An examination of the effects of a Technology-Based Graphic Organizer (TBGO) and the iPad on the persuasive writing of fourth-grade students with and without disabilities

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An Examination of the Effects of a Technology-Based Graphic Organizer (TBGO) and the iPad on the Persuasive Writing of Fourth-Grade Students With and Without Disabilities

by

Julienne Cuccio-Slichko

A Dissertation
Submitted to the University at Albany, State University of New York in Partial Fulfillment of The Requirements for the Degree of Doctor of Philosophy

School of Education
Department of Educational and Counseling Psychology

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An Examination of the Effects of a Technology-Based Graphic Organizer (TBGO) and the iPad on the Persuasive Writing of Fourth-Grade Students With and Without Disabilities

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Julienne Cuccio-Slichko

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Dedication

To Zack: thank you for propelling me into this career and being my first “lesson.” This dissertation is dedicated to you and all the Zacks that learn differently.

To Grandma and Grandpa: you taught me the value of an education and the importance of helping others. This Ph.D. is dedicated to you, in honor of your contributions to my life.

To Dylan: everything I do is for you.
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To the school where this data was collected, thank you to the teachers, administrators, students and parents that supported this research and welcomed me into their school.

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And to God, through Him, all things are possible.
Abstract

Writing strategies, such as graphic organizers and mnemonic devices, have supported students in planning in advance of writing and technology has the potential to alleviate the burden of handwriting fatigue for struggling writers. Furthermore, under the Common Core State Standards (CCSS, 2010), fourth-graders are expected to be able to use technology to compose essays across writing genres. The integration of mobile technologies, such as the iPad, is becoming commonplace in education at all levels; however, little empirical research currently supports the iPad as a medium for written expression. This study adds to the current research base by conducting the first comparative investigation that leverages a technology-based graphic organizer (TBGO), on an iPad, against the same graphic organizer on paper. Two fourth-grade inclusion classrooms were taught to plan and write with a paper graphic organizer and an iPad app, through a pretest/posttest, switching replications design. The use of an iPad as a tool for writing was viewed as socially acceptable by students and produced significant results in essay length over the paper version. Both the TBGO and the paper graphic organizers improved writing quality. Limitations and implications for practice are included.
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TITLE</td>
<td>i</td>
</tr>
<tr>
<td>COPYRIGHT</td>
<td>ii</td>
</tr>
<tr>
<td>DEDICATION</td>
<td>iii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>vi</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xii</td>
</tr>
<tr>
<td>LIST OF APPENDICES</td>
<td>xiii</td>
</tr>
<tr>
<td>CHAPTER 1 – INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Educational Initiatives</td>
<td>2</td>
</tr>
<tr>
<td>Proliferation of the iPad</td>
<td>3</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td>4</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>4</td>
</tr>
<tr>
<td>Design and Analysis</td>
<td>5</td>
</tr>
<tr>
<td>Research Questions</td>
<td>5</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>6</td>
</tr>
<tr>
<td>CHAPTER 2 – REVIEW OF THE LITERATURE</td>
<td>8</td>
</tr>
<tr>
<td>Search Procedures</td>
<td>8</td>
</tr>
<tr>
<td>Writing</td>
<td>9</td>
</tr>
<tr>
<td>The Writing Process</td>
<td>9</td>
</tr>
<tr>
<td>Persuasive Discourse</td>
<td>10</td>
</tr>
<tr>
<td>Skilled Writers</td>
<td>11</td>
</tr>
<tr>
<td>Struggling Writers</td>
<td>12</td>
</tr>
<tr>
<td>Writing Interventions</td>
<td>16</td>
</tr>
<tr>
<td>Planning Strategies</td>
<td>18</td>
</tr>
<tr>
<td>Technology</td>
<td>40</td>
</tr>
<tr>
<td>Planning</td>
<td>41</td>
</tr>
<tr>
<td>Mobile Technology</td>
<td>53</td>
</tr>
</tbody>
</table>
## List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Review of Studies Examining Mnemonic Strategy and/or Graphic Organizers for Persuasive writing</td>
<td>21</td>
</tr>
<tr>
<td>3.1</td>
<td>Participant data</td>
<td>70</td>
</tr>
<tr>
<td>3.2</td>
<td>Paper Graphic Organizer vs. iPad app Graphic Organizer</td>
<td>75</td>
</tr>
<tr>
<td>3.3</td>
<td>Intervention Time Table</td>
<td>77</td>
</tr>
<tr>
<td>4.1</td>
<td>Participants’ Scores from Contextual Conventions Subtest in Descriptive Terms</td>
<td>88</td>
</tr>
<tr>
<td>4.2</td>
<td>Means and Standard Deviations for Writing Conditions by Dependent Measures</td>
<td>90</td>
</tr>
<tr>
<td>4.3</td>
<td>Means and Standard Deviations for Holistic Quality by Cohort</td>
<td>92</td>
</tr>
<tr>
<td>4.4</td>
<td>Analysis of Variance for Holistic Quality</td>
<td>93</td>
</tr>
<tr>
<td>4.5</td>
<td>Means and Standard Deviations for Persuasive Elements by Cohort</td>
<td>96</td>
</tr>
<tr>
<td>4.6</td>
<td>Analysis of Variance for Persuasive Elements</td>
<td>96</td>
</tr>
<tr>
<td>4.7</td>
<td>Means and Standard Deviations for Words Written by Cohort</td>
<td>100</td>
</tr>
<tr>
<td>4.8</td>
<td>Analysis of Variance for Words Written</td>
<td>100</td>
</tr>
<tr>
<td>4.9</td>
<td>Means and Standard Deviations for Dependent Measures by Condition</td>
<td>103</td>
</tr>
<tr>
<td>4.10</td>
<td>Analysis of Variance of Posttests for Quality</td>
<td>104</td>
</tr>
<tr>
<td>4.11</td>
<td>Analysis of Variance of Posttests for Persuasive Elements</td>
<td>105</td>
</tr>
<tr>
<td>4.12</td>
<td>Analysis of Variance of Posttests for Words Written</td>
<td>107</td>
</tr>
<tr>
<td>4.13</td>
<td>Individual Scores for Students with Disabilities by Dependent Measure Across Conditions</td>
<td>110</td>
</tr>
<tr>
<td>4.14</td>
<td>Participants’ Interview Responses by Question</td>
<td>112</td>
</tr>
</tbody>
</table>
## List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Quality Means by Writing Condition for Cohort A</td>
<td>94</td>
</tr>
<tr>
<td>4.2</td>
<td>Quality Means by Writing Condition for Cohort B</td>
<td>94</td>
</tr>
<tr>
<td>4.3</td>
<td>Means for Persuasive Elements by Writing Condition for Cohort A</td>
<td>97</td>
</tr>
<tr>
<td>4.4</td>
<td>Means for Persuasive Elements by Writing Condition for Cohort B</td>
<td>98</td>
</tr>
<tr>
<td>4.5</td>
<td>Means for Words Written for Cohort A</td>
<td>101</td>
</tr>
<tr>
<td>4.6</td>
<td>Means for Words Written for Cohort B</td>
<td>102</td>
</tr>
<tr>
<td>4.7</td>
<td>Holistic Quality Scores Across Conditions</td>
<td>105</td>
</tr>
<tr>
<td>4.8</td>
<td>Number of Persuasive Elements Included Across Conditions</td>
<td>106</td>
</tr>
<tr>
<td>4.9</td>
<td>Number of Words Written Across Conditions</td>
<td>108</td>
</tr>
<tr>
<td>4.10</td>
<td>Samples of Roger’s Handwritten and iPad Essay</td>
<td>116</td>
</tr>
</tbody>
</table>
# List of Appendices

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Search Terms</td>
<td>161</td>
</tr>
<tr>
<td>B</td>
<td>Project WeGotIT! App</td>
<td>162</td>
</tr>
<tr>
<td>C</td>
<td>Persuasive Probes</td>
<td>163</td>
</tr>
<tr>
<td>D</td>
<td>IDEAS Paper Graphic Organizer</td>
<td>164</td>
</tr>
<tr>
<td>E</td>
<td>Transition Word List</td>
<td>166</td>
</tr>
<tr>
<td>F</td>
<td>Persuasive Writing Lesson Plans</td>
<td>167</td>
</tr>
<tr>
<td>G</td>
<td>Sample Essays</td>
<td>174</td>
</tr>
<tr>
<td>H</td>
<td>Graphic Organizer Lesson Plans</td>
<td>176</td>
</tr>
<tr>
<td>I</td>
<td>TBGO/iPad Lesson Plans</td>
<td>182</td>
</tr>
<tr>
<td>J</td>
<td>Anchor Papers for Scorers</td>
<td>196</td>
</tr>
<tr>
<td>K</td>
<td>PSSA Quality Index</td>
<td>200</td>
</tr>
</tbody>
</table>
CHAPTER I

Introduction

Forty years ago, Congress enacted the Education for all Handicapped Children Act (EAHCA; 1975), guaranteeing children with disabilities access to a public education. The Individuals with Disabilities Education Act (IDEA; 1990) and the Individuals with Disabilities Education Improvement Act (IDEIA; 2004), as well as its civil counterpart, the Americans with Disabilities Act (ADA; 1990), expanded EAHCA to further support students with disabilities through the entitlement of a free and appropriate public education in the least restrictive environment, in addition to providing various services including early intervention and post-secondary transition services. Concurrently, other initiatives and laws have supported students with disabilities. One of these, the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (Tech Act; reauthorized in 1994, 1998, and 2004), was enacted to promote awareness and access to assistive technology devices and services for all people with disabilities in all environments (Nichy.org, n.d.). Reform continued as The No Child Left Behind Act of 2001 (NCLB) changed how schools measure and report progress for students with disabilities via adequate yearly progress through the use of evidence-based practices, in the hopes that all students attain proficiency benchmarks by 2014.

