coded for number of t-units that contain accurate responses. The percentage of t-units, which were the number of t-units that contained accuracy responses divided by total number of t-units, corresponded to an accuracy rating of 1 to 5, which
ranged from an inaccurate to accurate paragraph.

**Questionnaire**

A strategy use, self-efficacy and motivation questionnaire was developed to determine the self-efficacy and motivation of students before and after the intervention (Appendix H and Appendix I). The 23-question survey contains questions about motivation for writing and self-efficacy. The questionnaire was modified from an existing validated efficacy and motivation survey that included 37 questions (Payne, 2012). Modifications included the removal of some questions to reduce the length for the younger students included in this study. Questions specific to writing in science and social studies were also added. In addition, the scale was also changed to include only three options with visuals to help students to understand disagree, neutral, and agree. Five questions were added specifically related to use of strategies while writing. The questionnaire includes seven questions related to strategy use, including SRL strategies, nine questions directly related to motivation, and seven questions related to self-efficacy.

**Interviews**

A sample of students was randomly selected to represent high, medium and low writers and students with HID. This included a total of 21 students in the 4th- and 6th-grade, which included low, medium, and high performing writers. The interviews were extensions of the strategy use, self-efficacy and motivation questionnaire. The researcher interviewed the sample of participants following an interview protocol to determine the student’s self-efficacy, motivation, and use of SRL strategies before and after the
interventions (Appendix I). Experimental students also answered interview questions after the maintenance phase. To determine the SRL strategy knowledge and their process of writing the paragraphs, the students read over their writing, and described their process of developing the paragraphs. In the interviews, students described their process of writing with or without the graphic organizer, and then answered specific questions about their motivation, self-efficacy, and strategy use before and after the intervention. The interview protocol contained 16 questions. Each interview was audio recorded and the duration of the interviews were approximately 4-minutes per student.

**Procedures**

Prior to the start of the intervention, permission was received from George Mason University and the schools districts Institutional Review Board was obtained. Then teacher, parental consent and student assent was obtained. Students, stratified by grade level, were randomly assigned to either experimental or control group.

Prior to random assignment, teachers nominated high, medium, and struggling writers. This nomination of students was used to stratify students based on writing achievement in the experimental and control conditions. To determine which students were high, medium, and struggling (low performing) writers, the researcher developed a 3-point scoring rubric of writing traits (Appendix B). The NAEP scoring rubric of excellent, uneven, and insufficient essays was used as a guide to develop the rubric. Constructs of writing, including grammar, punctuation, details, length, spelling, and organization, were included within the rubric. These aspects of writing could receive a score of 1 to 3, ranging from poor to proficient use of each element by the student in their
writing sample. A total score of 17 to 21 indicated a high performing writer, medium performing writers scored in the range of 12 to 16, and low performing writers scored between 7 and 11. Using the developed rubric, the teachers and researcher collaboratively scored the student writing samples. For the 4th-grade classrooms, there was a total of 13 struggling, 23 medium writers, and four high performing writers. In 6th-grade, there were 17 struggling, 17 medium, and three high performing writers. For each class within a grade level, students were ranked from the highest to the lowest scores, based on scores on the writing performance rubric, creating a numerical list of writers from high to low. Students from one class within their grade level were matched with the student of the same rank from the second class within the same grade level. This created matched pairs of students. Each matched pair was separated and randomly assigned to either an experimental or control group within their grade level to ensure that the experimental and control condition had a similar number of high, medium, and struggling writers.

For each grade level, there was one experimental and one control group, creating a total of two experimental groups and two control groups. Teachers who attended all trainings on instructional procedures during professional development were assigned to the experimental condition in the 6th-grade. The first 4th-grade teacher that was recruited for the study was assigned to the experimental condition. The duration of the intervention ranged from approximately six to eight weeks per classroom, and included testing, instruction, and interviews. This intervention required students to respond to an argumentative prompt based on informational social studies text. During the first week,
the researcher administered all pretest measures. Writing assessments and self-efficacy surveys were administered in large groups with all students in the classroom. Interviews were conducted with students individually. Students then participated in either the experimental or control intervention. Each writing lesson lasted an average of one hour for the experimental and control group.

Following the writing lessons, teachers taught researcher created social studies content in their classroom and required students to answer an argumentative prompt in writing with support of the CBGO for the experimental group and writing process and revision strategy in the control condition. Both the experimental and control groups wrote a total of five essays during the practice sessions. Immediately after the last practice session, post-test measures were administered. After post-test, students were required to write in an additional content area. This application measure required students to write an argumentative paragraph with the support of the CBGO in the science content area. Students then wrote during the maintenance measure without support of the CBGO. More details of the testing and lesson procedures are in the following sections.

**Professional Development**

The researcher conducted professional development with the teachers in the study. This professional development was conducted in the summer prior to the beginning of the school year and the start of the intervention. During the two professional development sessions, teachers were presented the purpose of the research study, introduced to the CBGO, and provided with an overview of all of the lessons for
the intervention. The professional development was presented with a *PowerPoint* presentation and each session was approximately three hours.

**Day 1.** During the first portion of the professional development, teachers were presented with an overview of the research study. This overview briefly discussed the purpose of the study, the genre of writing that this study would address, and the aspects of writing that the intervention would target. The researcher then briefly discussed results from previous research utilizing a similar intervention and presented previous examples of pre and posttest writing samples from a student with a learning disability.

After presenting an overview of the research study, the researcher shared the results of the previous research on SRL strategies and discussed how these strategies would be implemented in this intervention. The SRL strategies presented included goal setting, self-monitoring, self-instruction, and self-evaluation. The researcher then discussed argumentative writing, which is the type of writing that would be the focus of this research study. It was discussed how students’ responses to argumentative writing prompts may support content comprehension and also demonstrate students’ understanding of the topic. The school district standards were then discussed. The parts of the intervention that supported the school district learning standards were highlighted. The researcher then discussed the parts of the intervention and the strategy that help students to construct quality written response to answer an argumentative prompt.

During the last portion of the first day of the professional development, teachers received an overview of the CBGO that would be used in the intervention. The researcher presented the features of the CBGO, including embedded supports, and how
these supports help struggling writers as well as students with HID. The teachers explored the graphic organizer with support of the researcher and created a paragraph unrelated to science or social studies content. The researcher then received feedback regarding the graphic organizer.

**Day 2.** For the second day of the professional development, the teachers wrote argumentative essays based on informational text in the science content area with the support of the CBGO. The researcher also modeled lesson 1 of the intervention and provided a detailed overview of each of the lessons in the intervention. Teacher and researcher also participated in a collaborative planning discussion of the incorporation of science and social studies content during the intervention.

To construct an argumentative essay based on informational text followed by a writing prompt, the researcher presented short text on the projector. Teachers read the informational text and then responded to the prompt using the CBGO. Teachers completed each section of the graphic organizer, then participated in a brief discussion about (a) their opinion of using the CBGO to write an essay based on informational text, and (b) how they believed this intervention would support their students. The researcher then modeled lesson 1 of the intervention and reviewed in detail the additional lessons. During this time, teachers were presented with the binders for the intervention. As each lesson was reviewed, the teachers were instructed to look over the lesson plans and student materials. Teachers then provided feedback about the lesson plans and student worksheets.

**Grade level team meetings.** After the group professional development, the
researcher met with the teachers on grade level teams to discuss logistics, review class lists of students, and to discuss and collaboratively plan the timeline of the research study. The content to be covered during the practice sessions were also covered. Each grade level team meeting was approximately 30-minutes. These grade level team meetings were facilitated by the researcher who supported the teachers during research implementation.

**Instructional Procedures**

The following section includes the instructional procedures for the experimental and control groups. Teaching procedures and the timeline for instruction and testing is also included.

**Experimental group instruction.** Experimental instruction occurred over a three-week period for the 6th-grade classrooms, and a six-week period for 4th-grade classrooms. Students in the experimental condition learned how to write argumentative paragraphs in the content area of social studies with the support of a CBGO with embedded SRL strategies and related lessons. All lessons were co-taught by the researcher and teacher, with both the researcher and teacher participating in the presentation of the lessons and supporting students. Lessons were co-taught due to the large number of students in each classroom, the need for additional support in the classroom, or the teachers having difficulty implementing each lesson with fidelity. There were a total of four lessons and five practice sessions (Table 5). The instruction, including practice sessions, occurred during an hour long language arts block in 6th-grade. In 4th-grade, the four writing lessons and first practice session occurred during an
hour block, and the additional practice sessions took place during two hour blocks.

During the two hour blocks, the students had a 10 minute break and could dance or talk in the classroom. All instruction, including the maintenance lesson, was guided with PowerPoint presentations projected on a large screen in the classroom. Each lesson focused on the following (a) introduction to argumentative paragraphs and using a strategy for writing, (b) SRL strategies, (c) guided practice in writing an argumentative paragraph based on text and (d) independent practice of writing an argumentative paragraph based on text. Duration of experimental lessons in the 4th-and 6th-grade ranged from 1 hour to 1 hour and 30-minutes, with the total instructional time of 5 hours and 25-minutes for writing instruction. For practice sessions, the length of time ranged from 1 hour to 1 hour and 15-minutes, with a total practice time length of 5 hours and 30-minutes. See Table 5 for order of lessons and testing.

Table 5

*Experimental Group Schedule*

<table>
<thead>
<tr>
<th>Day</th>
<th>6th Grade Experimental</th>
<th>4th Grade Experimental</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pretest (writing)</td>
<td>Pretest (writing)</td>
</tr>
<tr>
<td>2</td>
<td>Pretest (self-efficacy and interviews)</td>
<td>Pretest (self-efficacy and interviews)</td>
</tr>
<tr>
<td>3</td>
<td>Make-up testing</td>
<td>Make-up testing</td>
</tr>
<tr>
<td>4</td>
<td>Lesson 1</td>
<td>Lesson 1</td>
</tr>
<tr>
<td>5</td>
<td>Lesson 1 and 2</td>
<td>Lesson 1 and 2</td>
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<tr>
<td></td>
<td>Lesson 1</td>
<td>Lesson 2 and 3</td>
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</tr>
<tr>
<td>6</td>
<td>Lesson 2 and 3</td>
<td>Lesson 2 and 3</td>
</tr>
<tr>
<td>7</td>
<td>Lesson 3 and 4</td>
<td>Lesson 3 and 4</td>
</tr>
<tr>
<td>8</td>
<td>Lesson 4 and Content Practice 1</td>
<td>Lesson 4/ Content Practice 1</td>
</tr>
<tr>
<td>9</td>
<td>Content Practice 1</td>
<td>Content Practice 1</td>
</tr>
<tr>
<td>7</td>
<td>Content Practice 2</td>
<td>Content Practice 2 and 3</td>
</tr>
<tr>
<td>8</td>
<td>Content Practice 3</td>
<td>Content Practice 4 and 5</td>
</tr>
<tr>
<td>9</td>
<td>Content Practice 4</td>
<td>Content Practice 5/ Post-test (self-efficacy and interviews)</td>
</tr>
<tr>
<td>10</td>
<td>Content Practice 5</td>
<td>Application measure</td>
</tr>
<tr>
<td>11</td>
<td>Post-test (self-efficacy and interviews)</td>
<td>Lesson 5 and Maintenance Practice</td>
</tr>
<tr>
<td>12</td>
<td>Application measure</td>
<td>Maintenance measure</td>
</tr>
<tr>
<td>13</td>
<td>Lesson 5 Maintenance Practice 1</td>
<td>Maintenance interviews</td>
</tr>
<tr>
<td>14</td>
<td>Maintenance Practice 2</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Maintenance Practice 3</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Maintenance measure (maintenance interviews)</td>
<td></td>
</tr>
</tbody>
</table>

**Lesson 1.** Lesson 1 began with the teacher starting the *PowerPoint* and
presenting the agenda for the day. Prior to starting the presentation, students received their student notebooks and were instructed to turn to the agenda in lesson 1. Then the teacher introduced the emphasis on learning a strategy and developing a plan to become a better writer. Students were also introduced to what it means to develop an argument. The students watched a video that presents an argument followed by the teacher reviewing how the speaker in the video developed an argument by presenting facts and elaborations. The teacher then presented the IDEAS strategy and discussed how an argument in writing can be developed by using each part of the IDEAS strategy. After discussing the strategy, the teacher played a PowerPoint game with the students. In the game, a sentence was presented on the board with options for the part of the paragraph that the sentence represented. The students selected from the options of summary, topic, facts, and elaborations. The teacher discussed why the students’ responses were correct and incorrect. After playing the game, the students reviewed a quality argumentative essay that contains all the parts from the IDEAS strategy. The students completed the guided practice activity of labeling the parts of an argumentative essay. Then, students independently labeled a different argumentative essay with each part of the IDEAS strategy.

**Lesson 2.** At the start of the lesson 2, the teacher started the PowerPoint presentation and review the agenda with the students. The students were handed their folders and instructed to turn to the agenda in lesson 2. The teacher reviewed the key words for the lesson and handed students a computer to complete a paper-based warm-up activity. During this warm-up activity, the students completed a worksheet that required
the students to write the IDEAS strategy in order. The teacher then reviewed the warm up activity. After reviewing the warm-up activity, the teacher informed the students that they will learn some steps to improve their writing. These steps were the SRL strategies that included setting a goal, self-monitoring, and self-evaluation. The teacher presented each of the steps to the student in the *PowerPoint*. The teacher reviewed how these steps could be used to improve writing and how the CBGO incorporates these strategies. The researcher, who was providing support through the lesson, demonstrated features of the CBGO to the students on a video projector. The students completed parts of the graphic organizer with guidance of the researcher. After completing sections of the CBGO guided by the researcher, the students completed the paper scavenger hunt activity. The teacher then closed out the lesson by reviewing the scavenger hunt worksheet.

**Lesson 3.** At the beginning of the lesson 3, the students received their student folders and the teacher reviewed the agenda and key terms. The students completed a paper-based warm up activity to answer questions about the CBGO. The worksheet contained questions about the order of completing the CBGO and how the SRL strategies can support writing. The teacher then began the guided practice writing activity. On the *PowerPoint* slide, the teacher presented a short informational text. The 450-word text, ‘The Five Second Rule,’ discussed how scientists tested food that has dropped on the floor to determine how much bacteria was on the food. The teacher read the text out loud and reviewed the main points of the text. The teacher read the writing prompt to the students. After the prompt was read out loud, the teacher modeled the think aloud process of responding to the prompt while using the CGBO. Students worked on the
laptops and followed along with the teacher in reading the prompt, brainstorming, completing the main points column, writing the complete sentences, and evaluating the essay.

**Lesson 4.** At the beginning of lesson 4, students received their student folders and the teacher reviewed the agenda and key terms. The students were instructed to complete the lesson 4 warm up activity, which asked the students to list the IDEAS strategy and write what each letter meant. After the warm-up activity, students were instructed to open their laptops. The teacher read an additional short text about the five-second rule and gave the student an argumentative prompt. The teachers instructed students to independently answer the prompt using the CBGO. The teacher circulated the classroom to assist students in need of support.

**Make-up lessons.** Students who missed lessons attended short make-up sessions with the researcher to make up the concepts missed during the lesson. During these sessions, the researcher only introduced the concepts to the students and did not require students to complete the warm-up or wrap-up activities.

**Writing practice sessions.** Five writing practice sessions occurred in the social studies content area. During these practice sessions, the teachers reviewed important vocabulary and then read a short text, approximately 500 words, to the students. The text read across grade levels aligned with grade level standards, current instruction in social studies for that week, and related to the topic of product and industries. In the 4th-grade, students read about the Powhatan Native Americans. In the 6th-grade, students read about the Inuit Native Americans. During the first two sessions, the teacher led the students in
a very short discussion about the text after reading the content. The teacher gave students a writing prompt related to the text. The students answered the writing prompt while using the CBGO to construct an argumentative essay. In the first two practice sessions, the teachers provided support on writing an argument with the CBGO. The classroom teacher, researcher, and special education teacher provided support and feedback. This feedback focused on the use of the features of the CBGO to create a paragraph and the inclusion of periods at the end of sentences. The feedback did not address spelling, content, or grammatical errors. This support was reduced during the third lesson. During the third session, the teacher did not discuss the text with the class or guide the students through the CBGO, but rather provide individual support to struggling students. During the fourth and fifth practice session, the teacher only read the text and prompt to the student but did not provide any additional support. During the fourth and fifth sessions, the researcher observed the students independent completion of the CBGO to answer the argumentative prompt. Students who had difficulty using the CBGO to answer a question, and struggled to set a goal, write sentences, and check their work, had an individual remediation session with the researcher.

**Remediation sessions.** Remediation sessions occurred with students who demonstrated difficulty in using the CBGO to answer an argumentative prompt during the 4th- and 5th-practice session. The remediation sessions were conducted by the researcher and conducted either in the hallway outside of the classroom or at a table at the rear of the participating classrooms. Students qualified for remediation sessions if they did not complete two or three components of the CBGO, including setting a goal,
checking their work, or evaluating. These omissions had to impact the completion of a paragraph for students to qualify for the remediation sessions. For example, students who skipped goal setting and evaluation, but completed a paragraph that included all the parts of argumentative response, were not included in remediation sessions. Most of the students included in the remediation sessions were having difficulty completing the IDEAS chart in the CBGO, and had difficulty completing sentences beyond ‘identify your claim’. Remediation sessions occurred after either the 4th- or 5th-practice session. Remediation sessions were completed individually. In the 4th-grade, six students, including two in special education, qualified for remediation sessions. In the 6th-grade, five students, and one student in special education, qualified for the remediation session. Each student that qualified received one remediation session which had a duration of approximately 20-minutes.

*Maintenance to writing without the CBGO.* During the maintenance lesson, the students were briefly taught how to use paper and the IDEAS strategy to create an argumentative essay. The instruction taught students to (a) set a goal on paper at the top of the page, (b) list the IDEAS strategy vertically, (c) create a list of main points beside each letter of the strategy, (d) type sentences based on each main point on the computer and, (e) check off each letter of the IDEAS strategy as the sentence is completed. The maintenance lesson lasted approximately 20-minutes. The maintenance lesson was guided by a *PowerPoint* presentation that presented all of the maintenance steps to the students. The maintenance lesson was followed by practice sessions.

*Maintenance practice sessions.* After the maintenance lesson, the students
participated in practice sessions. These practice sessions required students to practice applying the maintenance strategy to writing without the support of the CBGO. In these practice sessions, the students received a writing prompt in the social studies content area, accompanied by text, and then wrote with the maintenance strategy. These practice sessions lasted approximately an hour, with students completing a finished paragraph in between 20-minutes to one hour. In the 6th-grade classroom, the students completed three practice sessions. During the practice session, support from the teacher and researcher was faded to allow for students to demonstrate their independent ability to write with support of the CBGO. In the first and second practice session, all students received support from the researcher and classroom staff. The classroom staff consisted of the special education teacher in the experimental group and a floating teaching assistant. In the third practice session, only students who needed support received extra help from the researcher and staff. However, due to time restraints, students in the 4th-grade only received one maintenance practice session. During this practice session, the students received support by the researchers and classroom staff. In all the practice sessions, the students wrote about trade.

**Control group instruction.** Control instruction occurred over three-week period with a total of four lessons, a supplementary review lesson, and five practice sessions (Table 6). The instruction was guided with *PowerPoint* presentations projected on a large screen in the classroom. The lessons focused on the following topics (a) introduction to the four step writing process: drafting, revising, editing and publishing; (b) recall and practice of the steps; (c) guided practice of the writing process; and (d)
independent practice of the writing process. Each lesson lasted approximately an hour. In the 4th-grade, there was a total teaching time of 4 hours for writing lessons and 4 hours for practice sessions. In the 6th-grade, there was a total writing lesson time of 5 hours, and 4 hours and 15-minutes for practice sessions. In both grade levels, the experimental teaching had a longer duration. Students in 4th-grade the experimental group spent 30-minutes longer than the control group to complete the lessons. In the 6th-grade, students in the experimental group spent one hour longer in comparison to the control group. To control for the amount of instructional time, the students in the control group had a supplementary lesson that reviewed the components of the editing and revision strategies. This lesson was 30-minutes for 4th-grade students, and an hour for 6th-grade. See Table 5 for schedule of lessons and testing for the control condition.

Table 6

Control Group Schedule

<table>
<thead>
<tr>
<th>Day</th>
<th>6th Grade Experimental</th>
<th>4th Grade Experimental</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Pretest (writing)</td>
<td>Pretest (writing)</td>
</tr>
<tr>
<td>2</td>
<td>Pretest (self-efficacy and interviews)</td>
<td>Pretest (self-efficacy and interviews)</td>
</tr>
<tr>
<td>3</td>
<td>Make-up testing</td>
<td>Make-up testing</td>
</tr>
<tr>
<td>4</td>
<td>Lesson 1</td>
<td>Lesson 1</td>
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<tr>
<td>5</td>
<td>Lesson 2</td>
<td>Lesson 2</td>
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<tr>
<td>6</td>
<td>Lesson 3</td>
<td>Lesson 3</td>
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<td></td>
<td>Lesson 4</td>
<td>Lesson 4</td>
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</tr>
<tr>
<td>8</td>
<td>Review session</td>
<td>Review Session/ Content Practice 1</td>
</tr>
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**Lesson 1.** During lesson 1, students received their student notebooks and the teacher reviewed the agenda for the day. With the *PowerPoint* presentation as a guide,
the teacher introduced the steps of the writing process which include drafting, revising, editing, and publishing. Next, the teacher briefly discussed why it is important to be a good writer. Then, the students played a *PowerPoint* game where they identified parts of the writing process. After the *PowerPoint* game, the students completed an activity which requires them to order versions of a paragraph in the order of the writing process.

**Lesson 2.** In lesson 2, the students reviewed the steps in the writing process and were introduced to an editing and revising strategy. At the beginning of the lesson, the students received their student folders. The teacher presented that agenda and review key terms. Students completed a worksheet to recall the steps of the writing process. After completion of the warm up, the teacher introduced the ARMS and CUPS strategy to students, which would help them to revise and edit their writing. The ARMS strategy was used to support students during the revision process, and it represents; Add, Remove, Move, and Substitute. The CUPS strategy was used to support students during editing. The CUPS strategy represents; Capitalization, Usage, Punctuation, and Spelling. The teacher modeled how to use the strategy to revise and edit a paragraph while calling on students for support. The students independently practiced using the strategy to edit and revise a paragraph. The students revised and edited the practice paragraph on the computer using *Microsoft Word*.

**Lesson 3.** At the beginning of the lesson 3, the students received their student notebooks. The teacher reviewed the agenda and key terms and began the PowerPoint presentation. First, the students completed a warm-up activity that required the students to answer questions about the writing process. Then, the teacher read ‘The Five Second
Rule’ to the students. The teacher completed each step of the writing process on the large screen to demonstrate how to write a summary of the text, and asked students to complete the steps of the writing process to write a paragraph about the five second rule on their laptops.

**Lesson 4.** In lesson 4, the students independently wrote a summary using the writing process. At the beginning of the lesson, the students received their student notebooks. The teacher started the *PowerPoint* presentation and reviewed the agenda and key terms. The teacher then read an additional text about the five-second rule. The students had the remaining period to answer a question about the five second rule on their laptops.

**Supplementary lesson.** Supplementary lesson was developed by the researcher to control for the time difference between the instruction in the experimental and control groups. In the supplementary lesson, which was guided by a *PowerPoint*, the students reviewed the parts of the writing process. The students then had an opportunity to review previous paragraphs created during the practice sessions, or write a new paragraph. This lesson lasted 30-minutes in 4th-grade, and an hour in 6th-grade.

**Practice writing sessions.** In the control group, five writing practice sessions occurred in the social studies content area. The writing practice sessions required students to answer a question about a social studies topic while using the writing process, the revising strategy ARMS, and the editing strategy CUPS. During each session, the teacher discussed a topic with the guide of a *PowerPoint* presentation. Then, the students answered a question about the topic the teacher discussed. In the 4th-grade, the students
learned about the Powhatan Native Americans. In the 6th-grade, students learned about Inuit Native Americans. The prompts were the same in the experimental and control groups in both 4th- and 6th-grade. During the writing activity, students wrote on laptops and used *Microsoft Word* documents. The students had access to the mnemonic ARMS and CUPS on a paper card to remind them of the strategy steps. The classroom teacher, researcher, and classroom staff provided students with support during the practice session. This support and feedback during the practice sessions focused on the use of the editing and revision strategy to create a paragraph. The practice sessions lasted approximately an hour.

**Maintenance lesson.** During the maintenance lesson, the students were briefly taught how to use paper and the ARMS and CUPS strategy to revise and edit their work. This instruction taught students to write the ARMS and CUPS strategy on a blank sheet of paper, create their written response, then check off each letter of the ARMS and CUPS strategy as they revise and edit that part of their work. The maintenance lesson was guided by a *PowerPoint* presentation and lasted approximately 20-minutes.

**Maintenance practice lessons.** During maintenance practice sessions, the students responded to prompts about trade and used the learned strategy to write a response on paper. The maintenance practice sessions lasted approximately an hour, with completion time ranging from 20-minutes to an hour per session in students in 4th- and 6th-grade. In the 4th-grade control group, the students had one maintenance practice session. In the 6th-grade, the students completed three practice lessons. During the maintenance practice session, the control group reviewed social studies content in a *PowerPoint*
presentation prior to responding to the prompt.