Despite these initiatives and federal mandates with new accountability measures, proficiency scores remain stagnant for both students with and without disabilities. For example, the National Center for Educational Statistics (NCES) reported that only 30% of eighth- and twelfth-grade students performed at or above “proficient” level for writing (2012), indicating that many students have not mastered writing skills that are necessary for academic success (Salahu-Din, Persky, & Miller, 2008). Writing is not only a necessary skill for students to succeed in
school, but a vital skill for higher education, the workplace, and daily life (National Commission on Writing, 2005). Although students with disabilities are guaranteed equal access to curriculum, early intervention services, and accommodations, they continue to perform below their peers without disabilities.

**Educational Initiatives**

School reforms continue as the Race to the Top (RTTT) initiative and Common Core State Standards (CCSS, 2010) establish new expectations for students. One area of notably increased focus is writing, and specifically, writing with technology. Under CCSS legislation, students are expected to employ narrative, persuasive, and informative writing for multiple purposes and adeptly utilize technology to support their writing. Additionally, the U.S. Department of Education’s National Education Technology Plan (NETP, 2010) identified the need of 21st-century learning in America stating that:

Technology is at the core of virtually every aspect of our daily lives and work, we must leverage it to provide engaging and powerful learning experiences, content, and resources and assessments that measure student achievement in more complete, authentic, and meaningful ways…Every student and educator [should have] at least one Internet access device and appropriate software and resources for research, communication, multimedia content creation, and collaboration for use in and out of school. (p. 61)

The CCSS specifically address the integration of technology in written work. Fourth-graders are expected to use digital tools for planning and publishing written work, and fifth-graders are expected to type a two-page document in one sitting (CCSS, 2010). Not only will students need to use technology to compose, but they will need to become accustomed to
electronic assessments under the new standards. The National Assessment of Educational Progress (NAEP) administered the first computer-based assessment in writing in 2011 to eighth-and twelfth-graders but will soon be administered to all testing grades. Furthermore, technology is pervasive throughout the workplace and society, therefore schools must better prepare students for 21st Century Skills (NETP, 2010).

Writing interventions featuring computers or technology, commonly known as technology-aided instruction and interventions (TAII), have become an evidenced-based practice, especially for students with disabilities, such as those with Autism Spectrum Disorders (Wong et al., 2013). One device that is gaining the attention of researchers and school officials is the Apple iPad. Since its introduction in 2010, the iPad’s popularity has grown exponentially and globally, both with household consumers and school districts, averaging sales of 1.7 million iPads every week in 2012 (Michaels, 2013). However, despite its proliferation in schools, only a small body of research exists for the iPad’s ability to deliver content through iBooks, the internet, and educational apps; less is known about its validity as a technology to support writing.

Proliferation of the iPad

In response to federal initiatives and the CCSS, many school districts have purchased tablet devices, such as Apple’s iPad, to support students’ academic achievement in areas such as writing; some districts have allocated large amounts of monies and committed to putting an iPad in the hands of every student and teacher. Chicago Public Schools allocated $560 million to purchase iPads (Yaccino & Rich, 2013), and Los Angeles Unified School District allocated over 1.3 billion dollars to purchase iPads for 650,000 students (Blume, 2014). The State of Virginia’s Department of Education (2010) “Beyond Textbooks” initiative replaced history textbooks with iPads. Higher educational institutions are replacing textbooks, and even classrooms, with iPads.
For example, Lynn University now offers a new online degree program that is exclusively delivered through the iPad where tuition costs cover a personal mini iPad for each enrollee (Travis, 2014). Although the research is positive in support of the iPad’s utility for increasing student motivation and engagement (Campigotto, McEwen, & Demmans Epp, 2013), there is a gap in the research in terms of its effect on learning outcomes (Picard, Martin & Tsao, 2014).

**Statement of the Problem**

Students need writing skills to succeed in school and in life, yet three out of four students are not meeting grade-level proficiency in writing (NAEP, 2011). Common Core State Standards (CCSS, 2010) require that students become proficient writers across genres and disciplines and efficiently utilize technology to plan and produce written work. The United States Department of Education allocated $330 million dollars of Race to the Top funds in support of the CCSS (Porter, McMaken, Hwang & Yang, 2011) and much of those resources have been earmarked to purchase iPads or other types of mobile devices. However, little empirical research exists for effectiveness of these devices on teaching and learning outcomes, specifically in writing (Milman, Carlson-Bancroft, & Vanden Boogart, 2014; Picard, Martin & Tsao, 2014).

**Purpose of this Study**

The purpose of this study was to examine the differences in students’ persuasive essays composed with a technology-based graphic organizer app on the iPad compared to students’ persuasive essays composed with a graphic organizer on paper. Furthermore, this study tested the generalizability of the intervention to paper. This study added to the limited empirical research for the iPad by examining its utility as a tool for planning and writing.

To explore the appropriateness of a technology-based graphic organizer (TBGO) mobile app as a prewriting strategy for the composition of persuasive essays for fourth-grade students,
the literature will be reviewed through various lenses. The first section of the review will examine historical aspects of writing – its purpose, the process, and its importance in education. Next, the research on writing interventions, specifically at the upper-elementary and middle school levels, will be discussed. The latter sections will focus on technological advances, specifically mobile technologies that support education, with a focus the integration of the iPad in classrooms. Additionally, the literature in support of the iPad, through the theoretical framework of Universal Design for Learning (UDL; CAST, 2011), will be discussed. Finally, the review concludes with studies that examined the iPad and apps for writing. These studies were selected to support the various components of the app featured in this study, such as planning in advance of writing with graphic organizers and mobile learning. The literature presented in the next chapter collectively supports the adoption of the app and the iPad as a tool for writing.

**Design and Analysis**

This study employed a mixed method approach to research. First, persuasive essays were collected and assessed at eight points throughout the intervention- two at pretest, two in the iPad condition, two in the paper condition, and two at posttest. Dependent measures were analyzed for number of words written, number of persuasive elements, and overall holistic quality. The transfer effects of the planning strategy to traditional paper and pencil method were also examined. Next, qualitative data gathered through semi-structured interviews were analyzed for students’ perceptions about the iPad. The next section poses research questions for the current study and the definition of terms.

**Research Questions**

The research questions for this study are:
1. What is the difference in holistic quality of essays composed with a technology-based graphic organizer (TBGO) on the iPad compared to essays composed using a paper graphic organizer, as measured by a holistic quality index?

2. What is the difference in number of persuasive elements produced in essays composed with the TBGO on the iPad compared to essays composed with a paper graphic organizer?

3. What is the difference in the number of words composed with the TBGO on the iPad compared to essays composed using a paper graphic organizer?

4. What effects will the TBGO and iPad have on a paper and pencil writing task written without the graphic organizer?

5. What are fourth grade students’ perceptions of utilizing the iPad as a writing tool, collected through semi-structured interviews?

**Definition of Terms**

**App** – software designed for smartphones and other mobile devices.

**Common Core State Standards** – an educational initiative, sponsored by the National Governors Association and the Council of Chief State School Officers, in the United States, that details standards across states as to what K-12 students should know at the end of each grade in English language arts and mathematics.

**Computer-based graphic organizers (CBGO)** – software programs that support the creation and development of a graphic organizer to be used on a personal computer.

**Graphic organizers** – spatial arrangements of words (or groups of words) or pictures intended to represent the conceptual organization of text.

**Handheld device** – a small mobile device, including smartphones and tablets, excluding laptops.
iPad – a tablet computer, designed by Apple, Inc., with a multi-touch screen, virtual keyboard, Wi-Fi, and capabilities such as capturing video, photos, playing music, and web-browsing.

Mobile device – a small computing device that includes a display screen and an operating system, including but not limited to laptops, smartphones, and tablets.

Mobile technology – technology that is portable and capable of wireless internet access

Tablet computers – mobile device with a touchscreen display, circuitry, and battery in one unit.

Technology-aided interventions and instruction (TAII) – educational instruction and/or intervention where technology is the focus of the intervention to support the outcome for student(s).

Technology-based graphic organizers (TBGO) – Similar to CBGO, software programs or web-based programs that support the creation and development of a graphic organizer to be used on a mobile device.

Text-to-speech (TTS) – software program that converts text into spoken voice output.

Touchscreen – input device on an electronic visual display allowing a user to input or control the information processing system thought simple or multi-touch gestures with a stylus and/or fingers.

WiFi – wireless technology that allows electronic devices to participate in computer networking.
CHAPTER II

Review of the Literature

The purpose of this chapter was to review the literature pertinent to technology that supports writing in the elementary grades. To examine the utility of a technology-based graphic organizer (TBGO) app on the iPad as a method for planning and writing, the literature was reviewed within the following categories: (a) writing, (b) writing interventions, (c) technology, (d) mobile technology, and (e) writing and the iPad. The chapter first presents a brief overview of writing importance and the challenges for school-age children in writing. Next, the review presents literature on writing interventions that have sought to address these challenges. Then, a review of technology and its efficacy for writing is discussed. Lastly, the review explores the literature surrounding the integration of mobile technology in schools, particularly the iPad tablet and how it has been utilized as a writing tool.

Search Procedures

The literature was reviewed and collected by the following process: first, a list of keywords was developed (See Appendix A). The keywords were searched in Ebsco Academic Search Complete, Education Resources Information Center (ERIC), Education Source, Education Full Text, Education Research Complete, Teacher Reference Center, Computer Source, Computers and Applied Sciences Complete, Psychology and Behavioral Sciences Collection, and Social Sciences. Articles were read for appropriateness and were included if they met the following criteria: 1) writing intervention with a mnemonic strategy, graphic organizer, or was conducted on the iPad; and, 2) participants were of elementary or middle school age. The reference list of each relevant article was then reviewed and an ancestry completed. All relevant articles are included in this review.
Writing

Writing is a social endeavor (Hayes, 1996), as well as a vehicle by which the author can attain numerous objectives (Graham, 2006), such as historical recordkeeping (Fromkin & Rodman, 1998), formal and informal communication, creative expression, reflection (Fromkin & Rodman, 1998; Graham & Harris, 2005; Graham, Gillespie, & McKeown, 2013), and influencing others through persuasive discourse (Graham, MacArthur, & Fitzgerald, 2013). In school, students not only write to learn (Bangert-Drowns, Hurley, & Wilkinson, 2004; Graham et al., 2012; Graham & Perin, 2007; Klein & Meichi Yu, 2013), but also write to express and demonstrate understanding (Applebee & Langer, 2013; Bereiter & Scardamalia, 1987; Richart, Church, & Morrison, 2011). Writing can support students to improve the acquisition of knowledge; Graham and Hebert (2011) found that writing activities have a positive effect on reading comprehension for students in grades 1-12, and on reading fluency for students in grades 1-7; essentially, students’ content knowledge increases when they write about it. The next sections will discuss the writing process, characteristics of good writers, and possible explanations for writing difficulties.

The writing process. The writing process can be defined as organized thinking to achieve a specific goal and purpose (Flower & Hayes, 1981). Early research defined the writing process as conception, incubation, and production (Britton, 1970). Later, Hayes and Flower (1987) outlined research that identified the tenets of writing for a particular reason which involves the complex, recursive, processes of planning, generating text, and revising. Expounding upon these three steps, Graham et al., (2012a) outlined the practice of effective writing as planning, drafting, sharing, evaluating, revising, editing, and publishing.
Planning requires the writer to access topic knowledge, writing strategies, such as format and genre conventions, employ problem-solving strategies and set goals (Flower & Hayes, 1981). Hayes and Flower (1987) postulated that the planning process is driven by a type of fluid goal-setting where problem-solving strategies are particularly important for the writer who may be less familiar with the topic and/or less adept at using writing strategies. Prewriting activities can assist the writer to organize ideas and text structure (Brodney, Revves, & Kazelskis, 1999; First & MacMillian, 1995; Flower & Hayes, 1981). Next, the writer must draft their ideas from the planning stage into visible language whereby the writer must employ multiple cognitive functions simultaneously (Hayes & Flower, 1987) and be able to discern story elements, vocabulary, sentence structure, syntax and grammar (Graham et al., 2012a). The writer must then revise their work to include adding, substituting, deleting, and moving of text in order to clarify meaning and edit mistakes, such as correcting errors in the mechanics of proper writing (Parsons, 2001). Publishing of the final product should be done as a celebration of the accomplishment (Graham et al., 2012a). Research has shown that explicit instruction in these processes improves the quality of writing for all students (Graham, 2006; Graham et al., 2012a; Graham & Harris, 2003, Graham & Perin, 2007). However, in addition to understanding the writing process, writers must also be able to differentiate between genres (McCutchen, 1986).

**Persuasive discourse.** In elementary school, students learn about different writing genres, including descriptive, expository, friendly-letters, narrative, persuasive, and poetry. Typically, argumentative skills develop in the upper elementary grades (Crammond, 1998) and students, at this level, are able to differentiate between these genres by providing the appropriate characteristics; however, their understanding of persuasive writing is weak in comparison (Gillespie, Olinghouse, & Graham, 2013). In fact, many students are not skilled writers in this
genre; only 27% of twelfth-graders are skillful at composing a persuasive essay (NAEP, 2007). Persuasive writing is important as students learn to communicate wants and needs (Cuenca-Carlino & Mustain, 2013), but may be challenging because it requires students to use higher-level thinking skills (Brukhalter, 1995; Freedman & Pringle, 1984; Nippold, 2000) such as problem-solving skills (Bereiter & Scardamalia, 1987), knowledge of the audience (Ferretti & Lewis, 2013), goal-setting and self-regulatory processes (Graham & Harris, 2000), as well as, critical thinking skills (Ferretti & Lewis, 2013). If students do not plan in advance of writing, these cognitive functions may cause students to experience cognitive overload (Hayes, 1996). The ability to manage this overload is one of the differences between skilled and unskilled writers. The next sections discuss characteristics of those students who write well and possible explanations as to why some students may struggle.

Skilled writers. Those who write well tend to plan out what they are going to write whereas novice writers do not (Bereiter & Scardamalia, 1987; Brodney, Reeves, & Kazelskis, 1999; De La Paz & Graham, 1997; Hillocks, 1986). The act of planning and generating text involves many cognitive processes in which strong writers will engage (Hayes, 1996; Scardamalia & Bereiter, 1986), and they are more self-regulated than developing writers (Graham & Harris, 2000). Skilled writers set goals, organize topical information, select an audience and move fluidly through the writing process (Sturm & Rankin-Erickson, 2002).

To better understand the cognitive demands of writing, Hayes (1996) differentiated two components of the writing process – the task environment and the individual. The task environment encompasses those aspects external to the writer, such as audience, collaboration, text, and composition (Hayes, 1996). According to Hayes (1996) the individual component includes motivation, affect, cognitive processes, working memory, and long-term memory. All
of these elements work simultaneously as writers plan, compose, and revise their work (Hayes, 1996; Scardamalia & Bereiter, 1986).

In addition to planning effectively, students that write well have attained handwriting automaticity and do not have to devote cognitive processes to such constructs as handwriting or spelling (Graham & Harris, 2003) which may interfere with the writing process (Scardamalia & Bereiter, 1986). Skilled writers can balance these cognitive processes effectively to plan and write across genres. However, when students lack writing knowledge and struggle to regulate these processes, writing deficits exist (Graham & Harris, 2005). The next section presents some possible explanations as to why students might not write proficiently.

**Struggling writers.** Students’ writing deficits have been examined through two lenses: 1) lack of instruction of the writing process (Graham et al., 2012a); and 2) learner-centered impairments such as lack of planning, handwriting fatigue, and/or deficits in self-regulation (Graham & Harris, 2000, 2005), as well as a poor attitude about writing (Graham, Schwartz, and MacArthur, 1993).

Although writing is essential for learning, the complicated process of writing is not widely understood by teachers (Graham et al., 2012a); thus, many teachers report feeling ill-prepared to deliver effective writing instruction (Kiuhara, Graham, & Hawken, 2009; Graham, Capizzi, Harris, Hebert, & Morphy, 2014), since many have received minimal or no formal preparation in writing instruction themselves (Graham, et al., 2014). Research has shown that after third grade, teachers do not devote time to writing instruction and students write very little outside of academic writing (Applebee & Langer, 2011; Gilbert & Graham, 2010; Kiuhara, Graham, & Hawken, 2009). Subsequently, students that do not attain writing skills in elementary school are likely to struggle in secondary education and probably later on in life (Graham, 2006).
Research has shown that students with disabilities and others that struggle with writing do so because: 1) they do not employ the writing process and/or strategies; and, 2) the physical demands of handwriting interfere with that process (Graham & Harris, 2005). Students who struggle with writing are less knowledgeable about writing strategies than those who write well (Englert, Raphael, Fear & Anderson, 1988), and they spend less time planning (De La Paz & Graham, 1997; Graham, Harris, MacArthur, & Schwartz, 1991; McCutchen, 1995) and more time focusing on the “physical act of producing text” (Graham & Harris, 2005, p. 8). Furthermore, poor writers may lack self-regulation necessary for the writing process (Graham & Harris, 2000; Harris & Graham, 1992) and may be affected by a poor writing attitude (Graham, Schwartz, & MacArthur, 1993). The next four sections further explore these areas of concern.

***Lack of planning.*** Planning in advance provides structure and improves organization (Flower & Hayes, 1980; Graham & Harris, 2009; Monroe & Troia, 2006; Graham & Perin, 2007). Likewise, students that engage in prewriting activities have produced better organized essays of higher quality (Dexter & Hughes, 2011; Graham & Harris, 2009; Monroe & Troia, 2006). Additionally, studies have shown that the integration of technology, specifically for planning, can produce some positive effects on writing outcomes for elementary students (Graham, McKeown, Kiihara, & Harris, 2012b). Graham and Harris (1996) found that poor writers do not employ planning strategies before they write. When students write without planning, little thought is given to organization or the audience (Graham & Harris, 2000); they attack writing as an exercise in answering questions (Bereiter & Scardamalia, 1987) and may engage in “dump” writing (Sturm & Rankin-Erickson, 2002) by writing anything that comes to mind.
**Self-regulation deficits.** Self-regulation of personal, behavioral, and environmental aspects occur through the self-management processes of self-observation, judgmental process, and self-reaction (Bandura, 1986). In terms of writing, self-observation could be the thinking about one’s writing performance; judgmental process could be thought of as the self-evaluation of one’s writing performance; and, self-reaction could be thought of one’s corrective actions or writing revisions. Students that struggle with writing may do so because of an inability to manage their planning activities independently (Fitzgerald, 1987). Specifically, developing writers, such as students with learning disabilities (LD), have exhibited difficulties with setting goals, managing writing conventions, content generation, organization, and evaluating and revising their written work (Graham & Harris, 2000; MacArthur, Schwartz, & Graham, 1991). Furthermore, to achieve success a student must be able to set goals, organize their thoughts, and assess their progress independently (Graham & Harris, 2000; Harris, Graham, Reid, McElroy & Hamby, 1994).