**Testing Procedures**

Pretest measures in both conditions included the fluency subset of the WJIII, argumentative writing assessments, strategy use, self-efficacy and motivation questionnaire, and student interviews. Each writing measure and questionnaire were administered in a large group in the student’s classroom. The WJIII writing fluency assessments were administered in a large group setting. During the argumentative writing pretest, the students received a printed, short social studies text. The teachers read the text to the student as the student read the text silently. Then, the social studies writing prompt was shown on large projection screen. The teacher then read the prompt to the students and instructed the students to answer the prompt in writing. The teacher did not provide any assistance, other than re-reading of the prompt and providing support with technology issues, to the students. The students did not have access to the social studies text during this time, only the writing prompt. The students answered the prompt in writing using a Microsoft Word document on the computer. The Microsoft Word document was formatted with the questions at the top of the page in a gray square, and then a box for students to type their response below the prompt. The students did not have a time limit to answer the question. Students who did not finish the assessment during the allotted hour period were pulled by the researcher to complete the assessment in a separate room. Completion time ranged from 10-to 65-minutes to complete the pretest in 6th-grade and 20-and 90-minutes in 4th-grade. Students who asked for help were told to do their best by the teachers, researchers, and other staff in the classroom.
On the next assessment day, self-efficacy and motivation questionnaires were administered to students in the large group setting. The directions and questions were read out loud for students. After the self-efficacy and motivation questionnaires, randomly selected high, medium and struggling writers were pulled out of their classroom and interviewed individually for self-efficacy, motivation, and use of self-regulation strategies prior to intervention.

Posttest measures were administered to both conditions after four lessons and five writing practice sessions. They included all of the pretest assessments, except the WJII, and followed the same procedures, with the addition of the CBGO for the experimental group and the use of the writing process for the control group. The graphic organizer remained available for the experimental group and writing strategy cards were available for the control group during posttest. The CUPS and ARMS strategy and steps of the writing process was available in the form of a 4x4 card for students during the post-test in the control group. Also, all students answered the self-efficacy, motivation, and strategy use questionnaire at posttest. The application measure was assessed after the post-test. During application, students responded to a question in the science content area. Maintenance was assessed after the maintenance lesson and practice sessions. The same randomly selected participants from the pre-interviews were interviewed during post-assessment. During all writing measures, students were told to try their best while writing. Teachers, researchers, and other classroom staff only helped students if there were problems with the technology, or if the student had difficulty copying and pasting in the graphic organizer.
Writing prompts. Writing probes were administered to students during pretest, posttest, application to another content area, maintenance to writing without the CBGO, as well as during the practice sessions described later. These writing prompts were aligned with both grade level standards and the curriculum. Students received a single prompt in the social studies content area during pre and post assessment, each writing practice session, and maintenance (Appendix J). Students responded to a science prompt during application measure. The social studies writing prompts used during pre and posttest and maintenance were aligned with grade level standards related to product and industries. The essay prompts were reviewed by experts in the field including an assessment writer and general and special education teachers to ensure that the prompts were age appropriate and accurately reflected the science and social studies content. For all writing assessments, each essay prompt contained a short text providing background information providing a brief summary of the social studies or science text, approximately 40 to 50 words, and an argumentative question. The readability level of the writing prompts was adjusted for each grade level. Writing prompts for 4th-grade were between 4.6-4.9 for grade level readability. Writing prompts for 6th-grade were between 6.7 and 6.9 readability level. The writing prompts for pretest, posttest, application, and maintenance were the same prompts across grade levels, with adjustments made for readability levels.

Content texts. The content area texts used in pretest, posttest, and maintenance were selected from a social studies website, which had text related to social studies topics for students in elementary and middle school. The application text, a science text, was
selected from a science website for elementary and middle school students. During pretest, students read and wrote about trade and in post-test, students read about interdependence. In maintenance, students read and wrote about scarcity, and in the application measure, students read and wrote about matter. These topics matched 4th-and 6th-grade learning standards in both social studies and science. These texts were only modified to adjust for the readability levels. The content texts for pretest, posttest, and maintenance and application were the same in both 4th-grade and 6th-grade, with adjustments to readability for the specific grade level and the addition of some grade level specific examples. See Table 7 for readability level and number of words for test and practice session texts.

Practice session texts were obtained from government run websites about the Native Americans and early Virginia. Practice texts were related to the grade level specific standards for product and industry, and were different for each grade level. The topic of the content texts were also directly related to what each classroom was currently learning in social studies. The researcher collaboratively planned with the 4th and 6th-grade teams to connect the practice session texts to a learning standard that occurred in both grade levels, and specific topics based on the scope and sequence of the social studies content related to that grade level. Fourth grade classrooms read texts about the Powhatan Native Americans. Sixth grade classrooms read texts about the Inuit Native Americans. The researcher made modification to these texts including the removal or addition of information to fit the text within a certain number of words, and also adjusted for grade level readability.
Table 7

*Readability level and word count for texts during testing and practice session.*

<table>
<thead>
<tr>
<th>Probe</th>
<th>Grade 4</th>
<th>Grade 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Text name</td>
<td>Words</td>
</tr>
<tr>
<td>Pretest</td>
<td>Trade</td>
<td>458</td>
</tr>
<tr>
<td>Practice 1</td>
<td>The Powhatan Indians</td>
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<tr>
<td>Practice 2</td>
<td>Jamestown</td>
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<td>Practice 3</td>
<td>Powhatan Trading</td>
<td>402</td>
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<td>Practice 4</td>
<td>Trading with the Settlers</td>
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<td>Practice 5</td>
<td>Problems in the Colony</td>
<td>427</td>
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<tr>
<td>Posttest</td>
<td>Interdependence</td>
<td>473</td>
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<td>Application</td>
<td>Matter</td>
<td>476</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Scarcity</td>
<td>478</td>
</tr>
</tbody>
</table>
Reliability of Scoring

Reliability of scoring was calculated for pre and post writing assessments. Prior to the scoring, one doctoral student received training on the scoring conventions. This training included review of the scoring conventions and practice of scoring existing argumentative essays in the content area. During training, scoring conventions were refined. After training, 33% of the essays were scored for reliability by the graduate student. Number of words, and number of sentences had 100% reliability. Holistic quality had 87% reliability and accuracy of content had 91% reliability across both grade levels.

Fidelity of Implementation

Fidelity of implementation was calculated for both experimental and control groups. Each lesson and testing session was videotaped and assessed. To determine if the intervention was delivered with fidelity, a fidelity checklist was developed. This fidelity checklist contained the items related to the delivery of essential parts of the intervention and if the materials for the lesson were used. Fidelity checklists were also developed and completed for each testing session.

During each testing session and teacher delivery of the lessons, one researcher was in each classroom. These researchers completed the fidelity checklists for the lessons and testing sessions. Although fidelity was scored, the researcher in the classroom provided immediate support to the teacher during the lesson if fidelity was low. This support was provided by co-teaching, teaching specific lesson, or portions of
the lessons to the students in both grade levels and in the experimental and control group, when needed. Results from fidelity indicated the control group had 100% fidelity across both grade levels. In the experimental group there was 100% for 6th-grade experimental, and 98% for 4th-grade experimental.

An additional observer was trained on how to use the fidelity checklist to determine if the instruction was delivered as intended for the instructional phases of the study. To determine fidelity, the observer watched 100% of the video recordings of the experimental and control groups during lessons and testing sessions. The researcher checklists were compared to the observer checklist to determine the percent of agreement for fidelity. There was 96% fidelity agreement between the researchers and the observer.

**Data Analysis**

Data analysis occurred for all dependent measures. Argumentative writing samples were scored at pre and posttest, and application and maintenance sessions. Scored responses from the self-efficacy and motivation questionnaire were calculated. Interviews were coded and analyzed for themes within and across participants.

**Argumentative Paragraphs**

Holistic writing scores, number of words, number of transition words, and number of sentences were determined for the experimental and control condition during pretest. To determine if statistical differences exist between groups on the pretest measures, a t-test was conducted. For post-test measures, the holistic writing scores, number of words, number of essay parts, and number of sentences was determined. A t-
test was conducted to determine if there were differences between the experimental and control groups. Then, an ANOVA was conducted to determine if there are statistical interactions across grade level and condition.

**Accuracy**

Accuracy was measured by the accuracy of the content written. Accuracy was defined as information that was factual and did not have to be related or obtained from the text read. Accuracy was calculated by the percentage of t-units that contained accurate information. Students could receive an accuracy rating of 0 to 5. Students who wrote paragraphs that contained t-units that all contained accurate statements received an accuracy rating of 5, and students without any accuracy statements received a score of 0. A t-test was conducted to determine if there were differences between the experimental and control groups. An ANOVA analysis was used to determine if differences exist between experimental and control groups.

**Questionnaire**

Self-efficacy, motivation, and strategy use questionnaires were scored for each student. The results were analyzed as a whole and also for specific questions related to self-efficacy, motivation, and strategy knowledge. Means and standard deviations were calculated. A t-test was conducted to determine if there were differences between the experimental and control groups. An ANOVA analysis was used to determine if differences exist between experimental and control groups and pre-and post-test. Means and standard deviations for high writers, medium writers, low writers, and students with
HID was calculated and compared across groups.

**Interviews**

Pre, post, and maintenance student interviews were transcribed and coded to explore the occurrences for use of SRL strategies in writing, self-efficacy, and motivation to write. During the interviews, the students guided the researcher through their process of writing the paragraphs. These interviews were also used to explore if students were able to apply the SRL strategies to writing paragraphs during maintenance. During these interviews, the students were also asked about their motivation and self-efficacy for writing. The interviews were used to confirm the results of the self-efficacy questionnaire and to provide more depth to these responses.

The use of SRL strategies were also counted and used in quantitative analyses. Students, both in the experimental and control groups, described their writing process without interruption from the researcher and then answered explicit questions about the use of SRL strategies during the process of writing their paragraph. Although students in the control group did not receive instruction in SRL strategies, some students naturally apply SRL strategies (Bandura, 1986). Therefore, SRL strategies were coded and means were calculated for holistic quality as well in the control group during pre and posttest. Examples of questions include “after you read the question, what was the first thing that you did to write this paragraph?”, and “did you brainstorm and can you describe to me how you brainstormed?”. The interviews were transcribed, and each occurrence of an SRL strategy was coded. Closed coding was used to categorized each occurrence of an SRL strategy. SRL strategies were selected and coded for each part of
the SRL process. SRL strategies that were coded were the task analysis steps of goal setting and brainstorming during the forethought phase, planning and self-monitoring as a task strategy steps during the peformance phase, and self-evaluation during the self-reflection phase. The occurrence of each was strategy was counted once, and students could have used a maximum of five SRL strategies while writing. Brainstorming was counted as the thought process of what information to include in the paragraph, either occurring on paper or in thinking, and planning was coded as any decision making process of what place specific parts should be within the paragraph. Goal setting was coded as a student setting a goal for their writing and explicitly stating the selected goal, self-monitoring is the process of reviewing the work during completion, and self-evaluation was coded as the process of reviewing the paragraph once it was completed. Students had to explicitly state one of the SRL terms during the student interview and describe the process associated with that term, or either describe the process. The use of strategies was categorized as high, medium, or low. High use of SRL strategies was the use of four of five strategies, medium is the use of two or three, and low was the use of only one SRL strategy. The count of the SRL strategies used was based on the students description of their steps to complete their argumentative response, and not how the CBGO was utilized.

**Document Analysis**

A document analysis was conducted with the completed graphic organizers of the experimental group during posttest to determine what portions of the graphic organizer were completed to create an argumentative response. Since the CBGO contained
supports to guide the students through the SRL process, the graphic organizer was coded as five separate sections, each as a strategy of the SRL process. These sections were coded as complete, partially complete, or incomplete. Each student’s graphic organizer was coded for evidence of setting a goal, brainstorming, planning, self-monitoring, and self-evaluation. The paper products during maintenance were also analyzed for the occurrence of SRL use and replication of the graphic organizer.

Summary

This mixed methods study with a combination of true experimental and qualitative methods determined the impact of a CBGO with embedded SRL on the writing performance typical and struggling writers, including students with HID and ELLs. Qualitative research methods, including interviews and document analysis, were used to explore possible explanations for the differences in groups. Permissions were obtained prior to the start of the study from the district, university, teachers, parents, and students. For the experimental group, this study included (a) instruction on how to construct an argumentative paragraph using the CBGO, (b) practice sessions using the CBGO for answering a social studies prompt, (c) application measure for writing an argument in the science content area and (d) maintenance to writing without the CBGO. Students were matched and then randomly assigned to either an experimental or control group. The study lasted approximately three-six weeks per grade level, including pre and post assessments, instruction, practice sessions, maintenance to writing without the CBGO, and application to a second content area. Dependent measures for this study included quality of argumentative writing (Appendix F), number of sentences, number of
words, strategy knowledge, self-efficacy and motivation questionnaire (Appendix G), and accuracy. Students were interviewed to determine their use of SRL strategies while writing, their self-efficacy, and motivation to write (Appendix H). See Table 8 for research questions, sample, and proposed data collection.

Table 8

*Research Questions and Data Collection*

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Measure</th>
<th>Data Analysis</th>
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<tbody>
<tr>
<td>Is the holistic quality for struggling writers receiving support from the CBGO significantly different from the post-test holistic quality of typically achieving writers who wrote with and without the support of the CBGO?</td>
<td>Pre and posttests measures including holistic writing rubric, number of sentences, number of words and number of transition words</td>
<td>Statistical comparison across experimental and control groups (<em>t</em>-test and one-way ANOVA). Coding of student interviews.</td>
</tr>
<tr>
<td>Is the holistic quality for struggling writers receiving support from the CBGO significantly different from the post-test holistic quality of typically achieving writers who wrote with and without the support of the CBGO?</td>
<td>Posttest holistic quality of experimental and control group for each student classification.</td>
<td>Statistical comparison across groups and conditions (one-way ANOVA)</td>
</tr>
<tr>
<td>To what extent are students able to transfer the ability to construct argumentative essays using the CBGO with embedded SRL strategies into a science</td>
<td>Application measure: holistic writing rubric, number of sentences, number of words, and number of transition words</td>
<td>Comparison of scores for experimental group (<em>t</em>-test and one-way ANOVA)</td>
</tr>
</tbody>
</table>
Is the holistic quality for struggling writers receiving support from the CBGO significantly different from application holistic quality of typically achieving writers who wrote with and without the support of the CBGO during the application measure?

Application holistic quality of experimental and control group for each student classification. Statistical comparison across groups and conditions (one-way ANOVA).

To what extent does the use of the CBGO increase comprehension of content as measured by the accuracy of the argumentative written responses?

Accuracy of written responses. Statistical comparison across experimental and comparison groups (t-test and one-way ANOVA).

To what extent are students able to maintain the SRL strategies to write argumentative paragraphs without the support of the CBGO?

Maintenance measure: holistic writing rubric, number of sentences, number of words, and number of transition words. Student interviews. Student planning sheets. Comparison of scores for experimental group (t-test and one-way ANOVA). Document analysis.

Is the holistic quality for struggling writers receiving support from the CBGO significantly different from maintenance holistic quality of typically achieving writers who wrote with and without the support of the CBGO?

Maintenance holistic quality of experimental and control group for each student classification. Statistical comparison across groups and conditions. (t-test and one-way ANOVA)

To what extent are students able to generalize the SRL strategies to write argumentative paragraphs

Student questionnaire. Statistical comparison of scores for experimental group and comparison groups (t-test and one-way ANOVA).
without the support of the CBGO?

What are the effects of the CBGO and related lessons students’ self-efficacy and motivation to write?

| Student interviews and student questionnaires | Coding of interviews. Counting of uses of SRL for writing. Comparison to responses on self-efficacy questionnaire (t-test and one-way ANOVA) |
Chapter Four

This chapter presents the results from the study. This study evaluated the effects of a CBGO with embedded SRL strategies on the argumentative writing of 4th- and 6th-grade students, including struggling writers, in science and social studies. This intervention was compared to students in the control group who utilized the writing process to create argumentative paragraphs. To examine the results of the intervention, the following research questions were investigated.

1. What are the effects of the CBGO with embedded SRL strategies on the holistic quality, number of transition words, number of words, and number of sentences on the argumentative writing of 4th- and 6th-grade students in the social studies content area?

   1a. Is the holistic quality for struggling writers receiving support from the CBGO significantly different from the post-test holistic quality of typically achieving writers who wrote with and without the support of the CBGO?

2. To what extent are students able to transfer the ability to construct argumentative essays using the CBGO with embedded SRL strategies into a science content area?

   2a. Is the holistic quality for struggling writers receiving support from the CBGO significantly different from application holistic quality of typically achieving writers who wrote with and without the support of the CBGO during the application measure?
3. To what extent does the use of the CBGO increase comprehension of content as measured by the accuracy of the argumentative written responses?

4. To what extent are students able to generalize the SRL strategies to write argumentative paragraphs without the support of the CBGO?

   4a. Is the holistic quality for struggling writers receiving support from the CBGO significantly different from maintenance holistic quality of typically achieving writers who wrote with and without the support of the CBGO?

5. What are the effects of the CBGO and related lessons on the SRL strategies of struggling writers?

6. Does the use of the CBGO with embedded SRL strategies change students’ motivation and self-efficacy to write?

**Writing Measures**

Students in the experimental and control group constructed written argumentative responses at pretest, posttest, application, and maintenance. At pretest and posttest, students responded to a social studies read text and responded to a social studies prompt about the text read. During application, students read text science text and responded to a prompt about the text, and during maintenance, students responded to a social studies text and prompt without the support of the CBGO. Paragraphs were evaluated on holistic quality, number of transition words, number of words, number of sentences, and accuracy. Holistic quality was determined through the use of the holistic quality scoring rubric. In the holistic quality rubric, students were scored on accuracy, consistency, number of words, number of transition words, number of t-units, capitalization, and
number of facts and elaborations. Students could receive a score of 0 through 5 on the holistic rubric. A score of 1 indicated a low quality written response, a score of 2 was an insufficient response, a score of 3 was an uneven response, a score of 4 was a sufficient response, and a score of 5 was an excellent response. For example, a written response that had high accuracy and consistency, more than one fact and elaboration, an introduction and a conclusion, would receive a score of 5 (Appendix F).

Additional measures that were scored included number of transition words, number of words, number of sentences, and accuracy. Transition words were counted as words or phrases at the beginning of a t-unit or a sentence that signaled the transition between complete thoughts. Examples of transition words that were counted as transitions included: also, therefore, so, to begin, and first. Number of words was calculated as the total number of words, which included articles that were in the written response. Sentences were counted as a sentence if they included a noun, a verb, and had an ending punctuation mark. Accuracy was determined through the number of factual, non-opinion based statements in the written response. Students could receive a score of 0 through 5 for accuracy. A score of 0 indicated a response that was not accurate, 1 was minimally accurate, 2 was partially accurate, 3 was moderately accurate, 4 is mostly accurate, and 5 was completely accurate.

**Student Questionnaire**

Students responded to a self-efficacy, strategy use, and motivation questionnaire. The questionnaire consisted of 23 questions related to self-efficacy, strategy use, and motivation to write in science in social studies. Students answered each question to
indicate if they agreed with the statement, somewhat agreed, and did not agree on a scale of 1 to 3. Agree was coded as a 3, somewhat agree was coded as a 2, and disagree was coded as a 1.

**Student Interviews**

One-third, 22, of the participants were randomly selected in the experimental and control group, stratified by writing level, and interviewed at pre, post, and maintenance phases. There were 12 students interviewed from the experimental group including six 4th-grade students and six 6th-grade students. Ten students were also interviewed from the control group, and included seven 6th-grade and three 4th-grade students. Among the interviewed, there were seven struggling writers, 10 medium performing writers, and five high performing writers. Students were asked to guide the researcher though their process of writing their argumentative responses in both the experimental and control groups at pre and posttest as well as in the experimental group only during maintenance. During these interviews, students also viewed their produced text while describing their writing process and answered questions about their motivation and self-efficacy for writing.

**Results**

The means of pretest and posttest student performance in both conditions and by was compared for the dependent measures of holistic quality, transition words, number of
sentences, number of words, and accuracy\(^1\). SRL strategy use, self-efficacy and motivation scores were also compared at pretest at posttest.

**Writing Measures at Pretest**

Students in the experimental condition scored a mean of 3.03 (SD = .80) and the students in the control condition scored a mean of 2.91 (SD = .86) for holistic quality at pretest; therefore, an independent sample t-test was performed to determine if the differences between groups were statistically significant. The groups demonstrated homogeneity of variance, and there were no statistical differences between the holistic quality of the two groups at pretest \(t(67) = .61, p = .55\). Number of transition words, number of words, and number of sentences also demonstrated homogeneity of variance at pretest. Students in the experimental group had a mean score of .41 (SD = .76) and .31 (SD = .53) in the control group for number of transition words. The t-test demonstrated that the experimental and control groups were not statistically significant for number of transition words \(t(67) = .58, p = .57\) at pretest. For number of words at pretest, the experimental group had a mean score of 70.89 (SD = 61.68) and the control group had a mean score of 63.59 (SD = 59.06). The t-test demonstrated that the groups had equal variances, and there were no statistical differences between groups, \(t(67) = .50, p = .62\). Also, for number of sentences, the experimental group had a mean score of 2.43 (SD = 3.25) and the control group had a mean of 2.84 (SD = 3.02). The t-test demonstrated that the groups were similar at pretest for number of sentences, \(t(67) = -.54, p = .59\). For the

\(^1\) Additional statistical tests were employed to determine whether ANCOVA using pretest scores on all measures impacted findings
dependent measure of accuracy, the students in the experimental condition scored a mean of 3.51 ($SD = 1.28$) and the control condition scored a mean of 2.97 ($SD = 1.69$). An independent sample $t$-test was performed to determine if the accuracy of the two groups was statistically different at pretest. The accuracy of the two groups demonstrated homogeneity of variance, and there was no statistical differences at pretest $t(67) = 1.52, p = .13$.

**SRL Strategies Use Data from Interviews at Pretest**

During pretest interviews, the number of SRL strategies used by each student was coded and counted and a mean was generated. Students had an average use of 1.83 ($SD = .67$) SRL strategies during writing in the experimental group and 2.5 ($SD = .71$) SRL strategies use in the control group, out of a maximum of 5 strategies used. The $t$-test indicated that there were no differences in SRL use at pretest in the experimental and control group, $t(18) = - .82, p = .42$.

**Strategy Use Data from Questionnaire at Pretest**

On the pretest strategy use, self-efficacy, and motivation questionnaire, students self-reported a strategy use score of 2.51 ($SD = .46$) in the experimental group and a strategy use score of 2.46 ($SD = .49$) in the control group out of a maximum of 3. An independent $t$-test was conducted to determine if the two groups were similar at pretest. Results from the pretest indicated that equal variances were assumed, and students in the experimental and control group did not have statistically significant differences in strategy use at posttest, $t(62) = .43, p = .67$. 
Self-efficacy and Motivation Data from Questionnaire at Pretest

On the pretest questionnaire, students in the experimental group reported a self-efficacy mean of 2.37 (SD = .38) and motivation mean of 2.48 (SD = .40). For the control group, students had a mean self-efficacy score of 2.27 (SD = .44) and a motivation score of 2.34 (SD = .50). A t-test was conducted with the pre-intervention means to determine if the scores were similar. Results from the t-test indicated that equal variances were assumed, and there were no statistically significant differences at pretest for self-efficacy, $t(62) = .55$, $p = .55$, or for motivation, $t(62) = 1.28$, $p = .20$. Prior to the intervention, there were no differences between groups for self-efficacy or motivation.

For these reasons, mean posttest, application, and maintenance scores for holistic quality, number of transition words, number of words, number of sentences, and accuracy were used in the final analysis. Student interviews were also coded. The coded student interviews were combined with the statistical results to answer a portion of the research questions. Table 9 includes the research questions, dependent measures, and data analysis methods.

Results for Research Question 1

What are the effects of the CBGO with embedded SRL strategies on the holistic quality, number of transition words, number of words, and number of sentences on the argumentative writing of 4th- and 6th-grade students in the social studies content area? Measures used to answer this research questions included posttest means for holistic quality, number of transition words, number of words, and number of sentences. Since the experimental and control group were not significantly different at pretest, posttest
scores were used during the analysis. Combined grade levels, that included both 4th- and 6th-grade means, were used in the initial analysis. For the follow up analysis, comparisons were made across conditions and grade levels. In addition, a document analysis was conducted to determine the holistic scores based on partial or full completion of the graphic organizer. Effect sizes were calculated using the formula:

\[
\text{Cohen's } d = \frac{M_1 - M_2}{SD_{pooled}}.
\]

**Posttest holistic quality.** Descriptive data for mean holistic quality for experimental and control group for combined grades together and 4th- and 6th-grade are on Table 9 and Figure 4. Overall, the experimental condition across grade levels earned a mean holistic quality score of 4.41 (SD = .13) and the control group earned 3.29 (SD = .14). The effect size for the CBGO intervention in comparison to the control intervention was .51 for holistic quality.
Table 9

*Posttest Holistic Scores by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>n</th>
<th>$M$</th>
<th>$SD$</th>
<th>n</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined</td>
<td>37</td>
<td>4.41</td>
<td>.725</td>
<td>32</td>
<td>3.38</td>
<td>.83</td>
</tr>
<tr>
<td>Grade 4</td>
<td>20</td>
<td>4.10</td>
<td>.788</td>
<td>16</td>
<td>3.31</td>
<td>.95</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>4.76</td>
<td>.437</td>
<td>16</td>
<td>3.44</td>
<td>.44</td>
</tr>
</tbody>
</table>

*Figure 4.* Posttest holistic scores by condition and grade.
To determine if there was a statistical difference between the experimental and control groups for holistic quality, post test scores were used in a $t$-test. For the initial analysis, 4$^{th}$-grade and 6$^{th}$-grade experimental groups were combined for an overall experimental group and compared to a combined 4$^{th}$-and 6$^{th}$-grade control group. Results from the $t$-test yielded a statistically significant difference between the performance of the two groups, $t(67) = 5.50$, $p = .01$. These results indicate that the experimental group scored statistically higher on the holistic quality measure in comparison to the control group.