**Handwriting fatigue.** Handwriting is complex and requires the integration of physical, cognitive, and sensory processes (Kushki, Schwellnus, Ilyas, & Chau, 2011; Quinlan, 2004). Kushki et al. (2011) affirmed that when students gain automaticity in handwriting, motor demands are not likely to interfere with the writing process. Likewise, when students do not develop automaticity, it could impede the planning process (Graham & Harris, 2000; Graham & Weintraub, 1996; Jones & Christensen, 1999; Scardamalia & Bereiter, 1986), writing fluency, holistic quality (Graham, Berninger, Abbott, Abbott, & Whitaker, 1997), and ultimately, academic achievement (Cahill, 2009; Feder & Majnemer, 2007; Graham & Weintraub, 1996). Studies that have compared students’ handwritten essays to essays composed with technology (i.e. dictation or word processing) have found that the technology resulted in students creating
essays that were longer in less time than handwritten essays (Bangert-Drowns, 1993; Graham & MacArthur, 1988; MacArthur & Graham, 1987; Quinlan, 2004).

**Writing attitude.** Students’ attitude about writing can range from positive to negative and may influence their motivation to write (Graham, Berninger & Abbott, 2012; Sturm & Rankin-Erickson, 2002), as well as affect writing outcomes (Graham, Schwartz, & MacArthur, 1993). Poor writing attitude could be the result of poor self-efficacy (Klassen, 2002; Pajares, 2003) or lack of writing knowledge (Graham, Schwartz, & MacArthur, 1993). Graham et al., (1993) interviewed 68 students, from grades four through eight, and found that students with LD tend to be less positive than their peers about writing and less knowledgeable about the writing process. When asked why students have trouble writing, these students attributed difficulties to mechanics or neatness; whereas, normally-achieving students discussed the complexities of planning and strategies to writing. Poor writing attitude may cause a decrease in motivation to write and, left unaddressed, could ultimately affect literacy development (Graham et al., 1993).

In summary, writing is an important skill that students must acquire early in their educational careers to be successful. However, it is a complicated process that involves knowledge of topic information, audience, writing style, and writing conventions. The writer must employ multiple cognitive processes simultaneously, and achieve handwriting automaticity to be able to write well. Students' cognitive and physical deficits combined with lack of instruction, knowledge of strategies, attitude about self-efficacy in writing, lack of motivation, and limited time for composition within the school environment may be to blame for our national writing conundrum. In the next section, writing interventions, specifically those that focus on the planning process and the integration of technology with elementary students, are discussed.
Writing Interventions

Research on writing interventions has examined various aspects of writing, including planning, self-regulation, text production, revision strategies, as well as curricula across writing genres. The following section describes a meta-analysis of the research on writing interventions for elementary students.

Graham et al. (2012b) conducted a meta-analysis of existing research to examine instructional practices for teaching writing to elementary grade students. In an effort to establish evidence-based writing practices, they searched five databases and reviewed 12,000 abstracts to examine experimental and quasi-experimental intervention studies conducted within the last 30 years. Study inclusion criteria was defined as (a) a true or quasi-experiment, (b) subjects attended a typical elementary school (special schools were excluded), (c) included a treatment group that receive a writing intervention, (d) writing quality was examined at posttest (pretest for quasi-experimental designs), (e) research was presented in English, and (f) paper included statistical analysis with effect size. One hundred fifteen articles met these criteria, which the authors then itemized into 13 categories of effective writing practice. The categories were operationalized as:

1. Strategy instruction
2. Self-regulation/strategy instruction
3. Text structure instruction
4. Creativity/imagery instruction
5. Teaching transcription skills
6. Grammar instruction
7. Prewriting activities
8. Peer assistance
9. Product goals
10. Assessing writing
11. Word processing
12. Extra writing
13. Comprehensive writing programs
Each study was coded for grade levels, participant type, genre, treatment and control conditions, and publication type. The authors also established nine quality indicators to assess each study. The quality of each study was measured by the following items:

1. Design
2. Treatment fidelity
3. Teacher effects controlled
4. More than one teacher
5. Total attrition less than 10%
6. Total attrition less than 10% and equal attrition across conditions
7. Pretest equivalence of writing quality in quasi-experimental designs
8. Pretest ceiling or floor effects not evident

First, effect sizes were calculated for writing quality, based on a holistic quality measure (norm-referenced measures were only included if writing quality was measured). Second, the authors used a weighted random-effects model to calculate an average weighted effect size, confidence internal, and statistical significance. To account for the variability in the effect sizes, two measures of homogeneity were also calculated.

Graham et al. (2012b) found that 12 out of the 13 writing treatments yielded positive effect sizes and statistical significance. Teaching grammar produced the only statistically nonsignificant average weighted effect size. Graham et al. established the following 12 recommendations based on their results:

1. Strategies should be taught for planning, drafting, or revising different types of text
2. Procedures should be taught for regulating writing strategies
3. How to form visual images and creativity should be taught
4. Different types of text structure and form should be taught
5. Spelling, handwriting, and keyboarding should be included
6. Student collaboration should be developed
7. Goal-setting should be included
8. Students should engage in prewriting activities
9. Teacher, peer, and self-assessment should be included
10. Word processing should be a primary tool for writing
11. Opportunities for writing should be increased
12. A comprehensive writing program should be utilized
Although strategy instruction, comprised of Self-Regulated Strategy Development (SRSD) and Non-SRSD studies, produced the highest effect size (1.02), most of the writing interventions ($N=111$) also produced positive effects. This meta-analysis supports the theory that when elementary students are explicitly taught strategies, text structure, and provided with alternative modes for composing, the overall quality of their writing could improve significantly. Interventions that have focused on pre-writing strategies, specifically planning with graphic organizers, are discussed in the following sections. Of these strategies, those most pertinent to the current study are those with participants in elementary grades.

**Planning strategies.** Planning in advance of writing is necessary to be able to write well (Flower & Hayes, 1981). In studies where students were given a written task, researchers found that it was common for students with disabilities to allocate little or no time to advanced planning (MacArthur & Graham, 1987). When provided with explicit instruction in advanced planning strategies, students, particularly struggling writers and students with learning disabilities, composed papers of higher quality (De La Paz & Graham, 1997; Graham & Harris, 1989; Graham, Harris, MacArthur, & Schwartz, 1991; Sawyer, Graham, & Harris, 1992; Wong, Butler, Ficzere, & Kuperis, 1996, 1997), perhaps because cognitive overload was minimized (Hayes, 1996). Two strategies, in particular, that have supported students’ planning in advance of writing and are pertinent to this study – mnemonic strategies and graphic organizers.

Mnemonics can enhance students’ memory (Bulgren, Schumaker, & Deshler, 1994; Mastropieri & Scruggs, 1989). Mnemonic strategies can include using pictures or active manipulation to improve recall (Mastropieri & Scruggs, 1998). One mnemonic strategy that reinforces prewriting activities is the letter strategy, or acronym, where each letter stands for a step or process (Mastropieri & Scruggs, 1998). For example, the mnemonic **TREE** (e.g. Topic,
Reason, Explain, Ending) was used in interventions for teaching persuasive writing (Asaro-Saddler and Bak, 2012, 2014; Cuenca-Carlino & Mustain, 2013; Cuenca-Sanchez, Mastropieri, Scruggs, & Kidd, 2012; Delano, 2007; Graham & Harris, 1998; Harris, Graham & Mason, 2006; Hauth, Mastropieri, Scruggs, & Regan, 2013; Little, Lane, Harris, Graham, Story & Sandmel, 2010; Mason & Shriner, 2008; Mason, Kubina & Taft, 2011; Mason, Kubina, Valasa & Cramer, 2010; Mastropieri et al., 2009; Sexton, Harris & Graham, 1998) and is closely aligned to the mnemonic in this study.

The other planning strategy featured in this study is a graphic organizer. Graphic organizers, particularly genre organizers, assist writers to sequence or structure their writing by providing "visually representing relationships" (Lassonde & Richards, 2013, p. 208). Banikowski and Mehring (1999) argued that graphic organizers are powerful tools that assist students in constructing meaning, organizing ideas, understanding relationships, and pairing knowledge with new information. As a prewriting strategy, graphic organizers encourage the organization of ideas (Avery, Baker, & Gross, 1996; Lee, Bopry & Hedberg, 2007; Meyer, 1995; Guastello, Beasley & Sinatra, 2000; Unzueta & Barbeta, 2012) which may lead to better organized and higher-quality essays (Ruddell & Boyle, 1998; Zipprich, 1995). Specifically, graphic organizers allow the writer to focus on ideas instead of language; whereas, the student can transfer their ideas from the organizer into an essay as opposed to creating and developing all at once (Lee, Bopry, & Hedberg, 2007). Although graphic organizers have been used in studies that examine the effect on students’ informational writing (DiCecco & Gleason, 2014; Griffin, Malone & Kameenui, 1995; Loader, 1989) and creative writing (Meyer, 1995; Zipprich, 1995), graphic organizers have been used in studies, specifically in combination with the mnemonic TREE, for persuasive writing. Table 2.1 displays the studies that have included mnemonic strategies, a
graphic organizer, or both, to support students’ planning in advance of writing persuasive essays.

A discussion of the studies that include elementary students follows.
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Focus of Study/Strategy</th>
<th>Sample</th>
<th>Method/design</th>
<th>Results</th>
<th>Important Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asaro-Saddler &amp; Bak (2012)</td>
<td>SRSD; Mnemonic POW+TREE; TREE graphic organizer</td>
<td>Three students with Autism in third or fourth grade</td>
<td>Single-subject with multiple base-line across participants</td>
<td>All participants improved holistic quality over baseline; Number of words written was inconsistent among participants; Participants planned in advance of writing after learning the strategy.</td>
<td>Students reported that the mnemonic and the graphic organizer was the most useful; Teachers could learn to teach strategy with minimum training</td>
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<tr>
<td>Asaro-Saddler &amp; Bak (2014)</td>
<td>SRSD; Mnemonic POW+TREE; TREE graphic organizer</td>
<td>Six students with ASD, between the ages of nine and 10.</td>
<td>Single-subject with multiple base-line across participants</td>
<td>All students increased number of essay elements, quality, and number of words used, and planning time over baseline</td>
<td>Graphic organizer support planning and organization of essay elements.</td>
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<tr>
<td>Chalk, Hagan-Burke &amp; Burke (2005)</td>
<td>SRSD; Mnemonic: DARE</td>
<td>15 tenth graders with LD</td>
<td>Quasi-Experimental</td>
<td>Students significantly improved essay length and quality, from pretests, over the course of the intervention. Students maintained gains and generalized the strategy.</td>
<td>High school students benefit from strategy instruction.</td>
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<tr>
<td>Coker &amp; Erwin (2011)</td>
<td>SRSD; Mnemonic STOP and DARE vs. Collaborative Reasoning</td>
<td>38 urban, African American students in grades six and seven.</td>
<td>Case Study</td>
<td>Sixth graders, in both groups, wrote more after instruction. Seventh graders wrote more in the collaborative group over SRSD group.</td>
<td>Instruction in either strategy helped sixth- and seventh-graders create better written arguments. Students did not plan, or consider counter arguments, prior to oral arguments.</td>
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<td>Study</td>
<td>Methodology</td>
<td>Participants</td>
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<tr>
<td>Cuenca-Carlino &amp; Mustain (2013)</td>
<td>SRSD; Mnemonic POW + TREE; TREE Graphic Organizer and self-determination training; Mnemonic DGSPAME</td>
<td>Nine students with disabilities in grades six through eight.</td>
<td>Students made large gains across all dependent measures over baseline. Students increased self-determination and self-efficacy scores over baseline. Student interview responses supported social validity of the intervention</td>
<td>Explicit instruction in self-determination during writing can improve students' attitude and self-efficacy.</td>
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<tr>
<td>Cuenca-Sanchez, Mastropieri, Scraugus, &amp; Kidd (2012)</td>
<td>SRSD and self-determination training for persuasive writing; Mnemonic POW + TREE; TREE graphic organizer</td>
<td>21 seventh-grade students with EBD in alternative day schools</td>
<td>Experimental group significantly outperformed control group in knowledge of parts of a persuasive essay, self-determination, and self-efficacy. Student interview responses favored the intervention</td>
<td>Teachers need training with fidelity monitoring and sustaining the intervention</td>
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<tr>
<td>De La Paz &amp; Graham (1997a)</td>
<td>SRSD; Mnemonic STOP + DARE</td>
<td>Three fifth-grade students</td>
<td>Essay writing improved in (a) number of functional essay elements; (b) length; (c) quality. Gains were maintained 6-8 weeks after the intervention</td>
<td>Planning in advance of writing improves quantity and quality of persuasive essays. The strategy improved essays of one student with severe deficits.</td>
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<td>Study</td>
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<td>Findings</td>
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<td>De La Paz &amp; Graham (1997b)</td>
<td>SRSD; Mnemonic STOP + DARE; Dictation</td>
<td>42 students in fifth, sixth, and seventh grades with LD</td>
<td>Instruction in advanced planning with dictation produced better essays than the comparison group during and after the intervention. Dictation alone does not improve essays.</td>
<td>All students increased number of words written, number of functional elements, and time devoted to writing. Students generalized the strategy to another genre. None of the students maintained gains after three months.</td>
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<td>Delano (2007)</td>
<td>SRSD; Mnemonic TREE; Video self-modeling</td>
<td>Three students with Asperger syndrome in grades eight and ten</td>
<td>All students increased number of words written, number of functional elements, and time devoted to writing. Students generalized the strategy to another genre. None of the students maintained gains after three months.</td>
<td>SRSD with video modeling can improve writing for students with Asperger syndrome. Intervention period should be extended for students to maintain gains.</td>
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<td>Ennis and Jolivette (2014)</td>
<td>SRSD; Mnemonic STOP and DARE</td>
<td>Six students in ninth grade with EBD in a residential facility</td>
<td>Essay quality and correct word sequences improved over baseline. Self-efficacy scores varied.</td>
<td>SRSD instruction can be incorporated into the health curriculum.</td>
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<tr>
<td>Ennis, Jolivette &amp; Boden (2013)</td>
<td>SRSD; self-determination training; Mnemonic: STOP and DARE</td>
<td>23 students with EBD in grades three through sixth in restrictive facilities</td>
<td>Statistically significant improvements in students' writing in essay elements, quality, and total words written. Intervention group out performed control group. Students maintained gains. Teachers and students found the strategy to have social validity.</td>
<td>Students reported generalizing the mnemonic to other classes. Strategy can be taught whole-class to students in residential facilities.</td>
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<td>Study Authors</td>
<td>Methodology</td>
<td>Participants</td>
<td>Results</td>
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<td>Ennis, Jolivette, Terry, Fredrick &amp; Alberto (2014)</td>
<td>SRSD; Mnemonic STOP and DARE</td>
<td>44 students with EBD in grades seven through twelve, from a residential school</td>
<td>Students showed significant growth during intervention in all dependent measures: Correct word sequence, quality, and essay elements. Students generalized gains to achievement subtests. SRSD is an effective strategy for teaching persuasive writing to secondary students with EBD. Less intensive intervention (2 days per week) is still effective.</td>
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<td>Graham &amp; Harris (1989)</td>
<td>SRSD; Mnemonic TREE</td>
<td>Three sixth-grade students with LD</td>
<td>Students improve essay length, quality, number of functional elements, coherency, and decreased non-functional essay elements. Two students reported increase in self-efficacy and maintained and generalized gains. Strategy instruction in persuasive writing can improve essays for students with LD.</td>
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<tr>
<td>Hacker, Dole, Ferguson, Adamson, Roundy &amp; Scarpulla (2015)</td>
<td>SRSD; Mnemonic DARE</td>
<td>628 seventh-grade students from two Title I schools</td>
<td>Treatment group wrote significantly better essays over control group. Treatment group continued to make gains from post treatment to maintenance. SRSD is an effective writing strategy for low-income, urban students. Students that learned SRSD maintained gains months after the intervention.</td>
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<td>Study</td>
<td>SRSD; Mnemonic strategy</td>
<td>Participants</td>
<td>Design</td>
<td>Results</td>
<td>Findings</td>
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<td>Harris, Graham &amp; Mason (2006)</td>
<td>POW+TREE; Peer support vs. Writer's Workshop; various graphic organizers</td>
<td>63 second-graders identified as struggling writers</td>
<td>Experimental (SRSD; SRSD + Peer Support; Writer's Workshop)</td>
<td>SRSD groups spent more time planning, wrote longer essays, included more persuasive elements, higher quality, and exhibited more writing knowledge than comparison group. No difference was found in teachers’ perceptions of students’ motivation between groups. Majority of the students liked used the SRSD strategy for persuasive writing.</td>
<td>Struggling writers in the second grade can benefit from learning specific writing strategies. Teaching planning strategies at an early age can improve writing. Process approach instruction may not be appropriate for struggling writers.</td>
</tr>
<tr>
<td>Hauth, Mastropieri, Scruggs, &amp; Regan (2013)</td>
<td>POW+TREE; TREE graphic organizer</td>
<td>Eight students in eighth-grade with EBD</td>
<td>Multiple-baseline across subjects</td>
<td>All students improved quantity and quality of essays. Students generalized the strategy. Maintenance of skill varied. Social validity of strategy was supported through student interviews.</td>
<td>Provides support for SRSD as an evidence-based practice for students with EBD</td>
</tr>
<tr>
<td>Jacobson &amp; Reid (2010)</td>
<td>STOP + DARE</td>
<td>Three high-school students in eleventh- or twelfth-grade, diagnosed with ADHD</td>
<td>Multiple-baseline across subjects</td>
<td>Students increased a) planning time; b) essay parts; c) number of words written; d) quality; e) use of transition words.</td>
<td>Study supports the use of SRSD as an effective writing strategy for high school students with ADHD.</td>
</tr>
<tr>
<td>Kiuhara, O'Neill, Hawken &amp; Graham (2012)</td>
<td>STOP+AIMS+DARE</td>
<td>Six students in tenth-grade</td>
<td>Multiple baseline across pairs of participants</td>
<td>Students increased a) planning time; b) essay quantity; and c) essay quality. Mnemonic strategy was considered socially valid by students, teachers, and parents.</td>
<td>Strategies can be taught in various settings and within the context of a general classroom.</td>
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<tr>
<td>Study</td>
<td>Intervention</td>
<td>Mnemonic</td>
<td>Participants</td>
<td>Setting</td>
<td>Results</td>
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<tr>
<td>Little, Lane, Harris, Graham, Story &amp; Sandmel (2010)</td>
<td>SRSD; Mnemonic: POW + TREE; TREE graphic organizer</td>
<td>Thirteen, second-grade students that exhibit behaviors</td>
<td>Multiple-baseline across-participants</td>
<td>Supports teaching second-grade students SRSD for writing persuasive essays within the context of SWPBS.</td>
<td></td>
</tr>
<tr>
<td>Mason &amp; Shriner (2008)</td>
<td>SRSD; Mnemonic: POW + TREE; TREE graphic organizer</td>
<td>Six students with EBD in grades two through five.</td>
<td>Multiple-probe across subjects</td>
<td>Younger students made the most gains. Students with EBD may require longer support to maintain skill.</td>
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</tr>
<tr>
<td>Mason, Kubina &amp; Taft (2011)</td>
<td>SRSD Quick write; Mnemonic: POW + TREE; Tree graphic organizer</td>
<td>Seventh-graders with disabilities -- Study 1: Six students; Study 2: Ten students</td>
<td>Multiple-baseline across-participants</td>
<td>Interventions should supplement instruction, should be criterion-based, progress monitoring needs to document mastery</td>
<td></td>
</tr>
<tr>
<td>Mason, Kubina, Valasa &amp; Cramer (2010)</td>
<td>SRSD Quick write; Mnemonic: POW + TREE; Tree graphic organizer</td>
<td>Five, seventh- and eighth-grade students with severe EBD in alternative placement</td>
<td>Multiple-baseline across-participants</td>
<td>Interventions should be criterion-based, progress monitoring needs to document mastery</td>
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<tr>
<td>Mastropieri et al. (2009)</td>
<td>SRSD; Mnemonic: POW + TREE</td>
<td>15 eighth-graders with EBD in special placement</td>
<td>Multiple-baseline across-participants</td>
<td>Instruction took longer than other SRSD interventions in this setting</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>SRSD Methodology</td>
<td>Grade Level</td>
<td>Setting</td>
<td>Results</td>
<td>Notes</td>
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<td>-------------------------------------------</td>
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<tr>
<td>Mastropieri et al. (2010)</td>
<td>SRSD; Mnemonic: POW + TREE</td>
<td>10 eighth-grade students with EBD in a special day school</td>
<td>Experimental</td>
<td>Students improved writing quality and number of persuasive elements</td>
<td>Instruction took longer than other SRSD interventions in this setting</td>
</tr>
<tr>
<td>Sexton, Harris &amp; Graham (1998)</td>
<td>SRSD; Mnemonic TREE; graphic organizer TREE</td>
<td>Six students in fifth and sixth grades with LD</td>
<td>Multiple-baseline across participants</td>
<td>Students improved time devoted planning, essay length, essay elements, quality, and attributions. Maintenance of skills varied among participants. Two students generalized the strategy.</td>
<td>Success of the strategy depends on teacher engagement. Not all students need the same strategy.</td>
</tr>
<tr>
<td>Troia &amp; Graham, (2002)</td>
<td>Strategy Instruction in Advance Planning, Mnemonics: STOP &amp; LIST; SPACE &amp; DARE vs. Process writing approach</td>
<td>20 fourth- and fifth-graders with LD</td>
<td>Quasi-experimental comparing two instructional strategies</td>
<td>Significant difference between groups in time planning and planning propositions (favoring strategy instruction). No significant differences between groups for quality or essay length. Although students maintained their gains, they did not generalize strategy to another genre.</td>
<td>Additional research is needed about writing approaches. Students should work in pairs, and use checklists and a scoring rubric.</td>
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</table>