Means were also calculated for grade level and condition. The mean for holistic quality for 4$^{th}$-grade experimental was 4.76 ($SD = .44$) and 3.31 ($SD = .95$) for 4$^{th}$-grade control. For 6$^{th}$-grade students, the holistic quality mean was 4.76 ($SD = .44$) for the experimental group and 3.44 ($SD = .72$) for the control group. Effect sizes were calculated for both conditions across grade level. The resulting effect size for 4$^{th}$-grade experimental was .41, and the effect size for 6$^{th}$-grade experimental was .73.

The means were entered into a one-way ANOVA to determine differences between grade level and condition. Results from the one-way ANOVA indicated that there was a statistically significant interaction between grade level and condition, $F(3, 65) = 7.48$, $p < .001$. A post-hoc analysis was conducted to determine the specific interactions between grade level and condition. Results from the follow up analyses indicated that there was a significant interaction between 6$^{th}$-grade experimental and 6$^{th}$-grade control, $p < .001$. Students in the 6$^{th}$-grade experimental group outperformed students in the 6$^{th}$-grade control group. Fourth grade students in the experimental group
also outperformed students in the 4th-grade control group, \( p = .01 \). In addition, there were significant interactions across grade levels. The analysis yielded a significant interaction between 6th-grade experimental students and 4th-grade experimental students, \( p = .04 \) This indicates that students in the 6th-grade experimental group performed statistically higher on the post holistic quality measure in comparison to 4th-grade experimental students.

**CBGO completion and holistic quality.** A document analysis was conducted with the completed graphic organizers of the experimental group during postest to determine the holistic quality of the students who partially or fully completed the graphic organizer.

The graphic organizer contained several parts, included sections for goal setting, brainstorming (strategic planning), planning and developing sentences based on the plan and IDEAS mnemonic (self-instruction), self-monitoring, and self-evaluation. According to analysis of the 36 graphic organizers, 13% of students had incomplete goals and 86% students had complete goals. Eleven percent of students had incomplete brainstorm sections, 16% had partially completed brainstorming section, and 72% students had complete brainstorm sections. For the completion of planning in the CBGO, 11% students had partially complete tables and 89% students had completed tables. For self-monitoring, 44% of students completed the self-monitoring section, and 55% students had incomplete self-monitoring sections. For the self-evaluation section, there were 42% complete, 2.7% partially complete, and 55% fully completed sections.

Means were calculated and compared to determine if the completion of specific
sections of the graphic organizer related to SRL strategies had an impact on holistic quality (Figure 5). Students that set a goal in the CBGO, brainstormed, and planned had a higher holistic quality in comparison to students that did not complete these sections. Students that completed goal setting had a mean of 4.45 ($SD = .71$) in comparison to students that did not set a goal for their writing 4.0 ($SD = .70$). In addition, for students that completely planned, the mean score was 4.47 ($SD = .628$) in comparison to 3.75 ($SD = 2.12$) for incompletely completed tables. Students that completed brainstorming had a mean holistic score of 4.46 ($SD = .76$) in comparison to students that did not brainstorm, 4.00 ($SD = .00$).

![Figure 5. Mean holistic scores by CBGO section.](image)

Combinations of sections of the graphic organizer was also related to holistic
quality of writing (Figure 6). Students \((n = 14)\) that completed all five sections of the graphic organizer had a holistic mean of 4.71 \((SD = .47)\). Students that completed four sections \((n = 6)\) had a holistic mean of 4.50 \((SD = .87)\), and students \((n = 5)\) that completed three sections of the graphic organizer had a holistic quality mean of 4.20 \((SD = .44)\). For students that completed two sections of the graphic organizer \((n = 5)\), their holistic quality mean was 3.80 \((SD = 1.09)\) and for one completed section \((n = 6)\) the mean was 4.17 \((SD = .75)\). Students that completed all sections of the graphic organizer had higher holistic quality in comparison to students that only completed one or two sections of the CBGO.

Figure 6. Holistic Quality by CBGO completion.
Posttest number of transition words. Descriptive data for mean scores for number of transition words for experimental and control groups across grade levels and within each grade level are seen in Table 10 and Figure 7. Overall, the experimental condition had a mean of 5.22 (SD =1.35) and the control group had a mean of 1.03 (SD =.86) for number of transition words across both grade levels. The effect size for the CBGO intervention in comparison to the control intervention for number of transition words was .88.

Table 10

Posttest Number of Transition Words by Condition and Grade Level

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>Combined</td>
<td>37</td>
<td>5.22</td>
</tr>
<tr>
<td>Grade 4</td>
<td>20</td>
<td>4.75</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>5.76</td>
</tr>
</tbody>
</table>
A t-test was conducted to determine if the number of transition words were statistically significant at posttest. Results indicated there was a statistically significant difference between number of transition words at posttest, $t(67) = 15.02, p < .001$.

Means and standard deviations were also calculated for 4th-grade and 6th-grade students. Students in the 4th-grade had a mean number of transition words of 4.75 ($SD = 1.48$) in the experimental group and .56 ($SD = .72$) in the control group. Sixth grade students had a mean of 5.76 ($SD = .97$) in the experimental group and 1.50 ($SD = .73$) in the control group. Effect sizes were calculated for grade levels. The intervention had an effect size of 3.46 in the 4th-grade and 5.87 in the 6th-grade for number of transition words.

Therefore, an additional analysis was conducted to determine if there were
significant differences across grade level and condition. Posttest mean for number of transition words was entered into a one-way ANOVA analysis to determine if there were statistical interactions between grade level and conditions. Results from the ANOVA indicated that there was a significant interaction between conditions and grade levels for number of transition words in the written responses, $F(3, 65) = 13.40, p < .001$.

A follow up analysis was conducted to determine the effects of the intervention across grade levels. The results from the post-hoc analysis indicated that there was a significant interaction across grade levels. Experimental and control groups were statistically different in the 4th-grade, $p < .001$ and the 6th-grade, $p < .001$. This indicates that the experimental group statistically outperformed the control group in both grade levels. In addition, there was a significant difference in the performance of 6th-grade experimental students in comparison to 4th-grade experimental students, $p < .001$. Students in the 6th-grade wrote more transition words in their posttest paragraphs in comparison to students in 4th-grade experimental group.

**Posttest number of words.** Descriptive data of mean scores for total number of words written for experimental and control groups across grade levels and within each grade level are available in Table 11 and Figure 8. Overall, the experimental condition had a mean of 119.24 ($SD = 67.21$) for total words written at posttest and the control group had a mean of 90.75 ($SD = 103.96$). The effect size for the CBGO intervention in comparison to the control intervention for number of words was .33. The effect size of .33 indicates there was minimal effect of the intervention on the number of word written by students at posttest.
Table 11

*Posttest Number of Words by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>n</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combined</td>
<td>37</td>
<td>119.24</td>
<td>67.21</td>
<td>32</td>
<td>90.75</td>
<td>103.96</td>
</tr>
<tr>
<td>Grade 4</td>
<td>20</td>
<td>114.85</td>
<td>76.01</td>
<td>16</td>
<td>108.00</td>
<td>143.28</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>124.41</td>
<td>57.01</td>
<td>16</td>
<td>73.50</td>
<td>34.22</td>
</tr>
</tbody>
</table>

*Figure 8.* Posttest number of words by condition and grade level.

Posttest means for total number of words written were entered into an
independent sample $t$-test to determine if there was a statistical difference between the experimental and control group in number of words written at posttest across both grade levels. The results for the $t$-test indicated that the experimental and control groups were not statistically different at posttest, $t(67) = 1.37, p = .18$. During posttest, students in the experimental condition did not write more words in comparison to students in the comparison condition.

Means and standard deviations were also calculated for grade levels. Fourth grade students in the experimental group had a mean score of 114.85 ($SD = 76.01$) and 4th-grade control students had a mean of 108.00 ($SD = 143.28$) for posttest number of words written. Sixth grade experimental students had a mean score of 124.41 ($SD = 57.01$) and 73.50 ($SD = 34.22$) in the control group. Effect sizes were calculated for each grade level. The intervention had an effect size of 0.06, indicating no effect on number of words for 4th-grade students, and an effect size of 1.07 for 6th-grade students. An effect size of 1.07 indicates a large effect of the intervention for number of words for 6th-grade students.

Posttest means for number of words were entered into a one-way ANOVA to determine if there were statistical differences between groups. Results from the ANOVA indicated that there was no statistically significant interaction between groups, $F(3, 65) = 1.08, p = .36$. However, mean scores for the CBGO group for number of words written were higher in comparison to the mean words written by the control group in the 6th-grade.

**Posttest number of sentences.** Descriptive data of mean scores for number of
sentences for experimental and control groups across grade levels and within each grade level are in Table 12 and Figure 9. The experimental condition had a mean of 6.38 ($SD = 3.37$) for number of sentences and the control group had a mean of 4.41 ($SD = 4.89$) across both grade levels. The effect size for the CBGO intervention in comparison to the comparison intervention for number of transition words was .48, indicating that the CBGO had a moderate effect on the number of sentences written in the experimental group.

Table 12

*Posttest Number of Sentences by Condition and Grade*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th></th>
<th>Control</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$n$</td>
</tr>
<tr>
<td>Combined</td>
<td>37</td>
<td>6.38</td>
<td>3.37</td>
<td>32</td>
</tr>
<tr>
<td>Grade 4</td>
<td>20</td>
<td>5.25</td>
<td>2.84</td>
<td>16</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>7.71</td>
<td>3.54</td>
<td>16</td>
</tr>
</tbody>
</table>
An independent sample $t$-test was conducted for number of sentences in the experimental and control group. According to the $t$-test, equal variances were assumed, and there was not a statistical significance between the two groups, $t(67) =1.96, p = .05$. A follow up analysis was conducted to determine if there were statistically significant interactions between conditions and grade levels.

Mean number of sentences were calculated for the experimental and control groups in the 4th- and 6th-grade. Mean number of sentences for 4th-grade experimental group was 5.25 ($SD = 2.84$) in comparison to the control group who had a mean score of 5.18 ($SD = 6.71$). For students in the 6th-grade, the experimental group had a mean number of sentences of 7.71 ($SD = 3.54$) and the control group had a mean of 3.63 ($SD = 1.78$). Effect sizes were calculated for grade level. The effect size for the intervention on
number of sentences for 4th-grade students was .03 and 1.49 for 6th-grade. The intervention did not have an effect on the number of sentences written for 4th-grade students and a large effect on the number of words for 6th-grade students.

To determine if there was a significant interaction between conditions and grade level, the data for grade levels and conditions was entered into a one-way ANOVA. Results from the one-way ANOVA indicated a statistically significant interaction between groups, $F(3, 65) = 2.84$, $p = .04$. A follow up analysis was also conducted to determine if there were specific interactions between conditions and grade levels. The post-hoc analysis yielded a result of $p = .03$, indicating that there was statistical difference between the number of sentences written by 6th-grade students the experimental group in comparison to 6th-grade students in the comparison condition. There were no other statistical interactions between grade levels and conditions.

**Results for Research Question 1a**

Is the holistic quality for struggling writers receiving support from the CBGO significantly different from the posttest holistic quality of typically achieving writers who wrote with and without the support of the CBGO? Measures used to answer this research questions included pretest and posttest means for holistic quality for struggling, medium, and high performing writers. At pretest, the mean score for holistic quality for struggling writers in the experimental group was 2.77 ($SD = .83$), medium writers had a holistic score of 3.05 ($SD = .78$) and high performing writers had a mean of 3.60 ($SD = .55$). For the control group, struggling writers had a mean score of 2.91 ($SD = .83$), medium writers scored 2.89 ($SD = .90$), and high performing writers scored 3.00 ($SD = 1.00$). Means for
writer type and condition are on Figure 10. In both the experimental and control group, struggling writers had lower mean holistic scores in comparison to medium and high performing writers. A one-way ANOVA was conducted to determine if there were significant difference between these groups at pretest. Groups used in the ANOVA included low experimental, medium experimental, high experimental, and low control, medium control, and high control. The ANOVA indicated there were no significant interactions at pretest between writer type and condition, $F(5, 63) = .71, p = .62$. This indicates that there were no significant differences by writer classification and condition across at pretest.

At posttest, struggling writers in the experimental group had a holistic mean of 4.23 ($SD = .73$), medium performing writers had a mean of 4.53 ($SD = .51$), and high performing writers had a mean of 4.40 ($SD = 1.53$). In the control group, struggling writers had a mean of 3.20 ($SD = 1.09$), medium writers 3.39 ($SD = .78$) and high performing writers 3.67 ($SD = .58$). A one-way ANOVA was conducted for posttest holistic scores to determine if there was a statistically significant interaction between writer classification and group. Results from the ANOVA indicated that there were significant interactions during posttest, $F(5, 63) = 4.73, p < .001$. 

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A follow up analyses was then conducted to determine which groups had significant differences. According to the post-hoc analyses, holistic quality at posttest for struggling writers in the experimental group were not statistically different from medium performing writers \((p = .78)\) and high performing writers \((p = .99)\) that were also in the experimental group. Also, struggling writers in the experimental group did not have statistically higher holistic scores than struggling writers in the control group, \(p = .11\).

Since descriptive statistics indicate that the mean holistic scores of struggling writers in the experimental group were higher than struggling writers in the control group during posttest \((M = 4.23\text{ vs. }M = 3.20)\), gain scores were calculated to determine if struggling writers made greater gains than struggling writers in the control groups. Also, because there was no statistically significant difference between struggling writers and
medium performing writers \((p = .78)\) and high performing writers \((p = .99)\) in the experimental group, gain scores were also compared for writer type in the experimental group.

In the experimental condition, struggling writers had a mean gain score of 1.35 \((SD = 0.75)\), medium writers had a mean of 1.47 \((SD = 0.17)\) and high performing writers had a mean gain of 0.83 \((SD = 0.98)\). In the control condition, struggling writers had a mean gain of 0.36 \((SD = 0.92)\), medium writers 0.47 \((SD = 0.84)\) and high performing writers had a gain of 0.67 \((SD = 1.54)\). Struggling writers in the experimental condition had a higher gain for holistic writing quality in comparison to struggling writers in the control condition (Figure 11).

*Figure 11.* Holistic gain scores by writer type and condition.
A one-way ANOVA was conducted to determine if there were significant interactions between writer classification and groups based on gain scores. The results from the ANOVA yielded significant interactions across writer classification and groups, $F(3, 65) = 3.77, p = .05$. The ANOVA yielded a significant difference between struggling writers in the experimental condition and struggling writers in the control condition ($p = .01$). Struggling writers in the experimental condition made greater gains in comparison to struggling writers in the control condition.

**Results for Research Question 2**

To what extent are students able to transfer the ability to construct argumentative paragraphs using the CBGO with embedded SRL strategies into a science content area? Measures used to answer this research questions included application means for holistic quality, number of transition words, number of words, and number of sentences. For the application measure, two students were removed from the analysis due to incorrectly saved files. Therefore, pretest and posttest means were adjusted because these students were removed from the analysis. The adjusted pretest mean for holistic quality was 3.06 ($SD = .79$) for the experimental group and 2.90 ($SD = .87$) for the control group.

A $t$-test was conducted to determine if there were differences between groups at pretest. The $t$-test indicated that equal variances were assumed, and there was no significant differences between groups, $t(65) = .75, p = .45$. For transition words, adjusted means were .42 ($SD = .77$) for experimental and .32 ($SD = .54$) for the control group. There were no significant differences at pretest, $t(65) = .57, p = .56$, for number of
transition words. The mean scores for number of words for the experimental group was 72.19 ($SD = 62.04$) and 63.45 ($SD = 60.30$) for the control group. For number of sentences, the mean for the experimental group was $2.50$ ($SD = 3.27$) and $2.87$ ($SD = 3.06$) for the control group. There were also no significant differences between conditions at pretest for number of words, $t(65) = .58$, $p = .58$, and number of sentences, $t (65) = -.47$, $p = .87$. Equal variances were assumed for all comparisons.

**Application holistic quality.** Descriptive data of mean scores for holistic quality during application for the experimental and control overall and across grade levels group are presented in Table 13 and Figure 12. Overall, the experimental condition earned a mean holistic score $4.69$ ($SD = .53$) and the control group earned $3.42$ ($SD = .89$) for holistic quality of the application measure. The effect size for the CBGO intervention in comparison to the writing process intervention was $1.77$ for holistic quality. The effect size of 1.77 indicates a large effect on holistic quality.

### Table 13

*Application Holistic Scores by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th></th>
<th>Control</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$n$</td>
</tr>
<tr>
<td>Combination</td>
<td>37</td>
<td>4.69</td>
<td>.53</td>
<td>32</td>
</tr>
<tr>
<td>Grade 4</td>
<td>19</td>
<td>4.10</td>
<td>.78</td>
<td>15</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>4.76</td>
<td>.44</td>
<td>16</td>
</tr>
</tbody>
</table>
A *t*-test was conducted to determine if there was a statistical difference between the experimental and control groups on the holistic quality. Results from the *t*-test indicated that equal variances were not assumed. Therefore, a Mann Whitney *U* test was used to determine if there was a statistically significant difference between the performance of the two groups, $z = - .75, p < .001$. These results indicate that the experimental group scored statistically higher on the holistic outcome measure during application in comparison to the control group.

Application holistic scores were also calculated by grade level and group. The mean for holistic quality for 4th-grade experimental was 4.63 ($SD = .43$) and 3.27 ($SD =$ 166
.88) for 4th-grade control. For 6th-grade students, the holistic quality mean was 4.76 (SD = .44) for the experimental group and 3.56 (SD =.89) for the control group. Effect sizes were calculated for both conditions for each grade level. The resulting effect size for 4th-grade was 1.99 and the effect size for 6th-grade was 1.75. The intervention had a large effect on both 4th- and 6th-grade students.

Additional analyses were conducted to determine if there were statistical differences between grade levels in holistic writing quality of the experimental and control groups during application. Due to the equal variances not assumed for combined grade levels, an additional t-test was conducted for 4th-grade experimental and control and 6th-grade experimental and control. Equal variances were assumed for 4th-grade students, and the t-test indicated there was a significant difference between experimental and control groups for holistic quality during the application measure, \( t(32) = 5.37, p < .001 \). This indicates that the 4th-grade experimental condition outperformed 4th-grade students in the control group for holistic quality during the application measure. Equal variances were not assumed for the 6th-grade experimental and control, \( t(31) = 4.92 \), therefore, the Mann Whitney U test was conducted. Results from the Mann Whitney U indicate that there were significant differences between the holistic scores between experimental and control groups during the application measure, \( z = -4.17, p < .001 \). In the 6th-grade, students in the experimental group had a higher holistic score during application in comparison to students in the control group.

Descriptive statistics for holistic quality in both conditions during application were compared to the holistic quality during posttest to determine if students were able to
apply their ability to write with the CBGO from posttest to application. Fourth grade experimental students had a mean holistic score of 4.10 ($SD = .78$) for posttest and 4.63 ($SD = .60$) during application. For fourth grade experimental students, scores slightly increased. Fourth grade control students had a posttest holistic score of 3.31 ($SD = .95$) and an application score of 3.27 ($SD = .88$). Students in the 6th-grade experimental group had a posttest holistic score of 4.76 ($SD = .44$) and an application score of 4.78 ($SD = .44$). Means for 6th-grade students in the experimental group were similar from posttest to application. Students in 6th-grade control group had a holistic score of 3.44 ($SD = .73$) during application and 3.44 ($SD = .44$) during posttest. Student scores for 6th-grade control remained the same from posttest to application.

**Application number of transition words.** Descriptive data of mean scores for number of transition words for experimental and control groups across both grade levels and within each grade are available in Table 14 and Figure 13. Overall, the experimental condition had a mean of 5.44 ($SD = 1.03$) and the control group had a mean of .55 ($SD = 1.31$) for number of transition words. The effect size for the CBGO intervention in comparison to the control intervention for number of transition words was 4.14.
Table 14

*Application Transition Words by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th></th>
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<td>$SD$</td>
<td>$n$</td>
</tr>
<tr>
<td>Combined</td>
<td>37</td>
<td>5.22</td>
<td>1.35</td>
<td>32</td>
</tr>
<tr>
<td>4th Grade</td>
<td>19</td>
<td>5.21</td>
<td>1.08</td>
<td>15</td>
</tr>
<tr>
<td>6th Grade</td>
<td>17</td>
<td>5.71</td>
<td>.92</td>
<td>16</td>
</tr>
</tbody>
</table>

*Figure 13.* Application transition words by condition and grade level.
A $t$-test was conducted to determine if the number of transition words were statistically significant at posttest. Results indicated that equal variances were assumed, and there was a statistically significant difference between number of transition words at posttest, $t(65) = 17.12, p < .001$.

Means were calculated for grade level and condition. Fourth grade experimental had a mean of 5.21 ($SD = 1.08$) for transition words and the control group had a mean of 1.07 ($SD = 1.75$). The effect size for the intervention on transition words was 2.86 for 4th-grade. In the 6th-grade, the experimental group had an average number of transition words of 5.71 ($SD = .91$) and the control group had an average of .06 ($SD = .25$). The effect size for the intervention on the number of transition words for 6th-grade was 8.35.

Application mean for number of transition words was entered into a one-way ANOVA analysis to determine if there was a statistical interaction between grade level and conditions. Results from the ANOVA indicated that there was a significant interaction between experimental and control groups for number of transition words in the written responses during application, $F(3, 63) = 109.41, p < .001$.

A follow up analysis was conducted to determine the effects of the intervention across grade levels and conditions. The analysis indicated that there was a significant interaction between grade levels. Experimental and control groups were statistically different in the 4th-grade, $p < .001$ as well as the 6th-grade, $p < .001$. This indicates that the experimental group statistically outperformed the control group in both grade levels.

Descriptive statistics were used to compare the number of transition words in the application measure to the number of transition words written during posttest written by
students in the experimental condition. Students in the 4th-grade experimental group had posttest mean of 4.74 ($SD = 1.52$) for transition words and 4.75 ($SD = 1.48$) during application. Students in the 6th-grade experimental group had a posttest mean of 5.76 ($SD = .97$) and 5.70 ($SD = .91$) during application. Both 4th- and 6th-grade students were able to apply their ability to create written responses with transition words to a different subject.

**Application number of words.** Descriptive data for mean scores for total number of words written for experimental and control groups across both grade levels and within each grade are on Table 15 and Figure 14. Overall, the experimental condition had a mean of 110.50 ($SD = 40.26$) for total words written at posttest and the control group had a mean of 72.78 ($SD = 44.40$). The effect size for the CBGO intervention in comparison to the control intervention for number of transition words was .89. The effect size of .89 indicates there was a large effect of the intervention on the number of word written by students during application.

Application means for total number of words written were entered into an independent sample $t$-test to determine if there was a statistical difference between the experimental and control group in number of words written at application. The results for the $t$-test indicated that equal variances were assumed, and there were statistical differences between number of words written during the application measure, $t(65) = 3.64, p < .001$. 

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Table 15

Application Number of Words by Condition and Grade Level

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th></th>
<th></th>
<th>Control</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Combined</td>
<td>36</td>
<td>110.50</td>
<td>40.26</td>
<td>31</td>
<td>72.78</td>
<td>44.40</td>
</tr>
<tr>
<td>Grade 4</td>
<td>19</td>
<td>110.57</td>
<td>50.07</td>
<td>15</td>
<td>79.07</td>
<td>53.00</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>110.41</td>
<td>29.91</td>
<td>16</td>
<td>67.00</td>
<td>35.30</td>
</tr>
</tbody>
</table>

Figure 14. Application number of words by condition and grade level.

Application scores were also calculated for each grade level across conditions.
Fourth grade students in the experimental group had a mean score of 110.57 ($SD = 50.08$) and comparison students had a mean of 79.06 ($SD = 53.00$) for number of words written during application. Sixth grade experimental students had a mean score of 110.41 ($SD = 26.91$) and the control group had a mean number of words of 67.00 ($SD = 35.30$). Effect size for the intervention on number of words for 4th-grade students was .67 and .99 for 6th-grade students.

Application means for number of words were entered into a one-way ANOVA to determine if there were statistical differences between groups and grade levels. Results from the ANOVA indicated that there was a statistically significant interaction between groups, $F(3, 63) = 4.43, p = .004$.

A follow up analysis was conducted to determine if there were statistically significant interactions between specific groups and conditions. The analyses yielded significant interactions across some grade levels and conditions. Fourth grade experimental and control were not statistically significant ($p = .12$), indicating that there was no statistically significant difference between the number of words written by 4th-grade students in the experimental and the control groups. However, based on descriptive statistics, students in 4th-grade experimental wrote more words in comparison to the control group. For 6th-grade students, there was a statistically significant difference between experimental and control ($p = .02$). Sixth grade students in the experimental group wrote more words than students in the control group.

Descriptive statistics were used to determine if students in the experimental condition were able to maintain the amount of words written from posttest during the
application measure. Students in 4\textsuperscript{th}-grade experimental group had a mean of 114.85 \((SD = 76.01)\) for number of words written during posttest and 107.70 \((SD = 50.46)\) during application. For students in the 4\textsuperscript{th}-grade, the number of words decreased from posttest to application. This was consistent with the results from sixth grade students. Students in 6\textsuperscript{th}-grade experimental had a mean of 124.41 \((SD = 57.02)\) during posttest and 110.41 \((SD = 26.92)\) for application.

**Application number of sentences.** Descriptive data of mean scores for number of sentences for experimental and control groups overall and across both grade levels are presented in Table 16 and Figure 15. The experimental condition had a mean of 6.386 \((SD = 2.4)\) for number of sentences and the control group had a mean of 4.64 \((SD = 3.30)\). The effect size for the CBGO intervention in comparison to the comparison intervention for number of transition words during application measure was .77, indicating that the CBGO had a moderate effect on the number of sentences written in the experimental group.
Table 16

*Application Number of Sentences by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>Combined</td>
<td>36</td>
<td>6.86</td>
</tr>
<tr>
<td>Grade 4</td>
<td>19</td>
<td>6.26</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>7.52</td>
</tr>
</tbody>
</table>

*Figure 15.* Application number of sentences by condition and grade level.

An independent sample *t*-test was conducted for number of sentences for the
experimental and control group. According to the $t$-test, equal variances were not assumed. Therefore, the Mann Whitney $U$ analysis was conducted. The Mann Whitney $U$ test yielded a statistically significant difference between the experimental and control groups, $z = -3.14, p = .003$.

Mean number of sentences for 4th-grade experimental group was 6.26 ($SD = 2.83$) in comparison to the control group who had a mean score of 5.33 ($SD = 3.72$). For students in the 6th-grade, the experimental group had a mean number of sentences of 7.52 ($SD = 1.78$) and the control group had a mean of 4.00 ($SD = 2.82$). The intervention had an effect size of .28 for 4th-grade students and 1.06 for 6th-grade students.

To determine if there was a significant interaction between conditions and grade level, the data for grade levels and conditions was entered into a one-way ANOVA. Results from the one-way ANOVA indicated a statistically significant interaction between groups, $F(3, 63) = 4.55, p = .01$.

A follow up analysis was also conducted to determine if there were specific interactions between conditions and grade levels. According to the post-hoc analysis, there was a statistically significant interaction between 6th-grade experimental and 6th-grade control. The post-hoc analysis yielded a result of $p = .004$, indicating that there was statistical difference between the number of sentences written by 6th-grade students in the experimental group in comparison to 6th-grade students in the control condition.

There was not a significant difference between experimental and comparison conditions for number of sentences written during application by 4th-grade students, $p = .78$. Also, the students in the 6th-grade experimental condition did not write more words than the
students in the 4th-grade experimental condition, $p = .54$.

Descriptive statistics were used to determine if the number of sentences was consistent from posttest to application in the experimental group. Fourth grade students had a mean of 4.10 ($SD = .78$) for number of sentences written during posttest and 5.00 ($SD = .54$) for number of sentences during application. The number of sentences for 4th-grade students increased from posttest to application. However, the mean number of sentences for 6th-grade students were similar from posttest to application. Sixth grade students had a mean of 7.71 ($SD = 3.54$) for number of sentences during posttest and 7.53 ($SD = 1.78$) for application.

**Results for Research Question 2a**

Is the holistic quality for struggling writers receiving support from the CBGO significantly different from application holistic quality of typically achieving writers who wrote with and without the support of the CBGO? Since there was no statistically significant difference between groups at pretest, application means for holistic quality for struggling, medium, and high performing writers were used during this analysis. During application struggling writers in the experimental group had a holistic mean of 4.38 ($SD = .65$), medium performing writers had a mean of 4.71 ($SD = .58$), and high performing writers had a mean of 5.00 ($SD = .00$). In the control group, struggling writers had a mean of 3.45 ($SD = .93$), medium writers 3.41 ($SD = 1.00$), and high performing writers 4.00 ($SD = .00$).
Table 17

*Application Holistic Scores by Writer Type*

<table>
<thead>
<tr>
<th>Writer Type</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$M$</td>
</tr>
<tr>
<td>Struggling Writers</td>
<td>13</td>
<td>4.38</td>
</tr>
<tr>
<td>Medium Writers</td>
<td>17</td>
<td>4.71</td>
</tr>
<tr>
<td>High Writers</td>
<td>6</td>
<td>5.00</td>
</tr>
</tbody>
</table>
A one-way ANOVA was conducted for application holistic scores to determine if there was a statistically significant interaction between writer type and group. Results from the ANOVA indicated that there were significant interactions during application, $F(5, 61) = 8.54, p < .001$.

A follow up analyses was then conducted to determine which groups had significant differences. According to the analyses, holistic quality for struggling writers in the experimental group during application were not statistically different from medium performing writers ($p = .86$) or high performing writers ($p = .58$) who were also in the
experimental group. However, there was a statistically significant difference between the performance of struggling writers in the experimental and control group \((p = .05)\) and experimental struggling writers in comparison to medium performing students in the control group \((p = .01)\). Struggling writers in the experimental group outperformed medium and high performing writers in the control group. In addition, there was no statistically significant difference in the holistic quality of writing for struggling writers in the experimental group and the high performing writers in the control group during application \((p = .96)\). The holistic quality scores for struggling writers in the experimental group were comparable to the scores of high performing writers in the control group during application.

**Results for Research Question 3**

To what extent does the use of the CBGO increase accuracy of content as measured by the accuracy of the argumentative written responses? Measures used to answer this research questions included posttest and application means for accuracy in the experimental and control groups. At posttest, students in the experimental group had a mean accuracy score of 3.49 \((SD = 1.12)\) and students in the control group had a mean accuracy score of 2.91 \((SD = 1.35)\). Posttest accuracy means are on Table 18 and Figure 17. The effect size for the intervention on accuracy was .46, indicating a moderate effect on accuracy.
Table 18

Posttest Accuracy Means by Condition and Grade Level

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th></th>
<th></th>
<th>Control</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
<td>SD</td>
<td>n</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Combined</td>
<td>37</td>
<td>3.49</td>
<td>1.12</td>
<td>32</td>
<td>2.91</td>
<td>1.35</td>
</tr>
<tr>
<td>Grade 4</td>
<td>20</td>
<td>3.45</td>
<td>1.27</td>
<td>16</td>
<td>2.87</td>
<td>1.36</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>3.52</td>
<td>.95</td>
<td>16</td>
<td>2.93</td>
<td>1.39</td>
</tr>
</tbody>
</table>

Figure 17. Posttest accuracy by condition and grade level.
A t-test was conducted to determine if there was a significant difference between experimental and control conditions. The results from the t-test indicated there was no statistically significant difference between the accuracy of the experimental and control group, \( t(67) = 1.94, p = .06 \).

For grade level and condition, 4\(^{th}\)-grade students had an accuracy mean of 3.45 \((SD = 1.27)\) in the experimental group and 2.87 \((SD = 1.36)\) in control. In the 6\(^{th}\)-grade, experimental students had a mean accuracy of 3.52 \((SD = .94)\) and students in the control condition had an accuracy mean of 2.93 \((SD = 1.39)\). Effect sizes were calculated by grade level. Fourth grade students had an effect size of .44, and 6\(^{th}\)-grade students had an effect size of .49.

Means for combined experimental and control were entered into a one-way ANOVA. Results from the ANOVA indicated that there was not a statistically significant interaction for grade levels across conditions \( F(3, 65) = .30, p = .30 \). A post-hoc analysis was then conducted to determine if there were significant interactions between specific grade levels and groups. According to the post-hoc analyses, there were no significant interactions between any groups or grade levels. The interaction between 6\(^{th}\)-grade experimental and control groups was not statistically significant \((p = .53)\) as well as in the 4\(^{th}\)-grade experimental and control groups \((p = .52)\). There was also no significance across grade levels. Sixth grade students experimental students did not outperform 4\(^{th}\)-grade experimental students in accuracy \((p = .99)\).

The intervention did not have a statistical impact on the accuracy of the content during the posttest measure. However, the descriptive statistics indicate that students in
the experimental groups had higher accuracy of written content in comparison to students in the control groups in both 4\textsuperscript{th} ($M = 3.45$ vs $M = 2.87$) and 6\textsuperscript{th}-grade ($M = 3.52$ vs. $M = 2.93$) during posttest. A paired-sample $t$-test was also conducted to determine if both groups combined had an increase in accuracy from pretest to after the interventions. There was no significant differences from pretest to posttest between groups, $p = .77$.

**Application accuracy.** Accuracy of content was also calculated for the written response in the science content area during the application measure. Accuracy during application for the experimental group was $3.67$ ($SD = 1.26$) and $3.20$ ($SD = 1.30$) for the control group. Means were entered into an independent sample $t$-test. Results from the $t$-test yielded insignificant results for accuracy between experimental and control groups, $t(65) = 1.51$, $p = .14$.

Accuracy during application was also determined for each grade level. Fourth grade students in the experimental group had an accuracy mean of $3.52$ ($SD = 1.40$) and students in the control group had an accuracy score of $2.93$ ($SD = 1.28$). In 6\textsuperscript{th}-grade, experimental students had an accuracy mean of $3.82$ ($SD = 1.13$) and the control students had an accuracy score of $3.43$ ($SD = 1.31$).

Mean scores were entered into a one-way ANOVA for condition and grade level to determine if there were statistically significant differences between experimental and control across grade levels. Results from the ANOVA yielded insignificant difference between grade levels and conditions, $F(3, 63) = 1.31$, $p = .28$.

**Results for Research Question 4**

To what extent are students able to maintain the SRL strategies to write
argumentative paragraphs without the support of the CBGO? Measures used to answer this research questions included maintenance means for holistic quality, number of transition words, number of words, and number of sentences, and coding of student interviews. For the initial analyses, 4th- and 6th-grade experimental students were combined for a total experimental group, and 4th- and 6th-grade control students were combined for the control group. Subsequent analyses separated students by their grade level and condition.

Due to incorrectly saved files, two students were removed from the analysis for maintenance. These two students were a different set of students than the students who were removed from application. Pretest scores were recalculated for holistic quality, number of sentences, number of words, and number of transition words. The adjusted mean for holistic quality at pretest in the experimental group was 3.00 (SD = .80) and 2.91 (SD = .87) for the control group. Means for number of words was recalculated as 65.71 (SD = 48.87) for the experimental group and 63.57 (SD = 59.05) for the control group. Means for experimental and control were 2.43 (SD = 3.32) and 2.84 (SD = 3.04), for number of sentences, and .34 (SD = .69) and .31 (SD = .56) for number of transition words. T-tests were conducted for the recalculated means, and equal variances were assumed for each condition. There was no differences between the experimental and control group at pretest for holistic quality, \( t(65) = .46, p = .64 \), number of sentences, \( t(65) = -.53, p = .59 \), number of words, \( t(65) = .16, p = .36 \), and number of transition words, \( t(65) = .21, p = .36 \).
**Maintenance holistic quality.** Descriptive data of mean scores for holistic quality during maintenance for the experimental and control group across both grade levels and within each grade are shown in Table 19 and Figure 18. Overall, the experimental condition earned a mean score 3.91 ($SD = 1.01$) and the control group earned 3.28 ($SD = .81$) for holistic quality of the maintenance measure. Effect sizes for holistic quality during maintenance was .68, a moderate effect on holistic quality during maintenance.

Table 19

*Maintenance Holistic Quality by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$M$</td>
</tr>
<tr>
<td>Combination</td>
<td>35</td>
<td>3.91</td>
</tr>
<tr>
<td>Grade 4</td>
<td>19</td>
<td>3.57</td>
</tr>
<tr>
<td>Grade 6</td>
<td>16</td>
<td>4.31</td>
</tr>
</tbody>
</table>
Figure 18. Maintenance holistic quality by condition and grade level.

To determine if there was a statistical difference between the experimental and control groups on the holistic measures during maintenance, holistic quality scores for experimental and control were used in a t-test. Results from the t-test indicated that equal variances were assumed and there were significant difference between experimental and control groups, $t(65) = 2.08, \ p = .01$.

Means were also calculated for grade level and condition. The mean for holistic quality for 4th-grade experimental was 3.57 ($SD = 1.12$) and 3.06 ($SD = .93$) for 4th-grade control. For 6th-grade students, the holistic quality mean was 4.31 ($SD = .70$) in the experimental group, and 3.50 ($SD = .63$) for the control group. Effect size for the intervention on holistic quality for 4th-grade students was 0.48 and 1.21 for 6th-grade students.
Additional analyses were conducted to determine if there were statistical differences between grade levels in the experimental and control groups during generalization for holistic quality. A one-way ANOVA was used to determine if there were statistically significant differences across grade levels and conditions. Results from the ANOVA yielded significant differences between groups, $F(3, 63) = 4.31, p = .004$. Follow up analyses were conducted to determine which groups had statistically significant differences. According to the post-hoc analysis, there was a statistically significant difference between 6th-grade experimental and 6th-grade control ($p = .05$). There was also a statistically significant difference between 6th-grade experimental and 4th-grade control ($p < .001$). Students in the 6th-grade experimental group had a higher holistic mean in comparison to 4th-grade control. However, there were no statistically significant differences between 4th-grade experimental and 4th-grade control ($p = .32$).

Descriptive statistics for holistic quality in both conditions during generalization were compared to the holistic quality during posttest to determine if students were able to apply the strategies learned to write a argumentative paragraph without the support of the CBGO. Overall, experimental students had a mean score of 3.91 ($SD = 1.01$) for holistic quality during maintenance and 4.41 ($SD = .73$) during posttest. The control group had a mean of 3.28 ($SD = .81$) during maintenance and 3.38 ($SD = .83$) during posttest.

Means were also compared by grade level. Fourth grade experimental students had a mean holistic score of 4.10 ($SD = .78$) for posttest and 3.57 ($SD = 1.12$) during maintenance. Fourth grade control students had a posttest holistic score of 3.31 ($SD = .95$) and a maintenance score of 3.06 ($SD = .93$). Students in the 6th-grade experimental
group had a posttest holistic score of 4.76 ($SD = .44$) and a maintenance score of 4.31 ($SD = .70$) and students in the control group had a holistic score of 3.28 ($SD = .81$) at posttest, and 3.50 ($SD = .63$) during maintenance. Students in the 6th-grade group were able to maintain the skills learned during instruction to write a high quality argumentative paragraph without support. However, students in the 4th-grade experimental group had a decrease in holistic quality of their written response without the CBGO. Scores from the control group remained consistent from posttest to maintenance in both grade levels.

![Figure 19](image)

*Figure 19.* Change in holistic quality by condition and writing session.

**Document analysis.** Document analysis was conducted on the planning sheets used during maintenance in both the experimental and the control group. The documents
were coded for visible occurrences of SRL strategies including goal setting, brainstorming (strategic planning), planning (self-instruction), self-monitoring, and self-evaluation, and the creation of paper-based graphic organizer. Document analysis was used to determine how students transferred SRL strategies learned during the lessons and the text structure of argumentative paragraphs to writing without the CBGO.

In the control group, four students used paper to plan prior to writing. Each of the four students wrote the editing and revision strategy ARMS and CUPS on the paper planning sheet. Only one student showed evidence of self-monitoring by checking off each letter of the mnemonic after completing the editing and revision strategy during writing. However, in the experimental group, 93% ($n=23$) of the students used paper to plan or brainstorm before writing the maintenance paragraph. None of the students in the experimental or control group demonstrated evidence of goal setting or self-evaluation on the maintenance planning sheet.

**Visual representation.** Twenty-six percent ($n=7$) of the students that utilized paper for planning in the experimental group created a paper graphic organizer to provide a visual representation of content prior to writing the paragraph. In six of the graphic organizers, students drew a table with two columns. The left column contained the IDEAS strategy, and one letter of the mnemonic was written in each box for each row. In the right side of the column, students wrote a single word, phrase, or sentence related to the part of the paragraph represented by the letter in the mnemonic. One student created a graphic organizer that contained three columns. In the first column, the student wrote the IDEAS mnemonic. The second row contained words, and the third column...
contained sentences for each word. Students who recreated the graphic organizer on paper had a holistic quality mean of 4.75 ($SD = .50$).

**Brainstorming (Strategic planning).** Brainstorming was evident in 92% ($n = 23$) of the plans generated by students in the experimental group. Students who brainstormed created words or phrases on paper that represented the thoughts that they wanted to create complete sentences about in the paragraph. Fourteen students brainstormed by writing words or short phrases. Four students had a combination of words and phrases in brainstorming, and two students brainstormed by writing complete sentences on the planning sheet. Brainstorming was not evident in planning sheets created by the control group.

**Planning (Self-instruction).** Planning was evident in 100% of the planning sheets generated by the experimental group. Students planned by writing the letters of the IDEA strategy, which represented each part of the paragraph, and wrote words or sentences beside each letter to develop the structure for their argumentative response. All students repeated letters of the strategy if necessary if they needed multiple facts or elaborations in their responses. Students who planned without creating a paper-based graphic organizer had a holistic mean of 3.98 ($SD = .85$)

**Self-monitoring.** Self-monitoring was evident in six of the planning sheets generated by students in the experimental group. These documents contain checkmarks by either the letters in the mnemonic ($n = 2$), or the brainstormed words and phrases ($n = 4$). This indicates that students were checking off their progress as a way of self-monitoring their ideas or as the paragraph was created.
Maintenance number of transition words. Descriptive data of mean scores for number of transition words during maintenance for experimental and control conditions across both grade levels and within each grade are presented in Table 20 and Figure 20. Overall, the experimental condition had a mean of 2.37 (SD = 2.25) and the control group had a mean of .34 (SD = .70) for number of transition words.

Table 20

*Maintenance Transition Words by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th></th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Combined</td>
<td>37</td>
<td>2.37</td>
<td>2.25</td>
</tr>
<tr>
<td>Grade 4</td>
<td>19</td>
<td>1.79</td>
<td>1.90</td>
</tr>
<tr>
<td>Grade 6</td>
<td>17</td>
<td>3.06</td>
<td>2.43</td>
</tr>
</tbody>
</table>
A t-test was conducted to determine if the number of transition words were statistically different at maintenance. Due to floor and ceiling effects from students using a minimum of 0 transition words and a maximum of 5, a Man Whitney U test was conducted to determine if the groups were significantly different for the number of transition words at maintenance. Results from the Mann Whitney U yielded a significant difference between the number of transition words written by the experimental and control group, $z = -3.95, p < .001$.

A follow up analysis was conducted to determine the effects of the intervention across grade levels. Means and standard deviations were calculated by grade levels. Fourth grade experimental students had a mean of 1.79 (SD = 1.9) for transition words and the control group had a mean of .44 (SD = .89). In the 6th-grade, the experimental
group had an average number of transition words of 3.06 (SD = 2.43) and the control group had an average of .25 (SD = .45).

Since the groups were not of equal variances, independent sample t-tests were conducted for each grade level. Results from the independent t-test indicate that there was a statistically significant difference between the number of transition words written by the experimental and control groups in the 4th-grade (p = .02) and 6th-grade (p < .001). Fourth grade students in the experimental condition included more transition words in their written responses in comparison to the control condition. Sixth grade students also included more transition words in their responses in comparison to students in the control condition.

Descriptive statistics were used to compare the number of transition words in the maintenance to the number of transition words written during posttest written by students in the experimental condition. Overall, students in the experimental condition had a mean number of 2.37 (SD = 2.25) for transition words during maintenance in comparison to 5.22 (SD = 1.36) transition words written with the support of the CBGO at posttest. The control group had a mean use of .34 (SD = .71) transition words during maintenance and 1.03 (SD = 1.75) during posttest. Also, students in the 4th-grade experimental group had posttest mean of 5.22 (SD = 1.35) and 1.79 (SD = 1.96) during maintenance. Students in the 6th grade experimental group had a posttest mean of 5.76 (SD = .97) and 5.70 (SD = .91) during maintenance. Sixth grade students were able to maintain their ability to create written responses that included multiple transition words without the support of the CBGO. However, students in the 4th-grade had a decrease in the number
of transition words written in their responses without the CBGO.

![Figure 21. Number of transition words by condition and writing session.](image)

**Maintenance number of words.** Descriptive data of mean scores for total number of words written for experimental and control groups across both grade levels and within each grade are shown in Table 21 and Figure 22. Overall, the experimental condition had a mean of 91.61 ($SD = 54.75$) for total words written at posttest and the control group had a mean of 72.65 ($SD = 41.74$).
Table 21

*Maintenance Number of Words by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>M</td>
</tr>
<tr>
<td>Combined</td>
<td>36</td>
<td>91.60</td>
</tr>
<tr>
<td>Grade 4</td>
<td>19</td>
<td>69.68</td>
</tr>
<tr>
<td>Grade 6</td>
<td>16</td>
<td>117.63</td>
</tr>
</tbody>
</table>

*Figure 22.* Maintenance number of words by condition and grade level.
Maintenance means for total number of words written were entered into an independent sample $t$-test to determine if there was a statistical difference between the experimental and control group in number of words written during maintenance. The results for the $t$-test indicated that equal variances were assumed, and there were statistical differences between number of words written during the maintenance measure, $t(65) = 1.58, p = .12$.

Maintenance scores were also calculated for each grade level across conditions. Fourth grade students in the experimental group had a mean score of 69.68 ($SD = 35.32$) and 4th-grade control students had a mean of 60.75 ($SD = 49.91$) for number of words written during maintenance. Sixth grade experimental students had a mean score of 117.62 ($SD = 62.97$) and the control group had an average of 84.50 ($SD = 28.44$) words.

Maintenance means for number of words were entered into a one-way ANOVA to determine if there were statistical interactions between conditions and grade levels. Results from the ANOVA indicated that there was a statistically significant interaction between groups, $F(3, 63) = 4.87, p = .003$. A follow up analysis was conducted to determine if there were statistically significant interactions between specific grade levels and conditions. The analyses yielded significant interactions across some grade levels and conditions. Fourth grade experimental and control were not statistically significant ($p = .94$), indicating that 4th-grade students produced similar number of words in both conditions during maintenance. For 6th-grade students, there was a not a statistically significant difference between conditions ($p = .18$). However, students in the 6th-grade experimental grade outperformed students in the 4th-grade experimental condition for
number of words written \((p = .02)\) and 4\textsuperscript{th}-grade control \((p = .004)\).

Descriptive statistics were used to determine if students in the experimental condition were able to maintain the amount of words written from posttest during the maintenance. Students in 4\textsuperscript{th}-grade experimental group had a mean of 114.85 \((SD = 76.00)\) for number of words written during posttest and 69.68 \((SD = 35.12)\) during maintenance. For students in the 4\textsuperscript{th}-grade, the number of words decreased from posttest to maintenance. This was consistent with the results from 6\textsuperscript{th}-grade students. Students in 6\textsuperscript{th} grade experimental had a mean of 124.41 \((SD = 57.02)\) during posttest and 117.62 \((SD = 69.97)\) for maintenance. In the control group, students in the 4\textsuperscript{th}-grade had a mean number of words of 69.68 \((SD = 35.32)\) during maintenance and 108.00 \((SD = 143.23)\) at posttest. For 6\textsuperscript{th}-grade control students, students had a mean number of words of 84.50 \((SD = 28.44)\) during maintenance and 73.50 \((SD = 34.22)\) during posttest.
Maintenance number of sentences. Descriptive data of mean scores for number of sentences for experimental and control groups across both grade levels and within each grade are presented in Table 22 and Figure 25. The experimental condition had a mean of 4.34 (SD = 2.17) for number of sentences and the control group had a mean of 3.65 (SD = 2.62).
Table 22

*Maintenance Number of Sentences by Condition and Grade Level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Experimental</th>
<th></th>
<th>Control</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>$M$</td>
<td>$SD$</td>
<td>$n$</td>
</tr>
<tr>
<td>Combined</td>
<td>35</td>
<td>4.34</td>
<td>2.17</td>
<td>32</td>
</tr>
<tr>
<td>Grade 4</td>
<td>19</td>
<td>3.47</td>
<td>2.03</td>
<td>16</td>
</tr>
<tr>
<td>Grade 6</td>
<td>16</td>
<td>5.38</td>
<td>1.89</td>
<td>16</td>
</tr>
</tbody>
</table>

*Figure 24.* Maintenance number of sentences by condition and grade level.

An independent sample $t$-test was conducted for number of sentences for the experimental and control group. The $t$-test determined there were equal variances
between groups, and there were statistically significantly differences between experimental and control group, \( t(64) = 1.18, p = .24 \).