*Note: ASD = Autism Spectrum Disorder; LD = Learning Disabled; EBD = Emotional Behavioral Disorders; SRSD = Self-Regulated Strategy Development*
Of these 26 studies, nine specifically included participants in elementary grades. These studies are pertinent to this study for three reasons: 1) they focus on prewriting strategies; 2) they incorporate a mnemonic device and/or graphic organizer component; 3) they include similar-age participants. Therefore, results and implications of these studies are considered next.

In a single-subject design study, Asaro-Saddler & Bak (2012) examined the prewriting strategies of planning and self-regulation strategy on three students with ASD in grades three through four. The mnemonics **POW+TREE** were integrated with SRSD. The mnemonic **POW** stands for *Pick your ideas, Organizer your notes, and Write and say more*, and the mnemonic **TREE** stands for *Topic sentence, give Reasons (at least three), Explain their reasons, and wrap it up well with a strong Ending* (Graham & Harris, 1989). Additionally, the **TREE** mnemonic was embedded within a graphic organizer for planning. SRSD approach includes genre specific instruction with training in self-regulation strategies. The strategy was modeled for students, followed by guided and independent practice over six lessons. The intervention was taught for 45 minutes each day for three to four days per week, until the participants demonstrated mastery of the strategy.

As a result of the intervention, all participants improved in holistic quality (more than three points over baseline) and increased in planning before writing. Essay length was inconsistent; two of the three participants increased words written. One student did not increase number of words written but essay quality did improve, suggesting that essay length should not be the only measure of quality. Several implications for practice came out of this study. First, resource room teachers were able to implement the intervention with limited training. Second, students reported that they found the mnemonics and graphic organizers helpful in planning a
persuasive essay. Lastly, the self-monitoring component provided visual feedback for students to self-assess their progress towards writing goals.

Asaro-Saddler and Bak (2012) did not explore why one participant’s essay length did not improve during the intervention. Furthermore, the researchers were unable to collect maintenance and generalization data due to time constraints. Given the small number of participants and limited data collected, the generalization of the strategy is unknown from this study. However, the authors extended the study later to include more participants.

In 2014, Asaro-Saddler and Bak extended prior research to study the effects of the SRSD model on paired students with ASD (3 pairs, N=6) on the persuasive writing. Again, the TREE mnemonic was embedded in a graphic organizer to support the planning process. Results indicated an increase in the dependent measures of essay elements, holistic quality, and average number of words for all participants, as well as an increase in time devoted to planning for five of the six participants. The graphic organizer assisted students in planning and organization of essays which included more detail than their pre-instructional essays (Asaro-Saddler & Bak, 2014).

In this study, the authors addressed barriers to handwriting and included suggestions regarding the integration of technology to assist students with ASD in writing. However, evidence of maintenance and generalization of the strategy were unattained. Although the strategy supported students in planning, as well as improving essay quality, it is unknown if students transferred the strategy or maintained gains over time. Another limitation of the study is the evidence of peer support. Although students worked in pairs, a protocol for peer support was not included in this study, such as in the next study, conducted by Harris, Graham and Mason (2006). Expanding the SRSD model, Harris, Graham & Mason (2006) added peer support
strategies with a sample of sixty-six students, all second-graders, and randomly assigned them to three conditions – SRSD only \( (N=22) \), SRSD plus peer support \( (N=22) \) and control group \( (N=22) \). These students were identified as struggling writers from the Story Construction Subtest of the Test of Written Language 3 (TOWL-3; Hammill & Larsen, 1996); only 13 students were identified as having a disability during the time of the intervention. During the study three students moved out of district.

The intervention took place over a six month period of time. Students were taught various genre specific strategies, including the mnemonics for persuasive writing – \textbf{POW+TREE}. This instruction followed story writing instruction. In addition to the SRSD instruction, the peer support group worked in pairs to brainstorm how to apply the strategies to other classes and set goals for generalization. The students were also asked to report when and how they generalized these strategies. The control group was taught the Writers’ Workshop model (Calkins, 1986; Graves, 1983), focusing on the writing process of drafting, revising, editing, and publishing. Additionally, these students received mini-lessons on grammar, including planning techniques that featured graphic organizers, such as Venn diagrams or webs.

Essays were analyzed for length (number of words written), holistic quality, and story elements, specifically persuasive elements for the persuasive essays. The researchers also administered a survey of writing knowledge (Graham, Schwartz & MacArthur, 1993) prior to and after the intervention to assess students’ knowledge about planning and writing genres. Student effort and intrinsic motivation was also assessed by teachers using Mac Iver, Stipek & Daniels (1991) motivation scales. Social validity was collected on the two SRSD groups through student interviews.
Results were analyzed through repeated measures analysis of variance (ANOVA). In terms of persuasive essay writing, posttests revealed that the SRSD groups significantly outperformed the control group in planning time, essay length, and holistic quality. Generalization of skill varied by dependent measure; students in the SRSD groups wrote qualitatively better essays for classroom teachers over the control group, but in terms of length no differences were found between groups. Furthermore, researchers found that students in the SRSD groups had attained more knowledge about planning strategies and writing genres over the control group. Conversely, teachers did not rate students’ intrinsic motivation or effort any differently between groups, and no statistically significant effects were found between groups, for condition, or for time of testing. The use of the mnemonics were reported to be favorable among students, with 76% of the students liking the use of **POW** and 88% of students liking **TREE**. Findings of the study support the use of SRSD for writing persuasive essays with second-graders, specifically integrating genre-specific mnemonics for planning and self-regulatory procedures. Furthermore, the study highlighted the inefficacy of teaching young writers the process approach to writing.

Although the study included 63 participants, only 11 of those participants were identified as having a disability at the time of the study and only two had been identified as having behavioral problems. The composition of the participants may not be representative of the typical population as inclusive classrooms become more commonplace. However, this was one of the earliest studies to examine SRSD on a cross-section of second-graders. To specifically examine the strategy on second-graders with at-risk behaviors, Little, Lane, Harris, Graham, Story and Sandmel (2010) extended this study a few years later.
Little et al. (2010) also explored the effects of SRSD with second-graders, with at-risk behaviors. Thirteen second grade students, with poor writing skills, behavioral issues, and considered at-risk for EBD were taught SRSD for writing persuasive essays in a study conducted by Little and colleagues (2010). They also examined the mnemonics **POW + TREE** and a graphic organizer, within the SRSD model employing a multiple-baseline across-participants design, three to four times per week, lasting seven to 15 weeks, varying by student. Additionally, the schools from the participation pool had implemented School-Wide Positive Behavior Supports (SWPBS), a whole-school tiered intervention system, and these supports were incorporated within the intervention, such as distributing tickets as positive reinforcers. Essays were collected and analyzed at baseline, post-intervention, and at maintenance. Essays were scored for number of persuasive elements, holistic quality, essay length (number of words written). Additionally, data were collected and examined in light of the types of behaviors students’ exhibited prior to the intervention and categorized into two groups – internalizing behaviors and externalizing behaviors. Social validity of the intervention was assessed by gathering teacher perceptions using the Intervention Rating Profile (IRP-15; Witt & Elliott, 1985) and student perceptions using the Children’s Intervention Rating Profile (CIRP; Witt & Elliot, 1985).