Mean number of sentences for \( 4^{\text{th}} \)-grade experimental group was 3.47 (SD = 2.04) in comparison to the control group who had a mean score of 2.94 (SD = 2.77). For students in the \( 6^{\text{th}} \)-grade, the experimental group had a mean number of sentences of 5.38 (SD = 1.89) and the control group had a mean of 4.40 (SD = 2.29). To determine if there was a significant interaction between conditions and grade level, the data for grade levels and conditions was entered into a one-way ANOVA. Results from the one-way ANOVA indicated a statistically significant interaction between groups, \( F(3, 63) = 3.64, p = .02 \).

A follow up analysis was also conducted to determine if there were specific interactions between conditions and grade levels. According to the post-hoc analysis, there was a statistically significant interaction between \( 6^{\text{th}} \)-grade experimental and \( 4^{\text{th}} \)-grade control. The post-hoc analysis yielded a result of \( p = .02 \), indicating that there was statistically significant difference between the number of sentences written across grade levels and conditions. There was no significant difference between experimental and comparison conditions for number of sentences written during application by \( 4^{\text{th}} \)-grade students (\( p = .89 \)) or \( 6^{\text{th}} \)-grade students (\( p = .63 \)).

Descriptive statistics were used to determine if the number of sentences was consistent from posttest to maintenance in the experimental group. Overall, the mean for the experimental group for number of sentences written was 6.37 (SD = 3.37) for the experimental group and 4.41 (SD = 4.89) for the control groups. Fourth grade students had a mean of 4.10 (SD = .78) for number of sentences written during posttest and
3.47 ($SD = 2.04$) for number of sentences during maintenance. Sixth grade students had a mean of 7.71 ($SD = 3.54$) for number of sentences during posttest, and 5.38 ($SD = 1.89$) during maintenance.

Figure 25. Number of words by condition and writing session.

Results for Research Question 4a

Is the holistic quality for struggling writers receiving support from the CBGO significantly different from maintenance holistic quality of typically achieving writers who wrote with and without the support of the CBGO? Since there was no statistically significant difference between groups at pretest, maintenance means for holistic quality for struggling, medium, and high performing writers were used during this analysis.

During maintenance, struggling writers in the experimental group had a holistic mean of
3.54 (SD = 1.79), medium performing writers had a mean of 4.00 (SD = .79) and high performing writers had a mean of 4.33 (SD = 1.21). In the control group, struggling writers had a mean of 3.18 (SD = .98), medium writers 3.41 (SD = .71) and high performing writers 3.66 (SD = .57). A one-way ANOVA was calculated for maintenance holistic scores to determine if there was a statistically significant interaction between writer type and group. Results from the ANOVA indicated that there were significant no interactions during application, $F(5, 59) = 1.96$, $p = .09$. Struggling writers in the experimental group had similar holistic quality in comparison to medium and high performing writers in experimental group, as well as low, medium, and high performing writers in the control group.

Gain scores were calculated to determine if struggling writers made greater gains in the control group in comparison to struggling writers in the control group because there were no significant interactions between writer level and group. Gain scores in the experimental group were .81 (SD = .75) for struggling writers, .94 (SD = .82) for medium performing writers, and .83 (SD = 1.17) for high performing writers. In the control group, struggling writers had a mean holistic score gain of .27 (SD = .78), medium performing writers had a holistic mean gain of .52 (SD = .57) and high performing writers had a score gain of .57 (SD = .33). Although struggling writers in the experimental group had greater gains in comparison to struggling writers in the control group, the differences were not statistically significant ($p = .09$). Without support of the CGBO, holistic quality gains from pretest to maintenance were similar to the control group.
Table 23

*Maintenance Holistic Quality by Writer Type*

<table>
<thead>
<tr>
<th>Writer Type</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>n</em></td>
<td><em>M</em></td>
</tr>
<tr>
<td>Struggling</td>
<td>13</td>
<td>3.54</td>
</tr>
<tr>
<td>Medium</td>
<td>15</td>
<td>4.00</td>
</tr>
<tr>
<td>High Writers</td>
<td>6</td>
<td>3.66</td>
</tr>
</tbody>
</table>

*Figure 26.* Maintenance holistic quality by writer type.
Results for Research Question 5

What are the effects of the CBGO and related lessons on the SRL strategies of struggling writers? Measures used to answer this research question included student responses from posttest self-efficacy, motivation, and strategy use questionnaire and student interviews. Responses related to strategy use for the experimental group from pre to post intervention were included in this analysis. Students in the experimental and control group received the same strategy use questionnaire. The students responded to questions about SRL strategies including goal setting, brainstorming (strategic planning), planning (self-instruction), and self-evaluation. Students responded on a scale from 1 to 3. A score of 3 indicated that the student agreed with the statement, 2 indicated that the student somewhat agreed, and a score of 1 indicated disagreement.

Means and standard deviations were calculated for each SRL strategy (Table 25). Goal setting had a mean of 2.45 ($SD = .66$) in the experimental group and 2.55 ($SD = .67$) in the control group. Brainstorming had a mean of 2.58 ($SD = .71$) in the experimental group and 2.55 ($SD = .77$) in the control group. Means for planning (self-instruction) for the experimental group were 2.55 ($SD = .67$) and 2.52 ($SD = .68$) for the control group. Self-evaluation for the experimental group was 2.82 ($SD = .39$) and 2.68 ($SD = .75$) for the control group.

$T$-tests were conducted for each SRL strategy. Equal variances were assumed for all SRL strategies except self-evaluation. Results from the $t$-tests indicated there was no statistically significant differences between experimental and control for goal setting.
Due to equal variances not assumed for self-evaluation, a Mann Whitney U test was conducted. Results from the Mann Whitney U indicated there were no differences between experimental and control for self-evaluation, $z = -1.29, p = .19$.

Table 24

*SRL Scores by Question*

<table>
<thead>
<tr>
<th>SRL Components</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Total</td>
<td>2.58</td>
<td>.44</td>
</tr>
<tr>
<td>Goal Setting</td>
<td>2.45</td>
<td>.79</td>
</tr>
<tr>
<td>Brainstorming</td>
<td>2.58</td>
<td>.71</td>
</tr>
<tr>
<td>Planning</td>
<td>2.55</td>
<td>.67</td>
</tr>
<tr>
<td>Self-evaluation</td>
<td>2.82</td>
<td>.39</td>
</tr>
</tbody>
</table>

Questions within the constructs of strategy use were combined, and a mean score was determined. Strategy use means from the survey were calculated at posttest resulting in a strategy use mean of 2.58 ($SD = .44$) for the experimental group and 2.52 ($SD = .50$) for the control group. An independent sample $t$-test was conducted to determine if these
groups were significantly different at posttest. Results from the *t*-test yielded insignificant differences between experimental and control group, *t*(62) = .46, *p* = .652.

Means were calculated for grade level and condition. Fourth grade students in the experimental group had a mean strategy score of 2.61 (SD = .46) and the control group had a mean of 2.38 (SD = .59). Sixth grade students in the experimental group 2.60 (SD = .39) and control group students had a mean of 2.66 (SD = .27). A one-way ANOVA was conducted, and there were no significant interactions across grade level and condition, *F*(3, 64) = 1.27, *p* = .29.

Strategy use means were also calculated by writer classification and group. Struggling writers in the experimental group had a mean of 2.63 (SD = .45), medium performing writers had a mean of 2.62 (SD = .39), and high performing writers had a mean of 2.32 (SD = .62). In the control group, struggling writers had a mean of 2.56 (SD = .54), medium performing writers had a mean of 2.55 (SD = .39), and high performing writers had a mean of 2.26 (SD = .81). To determine if there were differences between groups, a two-way ANOVA was conducted. The results from the ANOVA revealed insignificant differences across writer classification and group, *F*(2, 64) = 1.39, *p* = .99.

Gain scores were also calculated to determine if struggling writers made greater gains in SRL strategy use in comparison to typically achieving writers. Struggling writers in the experimental group had a mean gain of .15 (SD = .18), medium performing writers had a mean gain of .04 (SD = .35), and high performing writers had a mean gain of .00 (SD = .14). In the control group, struggling writers had a mean gain of .15 (SD = .41), medium performing writers had a mean gain of .035 (SD = .27), and high
perfor

m writers had a mean gain of -0.07 (SD = .16). A two-way ANOVA was conducted to determine if there were significant interactions between writer classification and group. Results indicated that there were no significant interactions between grade level and group, $F(2, 64) = .04, p = .96$.

**Student strategy use interviews.** Students in the experimental group were interviewed at pretest, posttest, and maintenance. Although there was no statistically significant difference between experimental and control group in SRL strategy use during self-reporting on the questionnaire, the sample of students in the experimental group used SRL strategies at a greater frequency in comparison to the control group at posttest as described during interviews (Figure 30) and applied these strategies during maintenance (Figure 32). Although both groups were interviewed, this section will describe the change in the application of SRL from pretest to maintenance in the experimental group.

At pretest, all students interviewed in the experimental group ($N = 12$) described their process of writing their argumentative responses. These processes included four sequences of SRL strategy use, with a maximum of three SRL strategies utilized while writing. These writing processes included some strategies used during the forethought phase and the self-reflection phase, including brainstorming and self-evaluation. However, at pretest, students did not naturally apply any strategies in the production phase. Six students included the writing processes of brainstorming and self-evaluation; two students had the processes of goal setting, brainstorming, and self-evaluation; two students brainstormed only, one student only self-evaluated; and one student only typed and did not apply any SRL strategies. Most students thought about their writing.
(brainstormed), starting writing, and then checked their work for mistakes (self-evaluation).

Figure 27. SRL writing processes at pretest.

At posttest, the writing process of students in the experimental group changed. Students in the experimental group included more SRL strategies while utilizing the CBGO and were able to describe the use of these strategies. There were a maximum of five SRL strategies and a minimum of two SRL strategies described during the writing process, which was an increase from no strategies used and maximum of three writing strategies during the writing process at pretest. There was an inclusion of writing strategies in the performance phase, including planning and self-monitoring, which did not occur at pretest. Three students included the processes of brainstorming and self-
evaluation; three students also set goals and then brainstormed; three students set goals, brainstormed and then self-evaluated; two students set goals, planned, and the self-evaluated; two students set goals, brainstormed, planned, and then self-evaluated; and one student set a goal, brainstormed, self-monitored, and then self-evaluated.

Figure 28. SRL writing processes at posttest.

Students were also able to maintain the strategies utilized during posttest with the support of the graphic organizer to writing without support of the tool. During maintenance, students applied a range of one to five SRL strategies, and demonstrated the
inclusion of more SRL strategies during their writing in comparison to pretest. In comparison to writing during pretest, the student writing became more complex and shifted from brainstorming, writing, and reviewing their writing, to the inclusion of more SRL strategies. This ranged from one student self-evaluating; four students brainstorming, planning, and self-evaluating; one student that set goals, brainstormed and then self-evaluated; three students that set goals, brainstormed, planned, and self-evaluated; one student that set a goal, brainstormed, planned, self-monitored, and self-evaluated; one student that brainstormed, planned, self-monitored, and self-evaluated; and one student that set a goal, brainstormed, self-monitored, and self-evaluated.
Figure 29. SRL writing processes at maintenance.

**The forethought phase.** During pretest, students typically included strategies in the forethought phase. This included most students utilizing brainstorming as a way to strategically plan the content of their writing. In addition, goal setting was not frequently used \( n = 2 \) during pretest. However, there was an increase in the use of goal setting during posttest, when the students were guided by the embedded strategies in the CBGO. Students then transferred the ability to set goals, and continued to brainstorm, during maintenance.

**Goal setting.** Goal setting was the first step in the writing process of two students
that were interviewed who described their process of writing during pretest. John, a 4th-grade student, medium performing ELL student, and Gia, a high-performing 4th-grade student, both set goals prior to writing their paragraphs. Prior to writing, John stated that he set a goal related to the length of his paragraph. John stated, “I set a goal that I could get at least three or four sentences.” Similar to John, Gia also set a goal before writing. Gia stated, “I set a goal to write three sentences.” Both of the students set an outcome goal for production, rather than a process goal of steps that needed to be taken throughout the completion of their paragraph. During pretest interviews, other students stated that they did not set a goal, and did not describe process or production goals during the interview.

However, when writing with the CBGO, students increased their ability to actively set goals. In contrast to pretest, in which only two students set goals for their writing, seven students actively developed goals and used these goals to guide their writing during posttest. Students of varying ability levels, including low, medium, and high performing writers, as well as special education students, stated that they set a goal for their writing. All of the goals set by the students were obtained from the set of goals included with the graphic organizer. The students stated that they selected a goal from the options of goals, each of which were outcome goals and ranged from writing a paragraph with three facts and one elaboration, to write a paragraph with three facts and three elaborations.

Although goal setting was limited during pretest and increased with the use of the CBGO, students maintained their ability to set goals when the CBGO was removed.
Whereas the two students who set goals during pretest set goals for production, such as writing a specific number of sentences, nine students set goals during maintenance. These goals also shifted from setting production goals to writing with specific paragraph parts, which were similar to the goal options from the CBGO. Harry, a 6th-grade student who did not set a goal during pretest and set a goal while using the graphic organizer, also set a goal during maintenance. Harry stated that his goal was to write a paragraph that had three facts and three elaborations. David also set a goal for content. He set a goal to write three facts and three elaborations. Johnny, a struggling writer, also set a goal for parts. Johnny was able to visualize the options that were in the graphic organizer, even when the graphic organizer wasn’t present. When asked what goal he set, he stated that he “set the first goal, the one with one elaboration”.

**Brainstorming (strategic planning).** At pretest, brainstorming was the second process in writing process for a total of ten students; two brainstormed after setting a goal for their writing, and for eight students, brainstorming was the first step in the writing process. Two students did not brainstorm at pretest. For the students that used brainstorming at pretest, all described brainstorming as a step that occurred as a thought process as they reflected about how to answer the question in writing. John and Gia, who set a goal prior to brainstorming, had a similar process for brainstorming in their writing at pretest. John stated, “I thought about the story I was going to write, and then I started to write it.” Gia also stated that after she set a production goal for her writing, she reread the question, thought about how to answer the question, and then started to write the answer. Even for students that did not set a goal first, brainstorming was an integral part
of starting their writing process. The students interviewed stated that they thought about what they were going to write, and then started to type the answer on the computer. Kevin, a 6th-grade medium performing writer in the experimental group, stated, “I thought about all the stuff that could happen if people didn’t trade...and then I started writing”. For Kevin, brainstorming was a process in which he thought about how to answer the question about trade before he started writing. Andrew, a 6th-grade, high performing writer, provided more detail to his process of brainstorming during pretest, “First I thought about what would be a good answer and then I just kind of wrote as I, I just kind of thought as I wrote”. Then he elaborated, “I thought about some different countries that have some stuff that we need.” However, when asked directly if he brainstormed, the student stated that he did not. He did not associate the process of thinking what to write about and making a mental list of things that other countries need that could be acquired as trade as brainstorming before writing. Susan, a 4th-grade, struggling writer in special education only brainstormed prior to writing, and did not apply any additional writing strategies. She had difficulty describing the brainstorming process. The student stated that she brainstormed but was unable to describe how the process occurred.

Although a slight increase from pre to posttest, many students (n =11) applied brainstormed during posttest. Brainstorming was either the next step after setting a goal or the first step in the writing process. Students also increased their ability to explain the brainstorming process with support of the CBGO. Johnny, a struggling 4th-grade writer in special education was unable to state how he brainstormed, or what he thought about
during the brainstorming process. However, he stated how he brainstormed during posttest. After being asked if he brainstormed, Johnny stated “Yeah. I put gas, solid, and matter and everything.” With the visual support of the graphic organizer, Johnny was able to connect this process of thinking about his writing to the act of brainstorming and state the words that he thought of during brainstorming. Sara, another struggling writer in special education, was also unable to describe the brainstorming process at posttest, but was able to state how she brainstormed with the support of the CBGO. When asked how she brainstormed, Sara stated “I thought in my head.” Mary, a medium performing student, also improved their ability to describe the brainstorming process and how it helped her to answer the question. She stated,

I first thought about it like say if it was yes or no. I read over it. Then I said yes because do you think things get, yeah because sometimes when you need something the other person has it. You can just trade and then the person’s happy with what they have and this person is happy with what they have.

High performing students were also able to improve their ability to associate the term brainstorm with the process of thinking about what to write. Andrew stated, “First I brainstormed some ideas. I put down some words.” During pretest, Andrew did not make the connection between thinking about his writing and the process of brainstorming.

During maintenance, eleven students continued to connect the process of thinking about what to put in their writing to the act of brainstorming. David, a high performing writer in 6th-grade stated that he brainstormed in his head by thinking about what the
question asked before starting to write the answer to the question. Mary, a medium performing writer stated, “first like I thought like what am I going to write about and then like I kept on brainstorming and then right there like I just typed and then right there I keep like getting more ideas, more ideas.” Mary was able to brainstorm and generate ideas for her writing without the support of the graphic organizer, and associate the process of thinking about writing with the act of brainstorming.

**Performance phase.** At pretest, students did not use any strategies within the performance phase. However, some students in the experimental group planned and self-monitoring their writing using the CBGO at posttest. Although all students planned using the graphic organizer, not many students were able to connect the use of CBGO as planning their writing. During maintenance, some students did describe the planning process as a form of self-instruction and also continued to use self-monitoring.

**Planning (self-instruction).** None of the students described the process of planning during the pretest writing assignment. However, some students stated that planning was the process of thinking about what to write, instead of associating the act of thinking what to write as brainstorming. For example, when asked if Kevin planned before writing, Kevin stated, “by thinking of what would happen if people traded and what would happen if people didn’t trade.” However, when asked if he brainstormed, the student replied “no”. Kevin associated thinking about what content should be included in the paragraph as planning, rather than brainstorming.

When describing their writing process at pretest, the students did not demonstrate any evidence of the planning process. Although all students actively planned when using
the graphic organizer for writing at posttest, only four students were able to articulate this process while describing how they wrote their paragraphs. Mary and Andrew were two students that were able to describe their process of using the graphic organizer to plan. Mary stated,

I typed like, I looked where the brainstorm is and then I typed in yes because that was first thing that was there and that was the first thing I that I need to put in, identify your claim.

Mary took her thoughts from the brainstorming section in the graphic organizer. She then was able to plan her writing, utilize the needed parts of the paragraph based on the mnemonic and on the brainstormed thoughts. Andrew was also able to use his thoughts during brainstorming to plan and structure his paragraphs.

I wrote down my first letter for I, I wrote down for the IDEAS. Identify your plan. Then I wrote down some, then I thought of some facts from the text and wrote those down. On the elaboration I thought of some other facts and I wrote down an example just to clarify.

During pretest, students did not describe any planning processes. However, during maintenance, students were able to describe the process of planning their paragraphs. Harry stated that he used the paper to plan, and then he wrote his paragraph on the computer. David stated, “I put my main points first and then in my head I decided how my sentences were going to be. As I went I added other stuff.” Johnny stated that he wrote words down on paper, and then used the word s to write his paragraph. Andrew, a high performing writer stated, “first I wrote down everything I did on a sheet of paper
and I just wrote all of the facts I was going to write, type on the computer. On the short way.” Gia also described her planning process. She stated, “First I put IDEAS on the side of the paper. And I started to think what I was going to write about. I wrote it down on the paper and then I wrote it on the computer, a couple of words”.

Self-monitoring. In addition to the lack of planning during pretest responses, students in the experimental group did not self-monitor their writing. Although Andrew stated that he thought about what to write before and during writing, he did not describe the process of making sure specific content was included in the paragraph, or if he content answered the question.

However, self-monitoring was evident during posttest. David and Kevin described their process of monitoring their writing as they were answering the question. For Kevin, the self-monitoring process occurred after he brainstormed and before he wrote the complete paragraph. When asked what he did after he brainstormed, Kevin stated that he looked over the words he wrote during brainstorming and made sure that they words made sense and would answer the paragraph. In contrast, David self-monitored during the planning and writing process of completing the paragraph. He stated that after brainstorming, he reread the question to make sure that the words written in the brainstorming box would help to answer the question, then checked each fact he wrote to make sure that they made sense before copying and pasting and editing the final paragraph. For David, self-monitoring was an integrated part of the writing process.

During maintenance, three students self-monitored their writing process as they created their paragraphs. David self-monitored by brainstorming the ideas for the
passage, and making sure he had sentences for each of those words. David also looked at
the words that he used during brainstorming, and made sure that each of those words
helped the answer the question. Kevin also self-monitored during the writing process at
maintenance. Kevin stated that after he brainstormed, he made sure that he had parts of
the IDEAS strategy that related to the sentences that he was writing in the paragraph.
Mary self-monitored by setting a goal, and then ensuring that she was meeting her goal as
she was writing.

**Self-reflection.** At pretest, some students incorporated the strategy of self-
evaluation during the self-reflection phase. This increased during the posttest and
maintenance phase.

**Self-evaluation.** Although planning and self-evaluation was not evident in the
descriptions of their writing process, nine students did self-evaluate their work after
writing and made subsequent changes during pretest. For these students, self-evaluation
was the last step in the writing process. Mary, a 4th-grade, medium performing writer
stated that after brainstorming and writing her answer, she “[was] reading through it and
it was good and then I said okay and then I raised my hand.” Mary evaluated her work to
make sure it was good enough to turn in but did not make any changes. However, other
students evaluated their work, saw changes that they made during their evaluation, and
then made subsequent changes. Kevin also evaluated his work, but did not make any
changes. When asked how he reviewed his work, Kevin stated, “by rereading it and
making sure it made sense.” Harry a 6th-grade medium performing writer stated that after
writing his paragraph, he read over his work and then he made changes. Harry stated,
I was reading it…I changed like some of the words I made a mistake with like the construction. And then I accidently typed it wrong so I fixed that. And I fixed this part, the whole sentence.

Harry was reading his work to make sure it didn’t have any mistakes, but his evaluation was related to fixing mistakes in spelling, rather than checking over his work for content. Johnny, a struggling writer in special education, also evaluated his work after brainstorming and writing his paragraph. He stated that he read over is work and “when I like took this off and I put I trade a toy car. I erased it then I put this.” Again, self-evaluation was the process of reading over the paragraph and then making changes. However, Johnny changed content rather than mechanical or spelling errors.

At posttest, seven of the students interviewed stated that after they wrote their final paragraph, they reviewed their writing. The process of reviewing their writing was similar to the evaluation of their writing during pretest when the students checked their paragraphs for mechanical or content errors. John stated that after reviewing his writing, he noticed that his writing contained mostly capital letters. John then revised his writing. Danny, a 4th-grade high performing writer, also evaluated his work, but did not make any changes. He stated that he looked over his work and noticed that he needed to change capitalization and spacing, but he did not have time to make the changes.

Students continued to self-evaluate during maintenance. For example, Johnny looked over his writing after he wrote his paragraph. He noticed that he wrote about Harry Potter, and the prompt was about scarcity. He stated, “I changed Harry Potter and changed it, and I put Indians, Powhatans, and Settlers”. Mary also stated, “The changes
like I read over it and there was like a spot that like didn’t make sense and I just like spaced back and then put like the word that I wanted to put.”

**SRL use and holistic quality.** After each interview was transcribed and coded for student use of each SRL strategy, the occurrence of each SRL strategy was counted, and the total number of SRL strategies used during the writing process was categorized as either low, medium, or high use of these strategies. The codes were counted and categorized at pre-test, posttest, and maintenance in the experimental group. SRL strategies that were coded were the task analysis steps of goal setting and brainstorming during the forethought phase, planning and self-monitoring as a task strategy steps during the performance phase, and self-evaluation during the self-reflection phase. The occurrence of each was strategy was counted once, and students could have used a maximum of five SRL strategies while writing. Brainstorming was counted as the thought process of what information to include in the paragraph, either occurring on paper or in thinking, and planning was coded as any decision making process of what place specific facts should be within the paragraph. Goal setting was coded as a student setting a goal for their writing and explicitly stating the selected goal, self-monitoring is the process of reviewing the work during completion, and self-evaluation was coded as the process of reviewing the paragraph once it was completed. Students had to explicitly state one of the SRL terms during the student interview and describe the process associated with that term, or either describe the process. High use of SRL strategies was the use of four of five strategies, medium is the use of two or three, and low was the use of only one SRL strategy. Although students in the control group did not receive
instruction, some students naturally apply SRL strategies in their writing. Therefore, SRL strategies were coded and means were calculated for holistic quality as well in the control group.

**Posttest SRL use and holistic quality.** During posttest, both experimental and control groups equally applied self-monitoring strategies, with two students in the experimental group and two students in the control group applying these strategies. Also, there was an equal occurrence of students applying self-evaluation; eight students in the experimental group and eight students in the control group applied these strategies while writing during posttest. However, students in the experimental group applied brainstorming and planning techniques while creating their written responses at a greater frequency in comparison to the control group. Eleven students in the experimental group brainstormed in comparison to eight students in the control group, eight students set goals in the experimental group in comparison to the control group, and six students planned in comparison to two students in the control group.
Figure 30. Student SRL strategy use by condition.

The total number of strategies used by each student was categorized as either high (four or five strategies), medium (three strategies), or low use (one or two) of SRL strategies. Students in the experimental group had an average of 2.41 (SD = .51), and students in the control group had an average of 1.81 (SD = .63). A t-test was conducted to determine if there was a statistically significant difference between the frequency of SRL strategies used while writing at posttest. The t-test indicated a statistically significant difference between the number of strategies used at posttest, $t(20) = 2.52, p = .02$. Students in the experimental group applied SRL strategies while writing at a greater frequency than students in the control group.

Overall, students in both the experimental and control group that had a high use of SRL strategies had a higher mean for holistic quality during posttest. In both groups,
students with low SRL use had a mean holistic score of 3.00 ($SD = .00$), students with medium SRL use had a mean score of 4.00 ($SD = .85$), and students with high SRL use had a mean of 4.83 ($SD = .89$). In the experimental group, students with medium SRL strategy use had a mean holistic quality of 4.33 ($SD = .82$) and students with high SRL use had a mean of 5.00 ($SD = .00$). In the experimental group, there were no students that had low use of SRL strategies. For the control group, students who exhibited low SRL use had a mean score of 3.00 ($SD = .00$), students with a medium use of SRL strategies had a mean of 3.67 ($SD = .82$), and one student with high SRL use had a holistic score of 4.00.

![Figure 31. Holistic means for SRL use by condition.](image)

**Posttest SRL use of struggling writers.** The SRL use during the posttest written response was calculated for struggling, medium, and high performing writers. For the
experimental group at posttest, struggling writers had a mean SRL use of 2.00 ($SD = .00$), medium performing writers had a mean of 2.60 ($SD = .54$), and high performing writers had means of 2.66 ($SD = .57$). In the control group, struggling writers had a SRL mean of 1.66 ($SD = .87$), medium writers had a mean of 1.80 ($SD = .83$), and high performing writers had a mean of 2.00 ($SD = .00$). Struggling writers who used the CBGO had a greater use of SRL strategies in comparison to struggling writers in the control group. Struggling writers in the experimental group had the same mean SRL strategy use as high performing writers in the control group.

Gain scores were also calculated to determine if struggling writers increased their SRL use from pre to posttest. Struggling students in the experimental group had a gain of .25 ($SD = .50$) and in the control group a decrease of .50 ($SD = .70$) from pre to posttest. Medium performing writers in the experimental group had a gain of 1.00 ($SD = 1.22$) and .25 ($SD = .95$) in the control. High performing writers in the experimental group had a gain of 1.00 ($SD = .00$) and .00 ($SD = .00$) in the control from pre to posttest. All student writers had increased used of SRL strategies from pre to posttest in the experimental group, and struggling writers in the experimental group made greater gains from pre to post in comparison to struggling writers in the control group.

**Maintenance SRL use and holistic quality.** To determine how students in the experimental group transferred their knowledge of SRL strategies to plan and develop an argumentative paragraph, the student interviewes were also transcribed and coded during maintenance. The use of SRL strategies were also categorized as high, medium, and low. During maintenance, students in the experimental group utilized SRL strategies at a
similar or greater frequency in comparison to posttest. Goal setting slightly decreased from posttest to maintenance. During posttest, eight students set goals, but six students set goals at maintenance. However, brainstorming use remained the same, with eleven students brainstorming during posttest and maintenance. In addition, there were some increases in SRL use from posttest to maintenance. During posttest, two students self-monitored, but three students self monitored during maintenance, six students planned during posttest and nine planned during maintenance, and eight students self-evaluated at posttest, but twelve students self-evaluated during maintenance.

Figure 32. SRL strategy use for the experimental group by writing session.

The use of strategies per student was also categorized as high medium and low SRL use for the experimental group. During maintenance, the student who had low SRL
use had the lowest holistic score \((M = 2.00)\). Students with medium use of SRL strategies during maintenance had a mean score of 4.60 \((SD = .89)\) and students with high SRL use had a mean score of 4.00 \((SD = 1.16)\).

![Figure 33. Mean maintenance holistic scores for low, medium, and high SRL use.](image)

**Results for Research Question 6**

Does the use of the CBGO with embedded SRL strategies change students’ self-efficacy and motivation to write? Measures used to answer this research question included students’ responses from the pretest and posttest self-efficacy and motivation survey and student interviews. Responses were used for questions related to self-efficacy, motivation, and strategy use in the survey. Questions within the constructs of self-efficacy were combined, and the mean was determined. The mean score for motivation questions was also determined.
Means were then calculated to determine if there were differences post-intervention for self-efficacy. For self-efficacy, students in the experimental group had a mean self-efficacy score of 2.42 (SD = .36) and 2.32 (SD = .35) in the control group. A t-test was conducted to determine if there were statistically significant differences between the experimental and control group for self-efficacy. Results from the t-test yielded insignificant differences between groups for self-efficacy, \( t(62) = 1.18, p = .24 \).

Means were calculated for self-efficacy by grade level and condition. Students in the 4th-grade experimental group had a mean self-efficacy score of 2.32 (SD = .39) and students in the control group had a mean score of 2.24 (SD = .41). In the 6th-grade, students in the experimental group had a self-efficacy score of 2.53 (SD = .29) and 2.38 (SD = .28) in the control group. A two-way ANOVA was conducted to determine if there were significant interactions across grade level and conditions. Results from the ANOVA yielded insignificant interactions across grade levels and conditions, \( F(3, 63) = .23, p = .63 \).

Means were also calculated for motivation. Post intervention, students in the experimental condition had a mean motivation score of 2.58 (SD = .34) and 2.37 (SD = .43) in the control group. A t-test was conducted to determine if there were statistically significant differences between groups for motivation. Results from the t-test yielded significant differences for motivation, \( t(62) = 2.12, p = .04 \).

Means for motivation were calculated by grade level and condition. Students in the 4th-grade experimental group had a mean motivation score of 2.67 (SD = .41) and 2.37 (SD = .48) in 4th-grade control. In the 6th-grade, students in the experimental
condition had a motivation mean of 2.55 (SD = .28) and 2.36 (SD = .37) in the control group. A one-way ANOVA was conducted to determine if there were differences across grade levels and conditions. Although there were statistically significant differences between experimental and control group for motivation, the results from the ANOVA indicated there were no significant interactions by grade level and condition, $F(3, 63) = 1.79, p = .16$.

Table 25

*Self-efficacy and Motivation Means by Condition and Grade Level*

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<thead>
<tr>
<th>Grade</th>
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<td>Grade 6</td>
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**Student motivation and self-efficacy interviews.** Although there was no reported difference between self-efficacy and only a difference in overall motivation, during interviews, students in the experimental group preferred the quality of their writing when writing with the CBGO and believed that answering questions was easier with support of the CBGO. Mary stated,

Because it’s like more like, like sometimes when you have a whole sheet of paper, right? And then it’s like when you just write two or three sentences there’s that big spot right there that hasn’t been like used or anything. So it’s much better to write paragraphs because like there’s a little bit more space to use.

For Mary, she liked used the CBGO helped her to write more. Students also reflected that they preferred the graphic organizer because it helped them to know how write a paragraph. John stated, “*Because when I first started I didn’t know what to do, but now when I did it a couple times I know what to do.*” David stated that his writing continued to improve from pretest to maintenance. He stated,

I think I did the punctuation and stuff and I think I did good on including all the problems that had to do with scarcity like food scarcity, supply scarcity and stuff like that.

When asked what he liked about his paragraph, specifically, Andrew stated, “*Everything, just everything.*” Johnny, a struggling writer, also said he preferred writing without the graphic organizer. Most of the students stated that they felt better about the final outcome of their writing with the graphic organizer, but were unable to articulate why (*N = 9*).
In regards to self-efficacy at both pre and posttest, many students believed that they wrote just as well as their peers and felt that they could answer the questions in writing. For example during pretest, Mary, a 4th-grade medium performing writer stated that she believed everyone in her classroom has the same writing abilities. She also stated that she felt confident that she could answer the social studies question in writing at pretest. During posttest, Mary still believed that she wrote just as well as everyone in her classroom and also felt that she could complete the writing assignment. Students believed that they wrote just as well as their peers and were confident in their writing. This was evident from students in both grade levels and throughout all writer classifications in the experimental condition.
Chapter Five

This study determined the efficacy of a computer-based graphic organizer (CBGO) with embedded self-regulated learning (SRL) strategies on the argumentative writing of typically achieving and struggling writers in the 4th- and 6th-grade. The current study extended the research on CBGOs and SRL strategies on student writing performance (Evmenova et al., in press), in several ways. First, the student students created written responses in the argumentative genre and theses responses were relevant to topics of science and social studies. Second, the sample was sixty-nine students, which included a large percentage of ELLs. Fourth, student use of SRL strategies, level of motivation, and degree of self-efficacy were determined. Finally, instructional lessons were delivered by teachers in 4th- and 6th-grade at an elementary school in contrast to a middle school setting.

Major Findings

Overall findings revealed:

1. Students in the experimental condition statistically outperformed the comparison condition on the measure of holistic quality.

   a. There were statistically significant differences between 4th-grade experimental and the 4th-grade control group and 6th-grade experimental and 6th-grade control on the measure of holistic quality.
b. There was not a statistically significant difference between struggling writers, medium performing writers, and high performing writers in the experimental group.
   
i. Struggling writers of the experimental group made greater gains than struggling writers in the control group.

2. There were variations in the quantity of writing in the experimental and control group, including number of transition words, number of words, and number of sentences at posttest.
   
a. There were statistically significant differences in number of transition words written at posttest overall and by grade level.
   
b. Number of sentences written at posttest was at the threshold of significance overall, and there was a statistically significant difference in number of sentences written in the 6th-grade.
   
c. There were no statistically significant differences overall and by grade level for number of words.

3. There was no statistically significant difference in accuracy of writing between experimental and control groups.

4. Students were able to write quality argumentative responses in the science content area during application.
   
a. There was a statistically significant difference between 4th-grade students in the experimental and control group in holistic quality and number of transition words written during application.
b. There was a statistically significant difference between 6th-grade students in the experimental and control group in holistic quality, number of transition words, number of words, and number of sentences, during application.

5. There was a statistically significance difference in the holistic quality of writing score, the number of transition words, number of words, and number of sentences in comparison to the control group during maintenance.
   a. There was a statistically significant difference in the number of transition words in the 4th-grade experimental and control group. The 4th-grade experimental students did not outperform the control group in any other measure.
   b. There was a statistically significant different in holistic quality and number of transition words between the experimental and control group in the 6th-grade.
   c. There was no statistically significant difference between struggling writers in the experimental group, and medium and high performing writers in the experimental group.

6. There was no statistical difference between the self-efficacy of students in the experimental and comparison condition, however, motivation of the students in the experimental condition increased.
   a. The motivation and self-efficacy measures did not increase after the intervention for students in the 4th-grade or 6th-grade.
Each of these findings is discussed further in the following section. First, the outcomes of writing quality will be discussed followed by the quantity of writing. Third, use of SLR strategies will be discussed. Next, the reading of text and writing will be discussed including the accuracy of content measure. Fifth, the students’ ability to apply writing skills to science topics during the application measure will be discussed. Sixth, maintenance data will be discussed. Finally, student motivation and self-efficacy will be examined. This chapter concludes with educational implications, limitations, and recommendations for future research.

**Holistic Writing Quality**

Students in the experimental group wrote argumentative responses that were of a greater holistic quality in comparison to the control group. The differences in holistic quality across conditions were evident in the combined experimental and control group (4th-grade and 6th-grade) and in the 4th-grade and 6th-grade when data was analyzed separately by grade level. The use of the CBGO and the application of SRL strategies could have possibly attributed to the increased holistic quality of writing in the experimental group during posttest.

The use of CBGOs and the related improvement in holistic quality is consistent with previous research on CBGOs and writing (Evmenova, et. al., in press; Ponce, et al., 2012; Sturm & Rankin-Erikson, 2002; Unzueta and Barbeta, 2012). Similarities between the previous research and the present study include the implementation of a CBGO to support the writing of elementary or middle school students across various writing abilities. Writing genre and content area varied from the present study.
For example, in the research study by Sturm and Rankin-Erikson (2002), which included typically achieving students and students with learning disabilities, the student participants wrote with the support of *Inspiration*, a paper-based graphic organizer, and without any support. The students received instruction on how to create handwritten and CBGOs with the software program *Inspiration* by making story webs to support their writing. At posttest, the students who wrote with the CBGO had an increase in holistic quality.

Likewise, an additional research study conducted with struggling writers also determined the effectiveness of CBGOs using the software program *Inspiration*. Students with learning disabilities were the focus of this intervention (Unzueta and Barbetta, 2012). In Unzueta and Barbetta’s study, students used the software program *Inspiration* and wrote persuasive essays in the language arts content area. When using *Inspiration*, the students developed and used concept webs to plan for the content of their written responses. The students in this study also had improvements in holistic quality.

Although there were similarities between previous research and the present study in the application of a CBGO to improve writing, the CBGOs used in these two research studies were in a different format than the present study. In both of the mentioned research studies, computer based graphic organizers in the form of concept webs used the software program *Inspiration* to help students plan and write their written responses. These concept maps supported the students’ visualization of the content to support the construction of the final written response. Students connected thoughts or ideas using graphics and lines to show the relation between words and images as pre-writing step.
prior to generating their written responses. Conversely, in the present study, a CBGO was implemented which contained systematic steps of the writing process for students to complete. This CBGO contained sections for students to brainstorm, plan, and review their written response. Previous research has indicated that in addition to CBGOs in a story or concept map, CBGOs with steps to complete the writing process can be effective in increasing holistic quality of a written response.

The format of the CBGO utilized in the present study is most similar to the previous work of Ponce and researchers (2013). Ponce’s group investigation determined the effectiveness of CBGOs in multiple content areas, including informational text in science and social studies. In the study, 4th- through 8th-grade typically achieving students read science and social studies text and then used a CBGO to plan argumentative paragraphs. The CBGO in this research study required students to brainstorm, organize, and plan the written response in multiple content areas. In the software program used, students also had a choice of the type of CBGO that would be utilized, which included cause and effect, concept maps, or analysis of the story. The graphic organizers provided visual support to aid the participants in making connections between their thoughts and ideas. Students in this research study had increased holistic quality in comparison to the control group. Similar to the present study, the students in the intervention by Ponce and researchers were required to read text, organize their thoughts about the text in a CBGO, and then write about the text. Although student results were positive, the study excluded struggling writers, including students with disabilities and ELLs, who were all included in the present research. Also, because students had a choice of CBGO, including concept
maps and more structured formats that required students to analyze text or compare and contrast, it is undetermined which type of CBGO was the most beneficial in improving the quality of responses. However, Ponce’s study identified that structuring text read with the support of a graphic organizer can support the argumentative writing of typically achieving students in the content areas.

Although Ponce’s research focused on typically achieving students, an additional research study determined the impact of systematic graphic organizers on the quality of writing of struggling writers. In a study by Evmenova et al. (in press), which the present research extended, a CBGO with embedded SRL strategies was used to support the persuasive writing of students with disabilities in language arts. In this CBGO, students brainstormed, organized, and planned their written response in *Microsoft Word*. The visual support provided by the graphic organizer supported an increase of holistic quality measures of the persuasive responses. Yet, this study only focused on persuasive writing, and did not require students to read text and write about this text during the writing activity.

Most of the previous research determining the impact of CBGOs on holistic quality for struggling writers, inclusive of both persuasive and narrative genres, did not determine the impact of the tool on content area writing. The only study to determine the effect of a structured CBGO with text for content area writing focused on typically achieving students (Ponce, et al., 2012). The present study included students with a range of ability levels, implemented a CBGO that encouraged the systematic steps of the writing process including brainstorming and planning, and also focused on writing in
science and social studies. Because students are typically required to respond to prompts in science and social studies in short written responses, in classroom assignments and standardized assessments, writing about content was included in the present study. Also, students of all ability levels that are included in the general education setting are required to complete these writing activities.

Another point of discussion for the increase in holistic quality is the explicit steps embedded in the CBGO to complete an argumentative paragraph. During analysis, the steps completed in the CBGO were coded during document analysis and mean holistic scores were calculated by each step completed. Students who completed all steps of the CBGO had higher holistic means in comparison to students who omitted specific steps, indicating that the systematic process of completing all steps may improve writing quality. This visual representation, which allowed students to both systematically complete pre-writing steps and also connect thoughts and ideas, supported holistic quality. The students were able to go through the steps of the writing process with the CBGO, which may have encouraged the active application of brainstorming and planning. Prior to responding to a prompt, students also read text. The CBGO was helpful in supporting the students’ ability to write about content that is based on text, which is a frequent assignment in class and on standardized assessments. The present study also included a range of participants, including typically achieving students, students with HID, and ELLs, indicating that students with a range of ability levels can benefit from the systematic structure found in CBGOs. This study demonstrates that the implementation of a systematic CBGO that guides students through steps of the writing
process can also support students in the argumentative genre in writing in social studies. In addition, this study suggests that CBGOs may potentially support students with a variety of ability and language levels to write about science and social studies. Also, CBGOs are also beneficial in support students’ ability to write about text. Overall, CBGOs may be an effective tool in supporting the holistic quality of both struggling and typical writers across writing genres and content areas because it provide students the visual structure to develop and plan their writing content.

**SRL Strategies**

In the present study, students may have composed written responses with greater quality due to the combination of the organizational and visual support provided by the CBGO and the increased use of SRL strategies, which were facilitated by the embedded supports in the CBGO. The CBGO facilitated the systematic process for writing by including five SRL strategies: goal setting, brainstorming (strategic planning), self-instruction, self-monitoring, and self-evaluation. Previous research has stated that SRL strategies are strategies that are often incorporated by strong writers; however, struggling writers may not apply these strategies with great frequency (Bandura, 1986) Greater use of these strategies may result in improvements in writing, which could possibly explain the use of these strategies at a greater frequency by the high performing writers.

When students in both the experimental and control group talked through the process of writing a paragraph, they discussed what strategies they used and how they used the SRL strategies. Students who used more SRL strategies had greater holistic writing quality means in both the experimental and control group; however, students in
the experimental group applied these SRL strategies at greater frequencies. Students in the experimental group also had greater holistic writing quality in comparison to the control group. Students who had a greater use of SRL strategies in the experimental group, which were guided by the use of the CBGO, may have had a greater holistic writing quality due to the integration of these strategies in their writing and the visual structure provided by the CBGO.

Previous research has indicated that the use of SRL strategies can impact a variety of writing measures including holistic writing quality (Ferretti, 2009; Goddard, 2008; Graham, 1988; Voon, 2012). For example, self-instruction, which was embedded in the CBGO utilized in the present study, was found to increase the holistic quality and length of persuasive responses by 5th- and 6th-grade students with HID (Graham, 1988). In the study conducted by Graham, the students learned a six-step process for completing a persuasive written response. The students wrote with the support of these steps, and then these prompts were faded. Students were able to memorize these steps when writing a persuasive essay without the visual support of the instructions. This resulted in written responses of greater quality. Goal setting was also embedded in the CBGO and found to increase the quality of persuasive responses in previous research (Ferretti, 2009). In the study conducted by Ferretti, typically achieving 4th- through 6th-grade students received elaborated goals that stated what to include in their persuasive responses. Students with elaborated goals included more parts in their essays in comparison to students that did not receive elaborated goals. Self-monitoring was also embedded in the CBGO and has been effective in supporting writing achieving. In an intervention study students self-
monitored when composing narratives by completing a checklist (Goddard & Sendi, 2008). This resulted in the students’ increase in holistic writing quality scores. Similarly, each of these SRL strategies were embedded in the CBGO, relevant to the present study, as part of a systematic process to create a written argumentative response.

Writing Quantity

The quantity of writing, including number of transition words, number of words, and number of sentences, increased either overall or for specific grade levels during posttest. The structure of the CBGO enabled students to increase the number of transition words and number of words, but data suggests that the CBGO may have possibly limited the number of sentences generated by the student participants.

**Number of transition words.** Students in the experimental group included more transition words in their paragraphs relative to students in the control group. While writing with the CBGO, students were able to select transition words from a drop down menu. The students in the experimental group selected these words, and these words were incorporated in their final paragraph. Both students in the 4th- and 6th-grade effectively incorporated transition words in their posttest written responses. The effective use of these transition words by selection in the dropdown menus were internalized by the experimental group as demonstrated during maintenance when the support of the CBGO was removed. Graphic organizers that incorporate built in supports, such as a drop-down menu of transition words, may be helpful in encouraging the use of these words in writing.
Number of sentences. Overall, descriptive statistics indicated that students in the experimental group outperformed students in the control group for number of sentences, although results were on the threshold of significance ($p = .05$). The increase in number of sentences based on descriptive statistics may have been facilitated by the organizational support of the CBGO, which provided students a space to write a sentence for each of the essay parts as dictated by their goal and the IDEAS mnemonic.

Experimental students had a mean of $6.38$ ($SD = 3.37$) sentences total as compared to $4.41$ ($SD = 4.48$) in the control group. The CBGO that the students used to complete their writing task had a total of nine rows for students to write complete sentences based on brainstormed ideas. However, each row could contain multiple sentences. If students completed the minimal goal of writing a paragraph with three facts and one elaboration, with a topic and concluding sentence, then the paragraph would contain a minimum of six sentences written. Thus, the mean number of sentences may be directly related to the number of paragraph parts determined by setting the initial goal.

Although students in the combined experimental group outperformed the control group for number of sentences, there were some differences in performance between 6th-grade and 4th-grade experimental groups, with 6th-grade students in the experimental group outperforming 4th-grade students who received the same intervention. In addition, there were no statistically significant differences in number of sentences in 4th-grade, although the 6th-grade experimental group outperformed the 6th-grade control group in number of sentences at posttest. The lack of statistically significant differences between the 4th-grade experimental group and the 4th-grade control group could be attributed to
various factors. First, there was a notable lag time between the writing lessons and students’ practice sessions. For example, the 4th-grade intervention schedule was frequently interrupted by school testing, field trips, or school events. Therefore, the planned daily meeting schedule for the intervention was altered to a schedule in which the intervention was only conducted two or three times a week. Due to this lag time between sessions, the duration of the study was longer for the 4th-grade students, and the intensity of the instruction was subsequently decreased. To make up for lost instructional time, some individual one-hour sessions were combined into two sessions within a two-hour instructional block. Because of these combined sessions, students’ fatigue may have influenced the holistic writing quality measures at posttest. Second, one of the fourth grade teachers exhibited limited teacher involvement. This limited teacher involvement could possibly be attributed to this teacher not attending the summer professional development session. Therefore, she was uncomfortable with teaching the material and frequently asked for the researcher to teach the lesson or for support. Third, overall writing samples showed an abundance of mechanical errors for the 4th-grade students. Their writing exhibited grammatical, punctuation, and capitalization errors as well as a lack of organization. Thus, students in the 4th-grade may require a greater intensity of the intervention, which includes daily reinforcement of the concepts learned and a reinforcement of skills embedded in written expression. The 4th-grade students’ limited use of punctuation may have influenced the number of sentences written in comparison to the control group.
**Number of words.** Although experimental students improved in holistic quality, number of transition words, and number of sentences, there were no statistically significant differences in the number of words between the experimental and control group. This was consistent with results in the 4th- and 6th-grade. However, in previous interventions that utilized CBGOs, students that wrote with the tool did demonstrate an increase in the number of words written (Blair, 2002; Gonzalez-Ledo, 2012; Lin, 2004; Sturn & Rankin-Erikson, 2002; Unzueta & Barbetta, 2012). The differences in number of words between the present study and previous studies that utilized CBGOs could be attributed to the differences in format between the CBGO used in this study and the format of the CBGOs used in the other research studies. For example, most of the research studies that have incorporated CBGOs as a support for writing have utilized story mapping or concept mapping as a way for students to pre-write. When using these tools, students are able to use the software to create several boxes, connected by lines, to write their thoughts about the topic. The students then convert these words or phrases into sentences. The students have an unlimited amount of boxes to create or generate their thoughts, which could attribute to writing more words in comparison to writing without the support. However, the CBGO in the present student contained a maximum of nine spaces for writing. Students were taught to write at least one sentence for each of the parts they stated in their goal. Students may have had an increase in the number of sentences because they put an ending punctuation mark at the end of each paragraph part, but there were no differences in words because the CBGO was somewhat limited in space. Although the students could transfer the sentences written in the CBGO to the
orange box below the CBGO to edit and revise their essay, many students transferred the sentences without adding additional text. This may have caused the experimental group to write a similar amount of words in comparison to the control group. In the previous studies that incorporated story or concept mapping, students had an unlimited amount of boxes to represent their thoughts to answer the prompts during pre-writing, which may have resulted in more words written during posttest. However, in its current format, the CBGO may not have encouraged students to write more words.

**Reading Text and Writing**

Reading text and writing had an impact on two writing measure in the present study: number of words and accuracy of content. Although reading text and writing is an integral part of writing in science and social studies, explicit reading instruction may be needed prior to writing activities. The omission of explicit reading instruction in this intervention may explain the lack of statistically significant differences between the experimental and control group for number of words and accuracy of content.

**Reading text and number of words.** The additional cognitive requirement of writing about unfamiliar content without reading supports may have also impacted the quantity of the students writing. Many of the research studies that determined the impact of various interventions on argumentative writing in science and social studies required the reading of text to answer a specific question in writing (De La Paz, 2005; De La Paz, 2010; De La Paz, 2014; Monte Sano, 2011). The series of De la Paz’s studies that determined the impact of interventions on the argumentative writing of students also incorporated the reading and analysis of historical texts prior to each writing activity. In
these studies, students demonstrated an increase in quality and quantity of writing (De La Paz, 2005; De La Paz, 2010; De La Paz, 2014). In the De La Paz studies, students were taught how to read and analyze historical text prior to writing. The reading of text was also an integral part of the present study as students were required to read science and social studies text prior to writing. In the present study, students received text and read the text as the teacher read the text out loud. The teacher discussed the different texts during instruction and practice sessions, but the students did not learn a specific strategy to analyze the text.