Results indicated a positive response to the strategy with all students improving scores from baseline to post-intervention, across measures. All students attained a percentage of nonoverlapping data (PND), the percentage of data points exceeding the highest data point in baseline (Scruggs, Mastropieri & Casto, 1987), of 100% for the dependent measure of number of persuasive elements. However, results varied for the dependent measures of holistic quality and essay length, since some students returned to baseline during the maintenance condition. The
social validity of the intervention was also mixed. Prior to instruction, both teachers and students rated the strategy favorably, according to the IRP-15 and the CIRP. However after the intervention, six teachers’ ratings dropped, while all students’ ratings increased, with the exception of one student. Furthermore, students’ responses to a written questionnaire validated the favorable responses, with two-thirds stating they would teach the strategy to other students, and felt that the graphic organizer helped them write better.

Important implications of the study included the use of SRSD within the SWPBS model and the value of teaching at-risk, second-graders self-regulation strategies for writing as all students made immediate gains after the instruction across measures. Additionally, the improvements in writing were found across students, regardless of behaviors – externalizing or internalizing behaviors. Therefore the study added to the literature for SRSD, with genre-specific mnemonics and the graphic organizer for students whom exhibit behaviors. Furthermore, the students’ and teachers’ perspectives of the intervention add to the literature on the social validity of the intervention.

Little et al, (2010) did not address the generalization of the strategy to other genres or other academic areas. Kratochwill and Stoiber (2001) emphasized the importance of examining students’ ability to generalize an intervention as a measure of the intervention’s success. Furthermore, the SRSD model was embedded within SWPBS may have contributed to the effect, since students earned tickets and may have been a confounding variable. Therefore, a comparison study with and without SWPBS may have offered some insight as to the interplay of these two interventions. Nevertheless, writing improvement and students with behaviors were the focus of other studies and continued to be an important area for research.
Students classified with EBD were also the focus of another study, conducted by Mason and Shriner (2008), where researchers examined the effects of SRSD on the persuasive writing of six students in grades two through five. The planning strategy featured the mnemonics **POW** + **TREE** and the **TREE** graphic organizer. Student participants were grouped by grade level with two different instructors – Group 1 consisted of second- and third- graders, and group 2 of fourth- and fifth- graders. Employing a multiple-probe across-subjects design, the intervention was taught to one student from each group during the same time. Students were taught the SRSD strategy, including the mnemonics and the graphic organizer, until mastery was attained. Essays were analyzed at four points during the intervention – baseline, during instruction, post-instruction, and maintenance, across the dependent measures of number essay parts, holistic quality, number of transition words, and length (number of words written).

Results indicated that all students, with one exception, improved in all dependent measures over baseline, generalized and maintained skills. For essay quality, Group 1 improved from baseline ($M=0.07$) to instruction ($M=4.91$), but slightly decreased scores from post-instruction ($M=4.44$) and maintenance ($M=4.00$). A similar trend was apparent in Group 2, with baseline ($M=2.17$) scores improving during instruction ($M=5.77$), but then declining post-instruction ($M=4.89$) and again during maintenance probe ($M=4.00$). For number of words written Group 1 improved from baseline ($M=10.14$) to instruction ($M=47.33$), continuing to improve at post-instruction ($M=68.11$) and then decreasing at maintenance ($M=52.00$). Group 2’s results showed a similar trend; their essay length increased from baseline ($M=33.25$) to instruction ($M=79.31$), but then decreased at post instruction ($M=65.78$), and again at maintenance ($M=54.50$). In terms of number of transition words, both groups had a baseline mean of 0 and then included an average of 3-4 transition words during instruction, which they
maintained at post-instruction and at maintenance. All students increased their number of essay elements over baseline across all conditions, with the exception of one student, who returned to baseline at post-instruction probes. PND was calculated at 100% for Group 1 during instruction, 77% for post-instruction, and 100% for maintenance. PND points for Group 2 were reported to be 100% across all conditions. Students had indicated that the strategy was acceptable and that the mnemonic helped them write better, organized essays.

Researchers emphasized the importance of criterion-based instruction and consistency of reinforcing each step of SRSD. This study provided additional support for the use of SRSD with younger students (grades two and three) due to the group’s improved scored over baseline being greater than the older students’ improvement. However, maintenance of skills varied among participants, which could indicate that students with EBD require more practice over time.

Although this study adds to the literature base in support of writing interventions, including the combination of a mnemonic strategy and a graphic organizer, it is limited by the small number of participants; therefore the results may not be generalizable to all students with EBD or students differently diagnosed. Similar studies have explored the intervention’s effect with students diagnosed with LD (Sexton, Harris, and Graham, 1998).

Fifth- and sixth-graders participated in a study that examined the effects of SRSD, with the TREE mnemonic, on students with LD. Sexton, Harris, and Graham (1998) employed a multiple-baseline across-participants design, extending the earlier study conducted by Graham and Harris (1989), to students (N=6) in fifth- and sixth- grades. Participants were explicitly taught planning strategies with the mnemonic TREE. Essays were analyzed during baseline procedures, immediately following the intervention, and three to eight weeks following the intervention. Additionally, a generalization essay probe was administered in another class.
Dependent measures included: time devoted to planning, length, essay elements, quality, strategy use, and attributions. Social validity of the intervention also was gathered through qualitative interviews. Results of this study were similar to those attained by participants in Graham and Harris (1989) with one exception; students in this study did not maintain their gains.

Although the mnemonics **POW** and **TREE** were incorporated within the SRSD model, other mnemonics, such as **STOP** and **DARE**, have been included in studies focusing on persuasive writing. De La Paz & Graham (1997a) used the SRSD approach to teach persuasive writing using **STOP** and **DARE**, with three fifth-graders, identified with learning disabilities. The mnemonic **STOP** reminded students of the components of a persuasive essay – **S**uspend judgment; **T**ake a side, **O**rganize ideas, **P**lan more as your write. The mnemonic **DARE** supported students self-monitoring – **D**eveloping a position, **A**dding supporting arguments, **R**eport and refute counterarguments, and **E**nd with a strong conclusion. Employing a multiple-probe design across subjects, participants’ planning activities (time spend planning and number of ideas) and essays were analyzed for number of changes between draft and final essay, essay length (words written), text units (functional – premise, reason, elaboration, or conclusion) and holistic quality. The intervention continued until students demonstrated mastery, and a maintenance probe was administered six to eight weeks following instruction.

All students demonstrated substantial increase in functional text units, an increase in length, and quality doubled after instruction. Two of the three students planned in advance of writing, as well as increased the amount of time devoted to writing. Maintenance of skills varied; one student’s quality score returned to baseline on the maintenance probe. One important implication of the study surrounded the lack of planning for one student. Although this student was considered to have severe deficits, the student’s essays improved in quality over baseline,
suggesting that the strategy may support those with severe deficits, even when planning in advance of writing is not present.

De La Paz & Graham noted that handwriting difficulties and mechanics may have interfered with students’ ability to plan or generate essays. However, the researchers do not discuss solutions for these problems other than stating teachers need to be aware of such deficits. Furthermore, as in many of these studies, handwriting and poor mechanics are absolved by the researchers when they type essays and correct these mistakes. This could be problematic as it does not mimic the real world, since students are graded on writing conventions as part of writing quality (Deatline-Buchman & Jitendra, 2006).

The mnemonics **STOP** and **DARE** were featured in another study conducted by Ennis, Jolivette and Boden (2013). The intervention focused on the persuasive writing of 25 students with EBD or psychiatric disorders, in grades three through six, in a residential school for children with EBD. Researchers utilized a quasi-experimental design, two pre-established classes serving as the treatment and one class serving as the control group, to test the strategy on essay elements, essay quality, and total words written. The researchers also examined the social validity of the intervention using the IRP-15 and the CIRP. Researchers administered pretest essay probes, posttest essay probes, and maintenance probes. During treatment the intervention was taught to the two classes ($N=16$) in 12 (class 1) or 16 (class 2) sessions, until mastery was achieved, over a period of six weeks, while the control group received traditional writing instruction on the writing process, devoid of self-regulation strategies.

Persuasive essays were analyzed through $t$ tests. At pre-test there were no significant differences between the two groups across variables. At post-test, all students improved scores, but the intervention group outperformed students in the control group in essay elements ($ES =$
strategy to have social validity. The study’s findings were consistent with prior research on teaching SRSD to students with EBD, but added to the literature in terms of teaching whole-class lessons with participants in residential facilities. Furthermore, students reported generalizing the mnemonic to other classes.

Several limitations were present at the time of the study. Noncomparable groups were noted due to pre-existing classes and class size varied among groups. Additionally, attendance varied among participants due to absences and behavioral problems. Although the results of the integration of mnemonics STOP and DARE within the SRSD model were promising, the effect of these limitations were unknown but may have varied results.

Adding another writing genre, Troia & Graham (2002) examined the mnemonic SPACE for story writing in an experimental study comparing strategy instruction to the process writing approach with students with LD (N=20) in fourth- and fifth- grades. Students were randomly assigned to one of two groups – strategy instruction or process writing approach. After assignment, students worked in pairs and learned the components of narrative and persuasive essays. The mnemonic SPACE was used to remind students that a narrative story includes Setting, Problem, Actions, Consequences, and Emotions, and the mnemonic DARE was used to remind students how to write a persuasive essay. Following basic instruction, the treatment group received instruction in planning in advance of writing, using the mnemonic strategies, while the control group received instruction in the process of writing (drafting, revising, proofreading and editing, and publishing). Both instructional methods were criterion-based. Two persuasive writing probes were administered, one as a pretest, and another at posttest, and scored for length (number of words written) and quality, as well as time devoted to planning.
Although significant results were found between groups for story writing, favoring the strategy instruction group, no significant differences were found between groups in quality or length for persuasive essays. Students in the strategy instruction group produced essays that were slightly longer between pretest and posttest, but lower in quality. Conversely, students in the process writing group wrote shorter but higher quality essays after instruction. Additionally, no difference was found between groups for planning time. Findings from this study may imply that students did not generalize the planning strategies they learned during story writing to the persuasive genre, and time on task may be a consideration. However, explicit instruction in specific techniques, such as setting goals, brainstorming, and organization, encouraged planning behaviors during story writing ultimately improving writing performance for students with LD.