The reading and understanding of text is certainly critical to having content to write about, but instruction is needed for students to understand the text. A deep knowledge and understanding of the text facilitated by specific reading strategy instruction may have positively impacted the length of the students’ writing. Students would have a greater grasp of the concept and thus, have more to write about. Moreover, several of the previous studies that determined the effect of specific interventions on argumentative writing in science and social studies contained both writing and reading instruction. For example, the research studies in the research strand on historical argumentation by De La Paz included two parts; instruction in reading and understanding primary source documents, and instruction on constructing argumentative written responses. In each of these studies, accuracy of content increased in the experimental condition. For example, in De La Paz’s study (2010) with 11th-grade students of low to high writing ability, the historical reasoning strategy instruction was combined with SRSD. Prior to learning how to write argumentative written responses with the support
of the SRSD supports, students first learned how to analyze historical text. This included considering the source of the document, developing an understanding of the document, and critiquing the source. The combination of historical reasoning with historical documents was also conducted in her study with typical students and students with learning disabilities in the 8th-grade (2005). In a more recent study, De La Paz (2014) also combined reading instruction in understanding historical documents prior to the strategy instruction in writing.

Also, in additional argumentative writing interventions, students either read text (McNeill, 2011; Monte-Sano, 2011), or engaged in a laboratory activity that provided prior knowledge (Sampson, et al., 2013). The reading of text paired with strategies or the completion of laboratory activities may provide students with a deeper interaction with the content and may positively impact the quantity of written responses. In the present study, there was only instruction on writing the argumentative response. Students received science and social studies text, and read this text, but did not receive any explicit strategy instruction in reading the text, understanding the text, or how to turn this understanding into a written response.

**Accuracy of content.** In a similar vein, there was no statistically significant difference between the experimental and control group in accuracy of content during the posttest and application measures. According to results from the analysis of accuracy of content, students in the experimental condition had similar accuracy of responses to students in the control condition. Again, results may have been affected given the lack of additional strategies to understand the text. Writing about text, including the writing of
summaries and argumentative written response, have the greatest impact on student comprehension in comparison to other forms of writing (Langer & Applebee, 1987). Therefore, it is possible that there were no differences between groups because both groups were responding to prompts about text read. According to research, writing about text read has the greatest impact on comprehension (Graham & Herbert, 2011). In addition, reading instruction prior to writing could have possibly given the students a deeper understanding of the content, which could have possibly increased the accuracy of their responses. It is possible that to improve the accuracy of argumentative writing in science and social studies, reading instruction is also needed prior to the writing task.

**Application to Science**

Students were able to apply the learned skills of the CBGO for argumentative paragraphs in social studies to write in the content area of science. During the lessons, the teacher modeled how to use the CBGO in the science content area; however, all practice sessions occurred with the social studies standard of “product and industries”. In these practice sessions, the students read social studies text along with the teacher, and the teacher discussed the topic before the students wrote with the CBGO. At posttest, students wrote about a social studies topic within the same standard in which they had some background knowledge. However, during the application measure, the students read and wrote about a science topic, *matter*, which was not covered during the practice sessions or in the science topics in 4th- and 6th-grade prior to the application writing measures. When writing about a new topic in a different content area, students were able to use the CBGO and SRL strategies and maintained their ability to write quality
argumentative essays. The students in the experimental group showed an increase in holistic quality, number of transition words, number of words, and number of sentences, in comparison to the control group. These mean scores were similar to the performance of the students in the experimental group during the posttest measures. This increase in holistic quality in comparison to the control group was also evident when data was analyzed by grade level. Both 4<sup>th</sup>-grade and 6<sup>th</sup>-grade experimental groups outperformed the holistic writing quality by students in the control group in the same grade level.

Struggling writers also continued to benefit during the application measure. The struggling writers were still able to write with a similar level of quality as exhibited by the medium and high performing writers. There were no statistically significant differences between the holistic quality of the struggling writers in the experimental group and the medium and high performing writers that were also in the experimental group. In addition, there was a statistically significant difference between the holistic quality of struggling writers in the control group and struggling writers in the experimental group. Struggling writers in the experimental group had responses of a greater quality in comparison to struggling writers in the control group.

The ability of students to transfer skills of writing with quality in a different content area was evident in two previous writing studies (Hauth, 2012; Reynolds & Perin, 2009). In these previous research studies, students were able to apply the learned writing strategies to a different content area and continued to write with quality. In the research study conducted by Hauth, struggling writers received training in SRSD, related to writing about civics content, and then applied these strategies to writing in the math
content area. Although the training was unrelated to writing about math content, students were able to use learned strategies to write in the math content area with 100% PND for all writing measures, including holistic quality, length, essay parts, and sentences. In an additional study, (Reynolds & Perin, 2009), typically achieving students learned a text structure strategy for writing, wrote about social studies content during posttest, and then applied these strategies in the science content area. When students applied these strategies to the science content area during the far transfer measure, the students continued to have a high holistic quality of writing in comparison to the control group. Both of these studies were similar to the present study in that students maintained their ability to write in another content area. Effective writing instruction has the ability to impact writing quality across content areas.

However, there were some differences when data from the application measure was analyzed by grade level. Experimental students in the 4th- and 6th-grade outperformed students in the control group in both holistic quality and transition words. However, only 6th-grade students outperformed the 6th-grade control students for number of words and number of sentences when writing in the science content area. As previously mentioned, the differences between 6th-grade experimental and 4th-grade experimental, and the similarities in performance between 4th-grade experimental and control could be attributed to differences in intensity of instruction across the grade levels and mechanical errors in the writing of the 4th-grade students.

**Maintenance.** Students were able to maintain their ability to write quality argumentative responses during maintenance. Results from the data analysis indicated
that students in the experimental group had a higher holistic quality during maintenance in comparison to the control group. The experimental group also included more transition words and more sentences in their writing in comparison to the control group. When comparing the experimental group’s performance during maintenance to their performance during posttest and application, the experimental group scores increased from pretest to posttest, increased again from pretest to application, and then decreased at maintenance. However, scores in the experimental group were still higher at maintenance when compared to pretest scores. In comparison to the performance of the control group, the experimental group’s scores remained higher than the control group in all measures except number of words. During maintenance, many students in the experimental group used paper to plan their writing. On the paper, some students wrote the IDEAS strategy, recreated the graphic organizer, and utilized some of the SRL strategies, such as strategic planning and self-evaluation. The utilization of the strategies learned during the intervention, and practiced with the CBGO, helped students to create written responses with higher holistic quality in comparison to pretest. However, the decrease in maintenance scores indicated that the use of the CBGO with embedded SRL strategies helped students to have higher quality written responses. Re-creation of the graphic organizer and sole use of the IDEAS mnemonic did not have the same impact on the quality of writing.

The increase from pretest to posttest, and then a slight decrease from posttest to maintenance is consistent with results from additional writing studies (Evmeonova, et al., in press; Hauth, et al., 2012; Mastropieri, et al., 2009; Mastropieri et al., 2014). In these
studies, students learned how to utilize the strategy to generate a written response and utilized this strategy at posttest. However, when the strategy was removed during maintenance, there was a decrease in holistic quality. Although students learned the strategies, the additional supports were needed to maintain the quality of writing.

Although as a whole, the experimental had greater holistic quality in comparison to the control groups, there were some discrepancies between the writing achievements of students by grade level. In the 4th-grade experimental group, there were no differences in holistic quality between the experimental and control group in number of words or number of sentences. Fourth grade students in the experimental group only outperformed students in the control group in number of transition words. In the 4th-grade, students in both the experimental and control group were limited to only one practice session to apply the strategies learned to write an argumentative response without the CBGO, due to upcoming school assessments and winter break. Therefore, the 4th-grade students did not get as many opportunities to practice writing without the CBGO and to receive support from the researchers and teachers as the 6th-grade students. This could have possibly affected the holistic quality and number of sentences in the 4th-grade experimental group during maintenance. In addition, students in the 4th-grade generally exhibited difficulties in adding ending punctuation to their sentences. The lack of punctuation impacted the number of sentences written in both the experimental and control groups.

In the 6th-grade, there were differences between the experimental and control group in holistic quality and transition words, but not for number of words or number of sentences. The 6th-grade students may have had an increase in holistic quality in
comparison to students in the 6th-grade control group because this condition received three full practice sessions in applying the strategies learned to write a paragraph without the support of the CGBO. Students, regardless of their grade level, may require ample practice opportunities with teacher support to apply the learned strategies without the CBGO.

**Maintenance of SRL strategies.** In addition to the recreation of the CBGO and the use of the IDEAS mnemonic, the students in the experimental group maintained their ability to write an argumentative paragraph without the support of the CBGO due to the internalization of the SRL strategies. Without the CBGO, students continued to set a goal for their writing, brainstorm, plan, and self-evaluate, with some students internalizing the strategies of self-monitoring. During interviews, the students described their writing process and then the researcher asked specific questions about the SRL strategies used and how these strategies were utilized in the CBGO. The strategies were counted, averaged, and compared to their use of SRL strategies at posttest. Students either maintained their use of the strategies or increased their use of SRL strategies at maintenance. Students also showed evidence of self-instruction by remembering the parts needed to write an argumentative response and utilizing the IDEAS strategy and writing the letters of the strategy mnemonic on sheets of paper. Some students also recreated the graphic organizer on paper as a visual support.

Since students who scored higher on the use of SRL strategies also scored high for holistic quality of responses, it is possible that the students in this study were able to maintain their ability to write quality argumentative responses because of the increased
use and internalization of the SRL strategies. During maintenance, some students even had an increased use of specific SRL strategies, including goal setting and planning, in comparison to posttest. Despite other scores from posttest to maintenance decreasing, there was an increase in SRL use. Therefore, results suggest that the CBGO provided the organizational structure needed for students to effectively apply the SRL strategies, which resulted in paragraphs of greater quality. The use of SRL strategies paired with the CBGO may have had a greater impact on holistic quality than SRL strategy use alone.

**Motivation and Self-efficacy**

Questionnaire results revealed that students in the experimental group had higher motivation scores in comparison to the control group. However, there was no difference in self-efficacy between the two groups. Student interview data informed these results. For example, students in the experimental group stated that they preferred their writing when they wrote with the CBGO. Some students even stated that they believed their writing improved each time they wrote with the CBGO. Since students enjoyed writing with the CBGO, this could have played an important role in their motivation. Also, previous research has determined that goal setting and mastery experiences play an important role in student motivation (Mussen, Conger, Kagen, et.al, 1990). In the current intervention, students engaged in goal setting, and had multiple mastery experiences during practice sessions in the intervention. The students may have reported increased motivation because they met their writing goals, and/or they had multiple opportunities to successfully write an argumentative response about social studies and science topics.
Although motivation was impacted during the intervention, there were no differences in scores of self-efficacy between the experimental condition and the control group. The lack of different outcomes between the experimental and control group could possibly be due to both groups learning a strategy to help them improve their writing. Both groups may have felt that post instruction, they were able to write quality responses. Although the experimental intervention focused on the parts of writing an argumentative paragraph and the control group learned how to improve their writing with editing and revision strategies, both groups learned a strategy that may have influenced them to believe that they were now better writers.

In addition, according to research, students begin to develop ideas about their performance, effort, and ability at the age of ten (Stipek, 1981, 1998). As students in this study were between the ages of nine and eleven, with a mean age of 10.40, it is possible that they were unsure about their ability to perform the writing task. It is possible that their rating of self-efficacy was inaccurate at pre and post assessment because they were unsure what to think about their own ability to write.

Educational Implications

Several educational implications must be considered based on the results from this study. The positive results from this study paired with the increased emphasis on cross-curricular writing in science and social studies indicate a strong need for instructional strategies, including CBGOs with embedded SRL strategies, which improve the writing of all students, including struggling writers. Students, including struggling writers, can positively benefit from the utilization of CBGOs with embedded strategies
that encourage active SRL strategy use, which may positively impact writing quality. In addition, this study also highlights the potential challenges of teachers as interveners of research.

Currently, state and national standards require students to create written responses in science and social studies, which can be very challenging for struggling writers. The difficulty that struggling writers have, including the mechanics and organization of writing, may negatively impact their ability to reflect their knowledge of a topic in a written format (Kulikowich, Mason & Brown, 2008). The inability to proficiently answer questions in writing about science and social studies topics may negatively impact the student’s performance on in class activities and assessments, which could have a detrimental effect on their academic performance, and post-graduation outcomes (Bernhardt, Destino & Kamal, 1995; Chall, Jacobs & Baldwin, 1990).

The CBGO used in the present study had a positive impact on several aspects of writing, including holistic quality. The lessons used to introduce students to the CBGO and argumentative writing, the IDEAS mnemonic, and the embedded supports to guide self-regulation, played a role in increasing the writing quality of typically achieving and struggling writers. The CBGO provided the supports for students to successfully organize and structure their paragraphs. Also, the built in supports helped to guide students through all three phases of the SRL process. The SRL process is important in the writing process, as typical and high performing students use these strategies in their academic tasks. The CBGO with embedded strategies helped struggling writers, who had a low use of these strategies, to apply the SRL strategies, such as goal setting,
brainstorming, and self-evaluation, to their writing, which in turn, positively influenced the holistic quality of their writing.

Upon removal of the CBGO, some students recreated the graphic organizer on paper or utilized the IDEAS strategy. Students were still able to remember the strategies used, including the mnemonic and the SRL process, to create quality paragraphs. Students were able to internalize the SRL strategies and recall the strategy to write quality argumentative paragraphs when the CBGO was not present. The students’ retention of the SRL strategies and the IDEAS mnemonic resulted in high quality argumentative responses. Tools, such as the CBGO, paired with SRL strategies, can be effectively used as a support and then faded to encourage the use of these SRL strategies, which can improve writing outcomes. In addition, since students are unable to use tools, such as the CBGO on high stakes testing, it is critical that students have the ability to transfer skills learned, such as active application of SRL strategies, on state and national assessments. In the present study, it was demonstrated that when students practiced with the CBGO on multiple occasions and also practiced without the CBGO with reinforcement of the strategies learned, students had better writing outcomes in comparison to pretest scores. Scaffolding of supports, such as a CBGO with embedded SRL strategies, can prepare students to write quality responses on state and national assessments in order to demonstrate their understanding of a topic.

This study also highlights the potential challenge of teachers as interveners during research studies. In research, the inclusion of one teacher that is not as invested as other teacher participants may skew the results of a study, especially if there is a limited
number of teacher participants overall. For example, in the present study, only four classroom teachers participated as lead interveners for this research study. Although both 6th-grade lead teachers that served as interveners for the experimental and the control group were invested in the research study and completed all research activities with minimal assistance from the researchers, there were differences observed for teacher investment in the 4th-grade. The 4th-grade control teacher was invested in the research study and implemented each lesson with fidelity, requiring minimal assistance from the researcher, however; the 4th-grade experimental teacher exhibited an overall lack of investment. This minimal investment was displayed through minimal preparation for teaching and refusal to teach specific sections of the lesson plans, which required the researcher to intervene consistently in order to maintain fidelity of instruction. This 4th-grade experimental teacher’s lack of investment effected the schedule and intensity of instruction, which could have attributed to the 6th-grade experimental group outperforming 4th-grade experimental students, and the lack of statistical significance between some measures across conditions in the 4th-grade. In studies that utilized teachers as interveners, it is important that all teachers are invested and committed to the execution of the research study with fidelity and within the time frame for the schedule of the research. Lack of investment of a teacher in a study that has a limited number of teachers as interveners may impact the results within a specific condition or grade level.

Overall, this research study adds to the existing research of the positive benefits of SRL strategies on student writing and CBGOs. In addition, this study extends the research base of the effects of CBGOs on student writing outcomes for argumentative
writing in science and social studies, and also, investigates the combined effects of SRL strategies paired with a CBGO to support student writing. However, due to the limited research on the combination of SRL strategies and CBGOs in science and social studies writing with struggling writers, additional research is needed.

**Limitations**

There are several limitations to this study. First, strategy instruction to support the reading of the content was not included in this intervention. Also, the students did not respond accurately to their strategy use questionnaires. In addition, only a sample of the larger study was interviewed about the use of SRL strategies in their writing process and the writer classifications of these participants were subjective. Finally, replication is needed to increase the validity of the study. Each of the limitations are discussed below.

In the present study, students in both experimental and control groups did not make increases in accuracy of content. Students in this research study read texts about science and social studies content that they were not previously familiar with, and then were asked to write about the topics. The teacher also read the texts out loud to ensure that the students could understand the text. Essentially, the students were writing about less familiar topics, and were not taught a strategy to read and understand the text prior to writing about it. Although the students may have learned a prior strategy to understand content area text, the intervention did not include explicit strategy instruction to ensure comprehension of the text. This may have negatively impacted the accuracy of the content included in their response(s), and therefore; the holistic writing quality of the written responses. In writing in science and social studies, accuracy of content plays a
critical role in the quality of the responses. Although student responses had a higher holistic quality in comparison to the control group, the accuracy of content remained similar. Also, in most existing research in writing in science and social studies, when text is included, includes both a reading strategy and a writing strategy component. Future research on CBGOs with embedded SRL strategies should also contain reading strategy instruction, if text and content are involved.

In addition to the lack of strategy instruction for reading, students in this study may have not accurately responded to the self-efficacy, motivation, and strategy use questionnaires. Many students may have inaccurately responded to some of the questions about strategy use because they were unsure about the action that each strategy actually reflected. For example, during the interview process, some students were asked if they applied a specific SRL strategy during writing and described a process that was unrelated to the SRL term. These SRL terms were included within the questionnaire. Students may have associated SRL term with a different process. Therefore, the self-report may have influenced the outcome of the statistical analysis between groups. In addition, students at the age of ten begin to develop thoughts about their self-efficacy. Since many of the students in the study were young, between the ages of nine and eleven, the students may have not accurately responded to the questions about self-efficacy because they were unaware of their abilities to complete a task including their writing skills in comparison to others. Also, the self-efficacy, motivation, and strategy use questionnaire was modified from a previous questionnaire. The version used in the present study was not validated before the students’ responses to questionnaire.
To understand the SRL use of students, the coded responses of student interviews were used in the analysis. Although the coded interviews of the writing process provided an accurate reflection of student content, only a percentage of struggling, medium, and high performing students were interviewed. These interviews and the analyses provide insight on only a fraction of the writing processes of the students, and may not represent the writing processes of other students in the research study. Future research that employs the use of interviews to understand student use of strategies should interview all participants, or provide explicit examples of concepts that are represented within a questionnaire.

In addition to limitations with specific aspects of the intervention and measures, there were also limitations with the student participants and the implementation of the intervention. To begin, the classification of writer types was subjective. Although the teachers and researchers utilized a rubric to classify high, medium, and low writers, the classification was based on teacher knowledge of the students’ writing and the limited writing samples that the students had submitted at the start of the school year. Thus, students may have been misclassified as low, medium, or high performing writers. Also, there were a limited number of struggling writers, including students with disabilities, and typical achieving writers of medium and high writer classification in the intervention by grade level and condition. The minimal number of writers classified by group prohibited more advanced statistical analysis.

There are limited interventions that support the content area argumentative writing of struggling writers. In addition, this is the only study that implements a CBGO
with supports to guide the SRL process, to support the argumentative writing of science and social studies topics of students, including struggling writers. Although the results were positive, the study needs replication in order to increase external validity.

**Recommendation for Future Practice**

Recommendations for future practice address the limitations of this study and include replication and investigations to include the incorporation of reading strategies along with the CBGO with embedded SRL strategies. Further, the writing genre could also extend to other content areas or topics. In addition, it is also recommended that future studies base writer classification on existing, validated, writing measures. Also, additional studies that determine the use of CBGOs with embedded SRL strategies contain more students in each grade level, condition, and writer classification. The inclusion of more participants in each writer classification will better determine the effect of the CBGOs on writers of different ability levels.

It is also recommended that teachers continue to implement future research studies. However, in the current investigation, teachers required support. The researcher provided assistance in both the experimental and control groups to ensure fidelity. It is recommended that in future studies, teachers independently conduct the intervention without support from the researchers in order to determine authentic effects of the CBGO on student writing in a natural, educational setting. Perhaps with more extensive time devoted to professional development of teachers prior to the study, this would be feasible.

It is also recommended that future research studies continue to determine the relationship between SRL strategies, the frequency and use of these strategies, and how
these strategies directly affect students’ writing performance. Based on self-report from the questionnaire, there were no differences between groups in SRL strategy use. However, the student interviews revealed that the students in the experimental group utilized more SRL strategies and also used these strategies at a greater frequency, and this group maintained a higher quality of writing. However, because this intervention contained multiple components, it was not determined if there was a direct relation between the SRL strategies and writing outcomes. Future research should investigate the quality of writing of students who naturally apply SRL strategies at a greater frequency.

Finally, since students are often required to write about science and social studies topics in class and on state assessments, it is also recommended that additional data be gathered from state assessments, or in class assessments. This will help to determine if, after the use of the CBGO, students are able to transfer their acquired skills to write quality argumentative responses in formal standardized assessments.

Conclusion

This study determined the effects of a CBGO with embedded SRL strategies on the argumentative writing performance of 4th- and 6th-grade typical and struggling writers in the science and social studies content areas. This study extended the research of the use of SRL strategies on student writing and the use of CBGOs to support student writing. In addition, this study expanded the research of SRL strategies and CBGOs to writing about text regarding science and social studies topics. This study employed a mixed methods design, with the inclusion of group experimental research and qualitative
methodology to determine the effects of the intervention, and to explore the possible reasons for these effects.

Results from this study indicated that the CBGO with embedded SRL strategies positively impacted the argumentative writing of typical and struggling writers. The improvements were in the areas of holistic writing quality, number of transition words, and number of sentences. However, there was no statistically significant difference between the experimental and control group in terms of number of words and accuracy. In addition, students who used the CBGO to write their argumentative responses had greater SRL strategy use than students the control group. Students were also able to internalize these strategies when writing without the CBGO and continued to outperform the control group across most measures. Students in the experimental group also had greater motivation to write in comparison to the control group. These findings add to the limited body of research on instructional strategies that support the content writing of science and social studies for struggling writers.
TO: Anna Evmenova, College of Education and Human Development
FROM: Aurali Dale  
Assistant Vice President, Research Compliance
PROTOCOL NO.: 8418  
Research Category: Faculty/Staff
PROPOSAL NO.: 113030
TITLE: Project WeGetIT!: Writing Efficiently with Graphic Organizers - Teachers Integrating Technology
DATE: May 13, 2013
Cc: Kelley Regan

On May 13, 2013, the George Mason University Institutional Review Board (GMU IRB) reviewed and approved the amendment dated April 30, 2013 for the above-cited protocol following expedited review procedures. Copies of the revised approved consent documents are attached. Please use the content of these copies with the GMU IRB stamp of approval.

You may proceed with data collection. Please note that any further modifications to your research must be submitted to the Office of Research Subject Protections for review and approval prior to implementation. Any adverse events or unanticipated problems involving risks to subjects including problems involving confidentiality of the data identifying the participants must be reported to the GMU Office of Research Integrity & Assurance (ORIA) and reviewed by the GMU IRB.

The anniversary date of this study is January 30, 2014. You may not collect data beyond that date without GMU IRB approval. A continuing review form must be completed and returned to the Office of Research Subject Protections prior to the anniversary date, or upon completion of the project. A copy of the continuing review form is attached. In addition prior to that date, the GMU ORIA will send a letter to you regarding continuing review procedures.

If you have any questions, please do not hesitate to contact me at 703-993-5381.
Appendix A

College of Education and Human Development
MSN 1F2
Fairfax, Virginia 22030-4444
(703) 993-5256; FAX: (703) 993-3681
Email: aevelenov@gmu.edu

Student Permission for Participation in Research: Assent Form
Project Title: Writing Instruction

RESEARCH PROCEDURES
This study is to find out if computers help students write better papers. Your teacher is going to use graphic organizers on the computer and some new methods to teach writing. Your teacher will be giving you some tests to measure your writing skills.

We will be watching some of those classes this year. We would like to videotape you during classes. We will watch the videotape to see the writing lessons in your class. We would like to ask you questions about using technology for writing instruction. We would like to look at some of your written papers and test scores. We would like to look at some scores from your school records. Asking you questions will take only a few minutes of your time. This will not get in the way with any other classroom tasks.

RISKS AND BENEFITS
Nothing bad will happen to you if you do or do not take part in this study. There are no rewards or money paid for being in this study. We may find out things to help us prepare teachers to teach students how to write better. You might also learn how to write better papers.

CONFIDENTIALITY
Your name will not be used. Your own test scores will not be used when we write our reports. We will never tell anyone who you are. We may use some of your words when we write our report, but we will never put your name to these words.
PARTICIPATION
You don’t have to talk to us if you don’t want to. If you change your mind after we start talking and want to stop that is OK. We will not get mad and nothing will happen to you.

CONTACT
Our names are Anna Evmenova and Kelley Regan. We are professors at George Mason University. You can call us if you have any questions about this study. Anna’s phone number is 703-993-3652. Kelley’s number is 703-993-9858. The Office of Research Integrity & Assurance at George Mason University (GMU) knows all about our research. They said that it was OK for us to do it. You can call GMU at 703-993-4121 if you have any questions about being a part of this research.

CONSENT
I have read this form and I agree to be part of this study.

______________________________    ________________
Name                                      Date

I consent to the video recording of the instruction. I understand that any video tapes will be kept confidential.

_____ Agree    _____ Disagree
Appendix A

George Mason University
Helen Keller Institute for Human disAbilities
(703) 993-3670; FAX: (703) 993-3681
Email: aevmenov@gmu.edu

Parent Permission for Participation in Research: Informed Consent

Project Title: Project WeGotIT!: Writing Efficiently with Graphic Organizers - Teachers Integrating Technology

Purpose: This study is being conducted to investigate the effectiveness of computer-based graphic organizers and self-regulation strategy on the essay writing and writing fluency performance of 6th-8th grade students across subject areas (language arts, science, and social studies).

Project Requirements: Your child's teacher may be using some new methods to teach writing persuasive, narrative, and expository essays during language arts, science, and social studies classes. These methods were developed by university researchers based on the best practices from research. The researchers will train your child’s teacher in the writing strategy instruction and the tests to be used to measure your child’s performance. This project will evaluate the effects of this strategy instruction.

The project covers the regular classroom curriculum that targets improving written expression. Your child’s teacher will be trained to teach the writing strategy and test your child’s writing performance. These tests will include test scores from their essays written in class, and test scores from writing tests, including Writing Fluency, a subtest under Broad Written Language of the Woodcock Johnson Achievement Battery.

We will be watching and videotaping some of your child's writing tasks this year. We would like permission to include your child in these videotapes. We are studying how teachers implement and how students use technology during writing. We would also like to ask your child some questions about using technology for writing. These questions will take only a few minutes of your child's time, and will not interfere with any other classroom activities. We would like to give your child some tests to evaluate how well the writing instruction impacts their performance.

We would also like to look at some of your child’s school records. This includes IEP writing goals and test scores from existing school records of standardized tests, including SOL, achievement scores, disciplinary and attendance records. Any information collected, including videotapes and test scores, will be kept confidential by maintaining all materials in locked files and offices accessible only to project staff, and viewed only by project staff. Once the information is collected, student numbers will be assigned, and identifying information will be discarded. The videotapes will be erased 5 years after the project’s conclusion.
A consent form was distributed to your child in his or her daily folder. At that time the information contained in this letter and their assent form was described and any questions were answered. Students were encouraged to take their forms home and discuss the project with you before signing them and returning them to a designated place in the school. If you choose not to participate in the study, your child will complete scheduled classroom activities while other students participate in the research procedures.

**Foreseeable Risks:** There are no foreseeable risks or discomforts.

**Voluntary:** You and your child’s participation is voluntary, and you and your child may withdraw from the study at any time, even after signing the consent and assent forms, for any reason. There is no penalty for not participating or withdrawing.

**Benefits:** The personal benefits for participation may include improved written expression performance.

**Costs:** There are no costs to you, your child, or their teachers.

**Confidentiality:** All data collected in this study will be confidential; all person-identifiable data will be coded so that no one, including individual students, parents, teachers, schools, or districts can be identified.

**Researchers:** This study is being conducted by Drs. Anna Evmenova, Kelley Regan, Margo Mastropieri, Sheri Berkeley, and Michael Behrmann from College of Education and Human Development at George Mason University (GMU). You can reach them at telephone number: 703-993-3670 for questions or complaints.

You may also contact the GMU Office of Research Integrity & Assurance at 703-993-4121 if you have questions or comments regarding your rights as a participant in this research. This project has been reviewed according to George Mason University procedures governing your participation in this research.

If you agree to the information described above and will allow your child to participate in the research, please print your child’s first and last name below and sign both copies of the parental consent forms provided. Then, please return one signed copy to your child’s teacher within 10 days of receiving the information about the research.

Print First and Last Name of Your Child

Name (print) ____________________________ Signature ____________________________

Date of Signature ____________________________

---

IRB: For Official Use Only

Project Number: 477498-3
Date Approved: 2/5/15
Approval Expiration Date: 2/2/16

Page 8 of 16
## Appendix B

<table>
<thead>
<tr>
<th></th>
<th>Low (1)</th>
<th>Medium (2)</th>
<th>High (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization</td>
<td>Writing is typically disorganized. Does not contain introduction sentence, supporting evidence, or summary.</td>
<td>Writing is moderately organized. Contains some parts, but lacks structure.</td>
<td>Writing is highly organized. Contains topic sentence, supporting evidence, and summary.</td>
</tr>
<tr>
<td>Spelling</td>
<td>Writing contains several spelling errors.</td>
<td>Writing contains a few spelling errors.</td>
<td>Writing has limited spelling errors.</td>
</tr>
<tr>
<td>Punctuation</td>
<td>Poor use of punctuation.</td>
<td>Some punctuation errors.</td>
<td>Limited errors in punctuation.</td>
</tr>
<tr>
<td>Length</td>
<td>Brief responses</td>
<td>Moderate responses</td>
<td>Lengthy responses</td>
</tr>
<tr>
<td>Detail</td>
<td>Writing contains limited detail</td>
<td>Writing contains some detail</td>
<td>Writing includes details that help the reader to understand the topic.</td>
</tr>
<tr>
<td>Grammar/Usage</td>
<td>Multiple errors in grammar and usage</td>
<td>Some errors in grammar or usage</td>
<td>Limited errors in grammar or usage.</td>
</tr>
<tr>
<td>Word choice</td>
<td>Poor word choice</td>
<td>Unvaried word choices</td>
<td>Varied word choices</td>
</tr>
</tbody>
</table>

Low performing writer: 7-11 points. Writers who make errors in their writing that impact the understanding of the text.

Medium performing writer: 12-15. Writers who make errors, but these errors do not impact the understanding of the text.

High performing writer: 16-21. Writers who make minimal errors in writing. Writing style supports the understanding of the text.
Appendix C

IDEAS

Identify your claim
Determine 3 facts
Elaborate with evidence
Add transition words as you go
Summarize
Appendix D

1. Fill in the chart below. Click here to see an example.

2. Brainstorm:

- Main Points
- Sentences
- Check your work!

   - Identify your claim
   - Determine first fact
   - Elaborate
   - Determine second fact
   - Elaborate
   - Add transition words as you go!
   - Summarize

3. Next, copy the text in the orange box.

4. Facts (A) the text into the box below. Read your essay and edit it.
   Click here to see how your final paragraph should look.

5. Evaluate:
   1. How many words do I have in my essay?
   2. How many sentences do I have in my essay?
   3. How many facts do I have in my essay?
   4. How many elaborations do I have in my essay?
   5. Do all my sentences make sense? Yes, all my sentences make sense.
   6. How do I feel about my essay? 😊 😊 😊
   7. My next goal is: Choose your next goal here!

Feedback: You've included _______ click here to enter text _______ in your essay, which makes you a great writer!
Appendix E

Project WeGoIt!: Writing Efficiently with Graphic Organizers – Teachers Implementing Technology

Lesson 3 Fidelity Checklist

Observer: ___________________________  Condition: ___________________________

Period: ___________________________  Date: ___________________________

Note: Mark each step completed or not completed by the researcher. The fidelity of treatment will be calculated by dividing the number of steps completed by the number of steps planned. A separate checklist is to be completed by both the implementer and the observer.

1. Ensures that computer is open and on.  Yes  No

2. Ensures that the camera is recording.  Yes  No

3. Ensures that all materials have been given to students.  Yes  No

4. Ensures that PPT is followed throughout lesson.  Yes  No

5. Provides only technical assistance (if the computer is malfunctioning).  Yes  No

6. Reads agenda and instructs students to check off completed items.  Yes  No

7. Instructs students to complete warm up.  Yes  No

8. Models IDEAS organizer with student input as students complete as well.  Yes  No

9. Highlights features of graphic organizer stressing that they are working to become better writers by using the IDEAS strategy.  Yes  No

10. Reads text to provide students with background knowledge  Yes  No

11. Guides students to provide ideas for the completion of all parts in CBGO  Yes  No

12. Instructs students to find the missing parts as their lesson wrap up.  Yes  No

13. Collects completed handouts and ensures files are saved.  Yes  No
Appendix F

IDEAS Strategy + Technology Tool = Ways to Become a Better Writer

Agenda:

☐ Introductions and Agenda
☐ Expectations and Key Words
☐ Arguments and Writing
☐ Strategy: IDEAS
☐ Identify the Part!
☐ Label the Argumentative Essay
☐ Lesson Wrap-up

Key Terms:

☐ Plan: ______________________
☐ Strategy: ______________________
☐ Claim: ______________________
☐ Argument: ______________________

Lesson 1

George Mason University
Appendix F

Name: ________________________ Date: ________________________

Prompt: Did triceratops and brontosaurus really exist?

Triceratops and brontosaurus never existed. First, only a few skeletons of these dinosaurs were ever found. For example, most of the skeletons found of these dinosaurs were made up of other dinosaur bones. Also, the scientist who found these fossils was in competition with another scientist, so he made up fake dinosaurs. In addition, they are just baby skeletons of other dinosaurs. So, triceratops and brontosaurus are fake.
Appendix F

Directions: Place a letter in each box and the end of the sentence to identify the part of the IDEAS strategy that the sentence represents. Circle ALL transition words.

Prompt: Is Pluto a planet?

Pluto is not a planet in our solar system □. To begin, Pluto is too small to be a planet and planets have to be a certain size □. For example, Pluto is smaller than Earth’s moon and that is too small to be a planet □. Also, planets must orbit the sun and Pluto does not always orbit the sun □. To elaborate, Pluto sometimes orbits around Neptune and not the sun □. Finally, Pluto may have come from another solar system and got caught in the Sun’s gravity □. To summarize, Pluto is not a planet but could just be an object that was stuck in our solar systems orbit □.
MATCH IT UP

NAME: Click here to enter text.

Directions: Match the label with the part by dragging the term from the blue box to its match on the IDEAS Light Bulb. WHEN YOU ARE FINISHED, RAISE YOUR HAND.
Appendix F

Graphic Organizer
Wrap up: Scavenger Hunt

Directions: Put your name and date at the top of the paper. Please use the computer-based graphic organizer to complete the following items. Write your answers on this handout. You may work with a partner.

1. Look at the computer-based graphic organizer. Look for text in the column that says, IDEAS. To find the secret hint, place your cursor over text. Write the secret hints for the parts below:
   - Identify your claim: ________________________________
   - Determine facts: __________________________________
   - Add transition words as you go: ____________________

2. How many facts should you include in your computer-based graphic organizer?
   - A. Two
   - B. Six
   - C. Three
   - D. Seven

3. In the strategy, IDEAS, each letter stands for a phrase to remind you to add all of your paragraph parts.
   - This letter reminds you to elaborate on your facts: ______
   - This letter reminds you to restate your claim at the end of the essay: ______

4. The graphic organizer has transition words in drop-down menus:
   - What is one good transition word to select when summarizing your essay? ______

5. Look at this section of the computer-based graphic organizer. Circle the section that you think helps you to make your brainstormed thoughts well organized.
Appendix F

Warm Up
Directions: Fill in the blank, select one of the multiple choice answers, or select true/false.

1. The strategy we learned to become better writers is: ____________________

2. The first thing I do when I open the Graphic Organizer is:
   a. Check my work.
   b. Begin writing.
   c. Read the prompt.

3. After reading the prompt I can then:
   a. Pick a goal.
   b. Start typing.
   c. Start Brainstorming.

4. Why is it helpful to set a goal when writing? Circle one:
   a. Setting a goal is fun.
   b. Setting a goal will give us something to work towards.
   c. Setting a goal is what we were told we had to do.

5. When I'm done filling out the brainstorm and sentences column in Section 2 of the graphic organizer, then I am completely done with my essay.
   True          False

6. The final section of the graphic organizer is:
   a. Evaluate
   b. Copy and Paste
   c. Brainstorm

7. Text to speech, screen tips, and drop down menus can help me to:
   a. Become a better writer.
   b. Use the graphic organizer.
   c. Complete my work.
   d. All of the above.
Appendix F

Directions: A good writer started filling out this graphic organizer to write a persuasive essay, but he forgot to fill in some parts. Look at this graphic organizer and find the missing parts. Answer the questions below.

<table>
<thead>
<tr>
<th>Main Points</th>
<th>Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>better</td>
<td>It is better to eat food from the floor if it has been there for less than five minutes.</td>
</tr>
<tr>
<td>Less bacteria</td>
<td>First, food has been on the floor for less than five seconds, it has less bacteria.</td>
</tr>
<tr>
<td>tested</td>
<td>To illustrate, researchers tested it and food is less likely to have bacteria on it if it has been on the floor for a few seconds.</td>
</tr>
</tbody>
</table>

1. Circle the parts below that our good writer forgot to include in the graphic organizer.
   - Main Points
   - Sentences
   - Goal
   - Check your work
   - Brainstorm

2. Why did our writer need to include all of these parts? _____________________________
Appendix G

Expository Essay Scoring Rubric: Grades 4-6

Directions: Please score the student essay using the scoring rubric below. Scoring conventions are attached.

Student ID:  

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Category</th>
<th>0 Expectations not met (0-20%)</th>
<th>1 Expectation met minimally (25-40%)</th>
<th>2 Expectation partially met (45-60%)</th>
<th>3 Moderately meets expectations (65-80%)</th>
<th>4 Meets expectations (85-95%)</th>
<th>5 Exceeds Expectations 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy</td>
<td>Accuracy</td>
<td>Content is not accurate</td>
<td>Content is minimally accurate</td>
<td>Content is partially accurate</td>
<td>Content is sometimes accurate</td>
<td>Content is usually accurate</td>
<td>Content is accurate throughout essay</td>
</tr>
<tr>
<td></td>
<td>Consistent Topic</td>
<td>Writing does not answer prompt</td>
<td>Writing minimally answers prompt</td>
<td>Writing partially answers prompt</td>
<td>Writing sometimes answers prompt</td>
<td>Writing usually answers the prompt</td>
<td>Writing answers prompt and remains consistent throughout essay</td>
</tr>
<tr>
<td>Organization</td>
<td>Topic sentence</td>
<td>No topic sentence</td>
<td>Topic sentence unrelated to prompt</td>
<td>Topic identified in sentence with limited words (ex: yes, no) and ended with a period</td>
<td>Topic sentence included, but not discrete (such as yes, because) or a fact included with the topic</td>
<td>Discrete topic sentence</td>
<td>Discrete topic sentence that uses words from prompt to express topic</td>
</tr>
<tr>
<td></td>
<td>Facts</td>
<td>No facts included</td>
<td>More than one fact, but unrelated to topic</td>
<td>One fact that clearly supports the topic</td>
<td>Two facts that clearly support the topic</td>
<td>Three facts that clearly support the topic</td>
<td>Four or more facts that clearly support the topic</td>
</tr>
<tr>
<td></td>
<td>Elaborations</td>
<td>No elaborations</td>
<td>More than one elaboration, but unrelated to facts.</td>
<td>One elaboration related to a fact.</td>
<td>Two elaborations that clearly support facts.</td>
<td>Three elaborations that clearly support facts.</td>
<td>Four or more elaborations that clearly support facts.</td>
</tr>
<tr>
<td></td>
<td>Transitions</td>
<td>No transition words</td>
<td>One ineffective transition word</td>
<td>More than one transition word, but none appropriate for sentence</td>
<td>One appropriate transition word or phrase</td>
<td>Two appropriate transition words or phrases</td>
<td>Three or more appropriate transition words or phrases</td>
</tr>
<tr>
<td></td>
<td>Conclusion</td>
<td>No conclusion</td>
<td>Conclusion unrelated to topic sentence</td>
<td>Conclusion written with limited words (yes, no) and</td>
<td>Conclusion included, but not discrete</td>
<td>Discrete conclusion sentence</td>
<td>Discrete conclusion sentence that clearly and effectively uses words from prompt or topic sentence to summarize the text</td>
</tr>
</tbody>
</table>
### Expository Essay Scoring Rubric: Grades 4-6

**Directions:** Please score the student essay using the scoring rubric below. Scoring conventions are attached.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Category</th>
<th>0 Expectations not met</th>
<th>1 Expectation met minimally</th>
<th>2 Expectation partially met</th>
<th>3 Moderately meets expectations</th>
<th>4 Meets expectations</th>
<th>5 Exceeds Expectations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammar/Syntax</td>
<td>T-units</td>
<td>No t-units</td>
<td>1-3 t-units</td>
<td>4-6 t-units</td>
<td>7-9 t-units</td>
<td>8-10 t-units</td>
<td>10 or more t-units</td>
</tr>
<tr>
<td></td>
<td>Capitalization</td>
<td>No sentences begin with a capital letter</td>
<td>Minimal sentences begin with a capital letter</td>
<td>Few sentences begin with a capital letter</td>
<td>Some sentences begin with a capital letter</td>
<td>Most sentences begin with a capital letter</td>
<td>All sentences written begin with a capital letter</td>
</tr>
<tr>
<td>Depth of content</td>
<td>Number of words</td>
<td>No words</td>
<td>1-50 words</td>
<td>51-79 words</td>
<td>80-99 words</td>
<td>100-119 words</td>
<td>120 or more words</td>
</tr>
<tr>
<td></td>
<td>Sentences</td>
<td>No sentences</td>
<td>1 sentence</td>
<td>2 sentences</td>
<td>3-4 sentences</td>
<td>5-6 sentences</td>
<td>7 or more sentences</td>
</tr>
</tbody>
</table>

**Total Score**
Total Score Rating Scale
1-11: Unsatisfactory Paragraph: 1
12-22: Insufficient Paragraph: 2
23-33: Uneven paragraph: 3
34-44: Sufficient paragraph: 4
45-55: Excellent paragraph: 5

Scoring conventions:
Accuracy of content:
*This scores accuracy of essay unrelated to prompt question. The essay could have accurate information, but not answer the prompt.
*If between scoring ranges (ex: 22%. Round up if the number in the tens place is 5 or higher, round down if the number is 4 or less)
0- Content is not accurate. Essay contains information that is not accurate. 0-20 percent of t-units contain accurate information.
1- Content is minimally accurate. Essay contains minimal information that is factual. 25-40 percent of t-units contain accurate information
2- Content is partially accurate. Essay contains partial information that is factual. Approximately 45-60 percent of t-units contain accurate information
3- Content is sometimes accurate. Essay contains some information that is factual. Approximately 65-80 percent of t-units contain accurate information
4- Content is usually accurate. Essay contains minimal information that is factual. Approximately 85-95 percent of t-units contain accurate information
5- Content is accurate. Essay contains minimal information that is factual. Approximately 100% percent of t-units contain accurate information

Topic consistency:
*Related to answering the prompt and remaining consistent. An essay could answer prompt, but not have accurate information.
0- Writing does not answer prompt. 0-20 percent of t-units are related to prompt.
1- Content minimally answers prompt. Approximately 25-40 percent of t-units are related to prompt.
2- Content partially answers prompt. Approximately 45-60 percent of t-units are related to prompt.
3- Content sometimes answers prompt. Approximately 65-80 percent of t-units are related to prompt.
4- Content usually answers prompt. Approximately 85-95 percent of t-units are related to prompt.
5- Content answers prompt. Approximately 100% percent of t-units are related to prompt.

Topic Sentence
For score of 4/5. Must be discrete. Must end with a period. Does not need to begin with a capital letter
Facts
- Facts do not have to be discrete sentences, but must be a fact (even if not accurate) and not an opinion statement.

Elaborations
- Elaborations do not have to be discrete sentences. Can be an opinion, but must be related to a fact. (i.e. I think bears are cool).

Transition words or phrases
- Because, also, therefore, first, next.....(because only when used as a transition word at the beginning of a sentence)

Conclusion
For score of 4/5: must be discrete. Must end with a period. Does not need to begin with a capital letter.
T-units
- Total number of t-units in paragraph(s)

Capitalization
- Sentences do not begin with a capital letter. 0-20
  1- Approximately 25-40 percent begin with a capital letter.
  2- Approximately 45-60 percent begin with a capital letter.
  3- Approximately 65-80 percent of sentences begin with a capital letter.
  4- Approximately 85-95 percent begin with a capital letter.
  5- 100% percent of sentences begin with a capital letter.

Number of words
- Total number of words in paragraph(s)

Number of sentences
- Must be discrete. Must end with a period. Does not have to begin with a capital letter.
Self-Efficacy and Motivation Questionnaire

Directions: These questions will help us to know what you think about writing. Answer each question honestly. Circle the frown face if you don’t agree, the straight face if you agree a little, and the smile face if you agree a lot.

1. I like to write in science.
       

2. I like to write in social studies.
       

3. I am a good writer in science.
4. I am a good writer in social studies.

5. I complete writing assignments even when it’s hard.

6. Writing in science and social studies helps me to do better in school.

7. I write as well as other students.

8. I try my best when writing.
9. I am good at answering questions in writing in social studies.

10. I am good at answering questions in writing in science.

11. I can write a good paragraph in science.

12. I can write a good paragraph in social studies.

13. I plan before I write.

14. I use a strategy to write.

15. I review my writing before I turn it into my teacher.
16. I brainstorm before I write.

17. I set a goal for my writing.

18. It is easy for me to write a good paragraph.

19. I like to write in social studies.

20. I like to write in science.

21. Being a good writer is important to me.
22. I want to write in social studies

😊 😞 😞

23. I want to write in science

😊 😞 😞
Appendix I

Student Name: __________________________

Date: _________________________________

Recorder #: __________________________

Semi-Structured Student Pre-Instruction Interview

Note: Be sure to begin the recording. State the date and the participant. Ex. “This is Ms. Andrea and I am talking with Sue. Today is August 3rd.” Make notes on this protocol as needed during the interview. For questions 4-16, students will respond to these questions while looking at the pre-intervention writing sample.

Say out loud: Today we are going to ask what you feel about writing activities as well as what you think about your writing. Please feel free to share what you really think. If you don’t know an answer, just say “I don’t know. Also, I may write down what you say or do – as we go. Any questions? OK, let’s get started.

1) Do you like to write? What is your favorite or least favorite part about writing?

2) Think about the other students in your class and how they write. Do you think you write just as well as other students in your class? Why or why not?

3) Do you try your very best when you are writing?

Say out loud: Now I’m going to show you what you recently wrote in class and ask you some questions about your writing and what you thought about this writing activity. Is that OK?

4) Can you tell me what you wrote about?

5) How did you feel when your teacher told you to write about this topic?
6.) Did you think that you would be able to answer this question in writing?

7.) What do you think about what you wrote? Do you think it’s good?

8.) What would you improve?

9.) What do you like about your writing in this sample?

11. Now, I want you to walk me through your process for writing this. What did you do first…and after that? And after that?

12. Did you set a goal for your writing before you answered the question?

13.) Before you wrote this, did you plan? How did you plan?

14.) Did you brainstorm? How did you brainstorm?

15.) Did you use a strategy? Tell me about the strategy that you used.

16.) Did you look over your work and make any changes? Tell me how you reviewed your work and made changes.

Say out loud: Thank you for sharing your work and opinions with me!
Student Name: _______________________

Date: _______________________________

Recorder #: __________________________

Semi-Structured Student Post-Instruction Interview

Note: Be sure to begin the recording. State the date and the participant. Ex. “This is Ms. Andrea and I am talking with Sue. Today is August 3rd.” Make notes on this protocol as needed during the interview. For questions 4-16, students will respond to these questions while looking at the pre-intervention writing sample.

Say out loud: Today we are going to ask what you feel about writing activities as well as what you think about your writing. Some of these questions will be similar to what I asked you before. I just want to know how you feel about writing now that we’ve had a few lessons. Please feel free to share what you really think. If you don’t know an answer, just say “I don’t know.” Also, I may write down what you say or do – as we go. Any questions? OK, let’s get started.

1) Do you like to write? What is your favorite or least favorite part about writing?

2). Think about the other students in your class and how they write. Do you think you write just as well as other students in your class? Why or why not?

3.) Do you try your very best when you are writing?

Say out loud: Now I’m going to show you what you recently wrote in class and ask you some questions about your writing and what you thought about this writing activity. Is that OK?
4.) Can you tell me what you wrote about?

5.) How did you feel when your teacher told you to write about this topic?

6.) Did you think that you would be able to answer this question in writing?

7.) What do you think about what you wrote? Do you think it’s good?

8.) What would you improve?

9.) What do you like about your writing in this sample?

11. Now, I want you to walk me through your process for writing this. What did you do first…and after that? And after that?

12. Did you set a goal for your writing before you answered the question?

13.) Before you wrote this, did you plan? How did you plan?

14.) Did you brainstorm? How did you brainstorm?

15.) Did you use a strategy? Tell me about the strategy that you used.

16.) Did you look over your work and make any changes? Tell me how you reviewed your work and made changes.

Say out loud: Thank you for sharing your work and opinions with me!
Appendix J

Sample Prompt:

When food is dropped on the floor, a small amount of bacteria is transferred to the food. More bacteria is transferred when the food stays on the floor for longer amounts of time.

Question: Is it safe to eat food that has been dropped on the floor?
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Biography

Andrea Boykin graduated from Hampton High School, Hampton, Virginia, in 2002. She received her Bachelor of Arts from Old Dominion University in 2007. She was employed as a teacher in Washington D.C. for three years and received her Masters of Education in Special Education from George Mason University in 2011.