Troia and Graham (2002) acknowledged the indeterminateness of generalizability of the findings, since this study occurred under conditions that are not practical in regular educational settings (i.e. one-on-one feedback). However, the authors provide several suggestions for implementation in a typical setting, including self-assessment techniques and peer feedback.

In summary, writing interventions that included a graphic organizer and a mnemonic device, as a prewriting strategy for persuasive writing, have yielded positive outcomes for struggling writers (Asaro-Saddler & Bak, 2012, 2014; Dexter & Hughes, 2011; DiCecco & Gleason, 2001; Graham & Harris, 1998; Sexton, Harris, & Graham, 1998; Meyer, 1995). Students perceived that mnemonic strategies, such as **POW+TREE** or **STOP** and **DARE**, have helped them write better essays, and graphic organizers helped them organize their thoughts (Asaro-Saddler & Bak, 2012; Little et al., 2010). Although these intervention studies have taught students strategies for planning in advance of writing, implications of these studies suggest that some students may improve compositional quality and/or fluency with the aid of technology.
(Asaro-Saddler & Bak, 2014) due to deficits in transcription skills (Graham & Harris, 2000) and handwriting fatigue (Kushki, Schwellnus, Ilyas, & Chau, 2011; Quinlan, 2004). Therefore, the next sections discuss the progression of technology in education and its utility for compositional planning and writing.

**Technology**

Throughout history, technological advances have changed the face of American education (Cuban, 1986). In the 1950's film and radio supplemented teacher-direct instruction, as did television for the next few decades, by expanding teaching and learning beyond classroom walls (Cuban, 1986). Then the personal computer, introduced in the 1980's, changed how students accessed and produced information (Cuban, 1986). Today, technology is ubiquitous in students' lives; many students attend school as digital natives (Prensky, 2001); they are familiar with and readily use the latest technologies. Technological advances have paved the way for self-directing learning opportunities with possibilities for increasing student achievement (Malik & Shabbir, 2008).

Engaging students through the use of technology has many implications for teaching and learning outcomes. Additionally, technology has the potential to increase student enthusiasm and engagement, (Lorenz, Green & Brown, 2009) impacting their metacognition and performance, as well as teacher effectiveness and productivity (Jamil & Shah, 2011; Wang, Shen, Novak, & Pan, 2008). In one study, for example, student performance in six content areas of art, music, technology, history, English/language arts, and interdisciplinary studies, increased as a result of engaging in technology-supported learning activities for students in Vermont in grades K-12 (Sherry, Billig, Jesse, & Watson Acosta, 2001).
Not only does technology increase student engagement, the use of technology has shown to improve the quality and quantity of students' written work (Graham, McKeown, Kiuahara, & Harris, 2012b). Writing interventions featuring a technology component have produced significant outcomes for students with and without disabilities (Graham et al., 2012b). A discussion of the literature pertaining to using technology for planning and text generation follows.

**Planning.** Technology can support writers during the planning process. For example, just as paper graphic organizers have increased students' planning time and improved quality (Asaro-Saddler & Bak, 2012; Zipprich, 1995), computer-based graphic organizers (CBGO), specifically applications like *Kidspiration* and *Inspiration*, have also yielded promising results (Ciullo & Reutebuch, 2013). Although traditional paper-based graphic organizers have long been used in schools for content learning and advanced planning, CBGOs and technology-based graphic organizers (TBGOs) have only recently gained popularity in schools for students with and without disabilities (Boon, Burke, Fore, & Spencer, 2006). The appeal may be that these programs further support students by melding the benefits of the graphic organizer with word processing capabilities.

To explore the effects of interventions on computer-based graphic organizers, specifically for students with learning disabilities (LD), Ciullo and Reutebuch (2013) searched two databases and five research journals for articles published any time prior to and including 2012. Inclusion criteria were as follows:

1. Studies published in peer reviewed journals.
2. Participants were classified with LD for at least 50% of the sample.
3. Participants were enrolled in grades K-12.
4. The intervention included computer-based graphic organizer.
5. Outcomes measures in reading comprehension, content learning, vocabulary, or writing.

Twelve studies met the criteria and were coded for participants, methodology, intervention and comparison description, clarity of causal inference, measures, and findings. Effect sizes were calculated where authors provided means, standard deviations, sample size, or $F$ values. Of the twelve studies, eight took place at the secondary level (Grades 6-12), three at the elementary level, and one combined participants at the elementary and middle school levels.

After aggregating the data by subject (i.e., content area learning, writing, and reading comprehension) and instructional features, (i.e., instructional support, implementer, and instructional deliver), the authors concluded the following:

1. The combination of CBGO and principles of effective instruction (explicit instruction, guided practice) for students with LD produced the largest effect size.
2. The use of computer-based graphic organizers in content acquisition interventions ($N=5$) showed to be effective for some participants.
3. Writing interventions ($N=5$) that integrated technology yielded positive results for some participants in three out of the five studies. Four of these (Englert et al., 2005, 2007; Sturm & Rankin-Erickson, 2002; Unzueta & Barbetta, 2012) focused on writing interventions using computer/technology-based graphic organizers. One study used clip art and story prompts.
4. Studies that investigated reading comprehension and CBGO ($N=2$) were not as promising as the other studies.

In summary, the authors described writing interventions that integrated CBGO as “promising” (p. 207) and offered some noteworthy recommendations, such as the assertion that technology could be useful for increasing engagement and motivation of students but must be
scaffolded with explicit instruction (Ciullo & Reutebuch, 2013). These relevant studies will be described next.

In the first study, Lorenz, Green, and Brown (2009) evaluated the use of the multimedia graphic organizer software, Kidspiration, on the prewriting process of four classes of second-grade students. Of the four classes, only 24 students, representing diverse achievement levels (e.g. high, mid, and low achievement), and similar number of boys and girls were randomly selected for each group. The intervention took place in an elementary school, during the school day, over a three-week period. During the first part of the intervention, four second-grade teachers explicitly taught all students how to utilize a wheel-and-spoke paper graphic organizer to plan a personal narrative essay. The second half of the intervention included explicit instruction in using the multimedia graphic organizer Kidspiration. The completed graphic organizers were printed and then used to draft essays with paper and pencil. The graphic organizers and the final essays were collected from the sample of students (N=24) and were analyzed for holistic quality, quantity, organization, language usage, main topic, and use of details. Teacher interviews and anecdotal notes were also included in the study.

Results showed that the length of students' essays varied: 1) only eight of the students’ essays increased in length in the computer condition; 2) no difference was observed between the two conditions for 13 students; and, 3) two students produced longer essays using the paper graphic organizer. Result for one of the participants was not reported. Overall, idea creation was slightly higher in the computer condition (M = 8) over the paper condition (M=7), but organization of ideas were similar across conditions. Teacher affect was also examined; researchers concluded results did not vary among classes. However, teachers' (N=4) anecdotal notes indicated that students seemed to be more motivated, engaged, and collaborative during the
computer condition over the paper condition. Two of the four teachers indicated that they would continue the use of the computer lab for prewriting activities.

In terms of results by students' achievement levels, the researchers noted that low and high-achieving students scored similarly in both conditions. Conversely, the mid-range students benefited from the use of the computer program for prewriting in terms of organization and quantity of writing. In terms of gender, girls generated more ideas in the computer condition over boys. However, gender differences were not noted for the other dependent measures. The researchers concluded that using a computer program for prewriting activities benefited the middle-achieving students and did not hinder writing outcomes for any of the students.

Overall, planning with the computer program produced essays that were slightly better over the paper graphic organizer condition. Although student outcomes by gender and achievement were mixed, both boys and girls expressed excitement for planning with the computer, and overall, students were more focused during computer condition (Lorenz, Green, & Brown, 2009). However, the authors did not elaborate on the discrepancy of scores but to say that the variability was related to gender and reading ability. Furthermore, Lorenz and colleagues only discussed the small number of participants as the study’s limitation. However, the study was the first to examine the utility of Kidspiration software as a tool for planning in advance of writing.

In another study that explored the effects of Kidspiration software, Gonzalez-Ledo, Barbetta, and Uzueta (2015) employed a single-subject study with a multiple baseline across subjects design on fourth- and fifth-grade boys (N=4) identified with Specific Learning Disabilities (SLD). The researchers’ purpose was to examine the effects of the computer-based
graphic organizer (CBGO) program *Kidspiration* across the four dependent variables: total number of words, minutes planning, number of story elements, and overall organization.

The intervention took place in a private elementary school, after school, for four days per week, over 12 weeks. Prior to baseline, all participants received three, half-hours of instruction in narrative writing, specifically using the mnemonic device 3Ws and 2Hs method (e.g., **Who, What, Where, How did it happen? & How did it end?).** During baseline procedures, each participant was provided with randomly selected prompts, pencils and paper and was permitted to write for 10 minutes per session. Once baseline was established, the participant received training in planning with the computer graphic organizer software, *Kidspiration.* After the participant was deemed competent in utilizing the software, the participant was given a prompt and asked to complete the graphic organizer on the computer and then write his essay with paper and pencil.

Results of the intervention showed that all four students increased in the dependent measures of number of words written from baseline ($M = 59.32$) to intervention ($M = 88.96$), as well as the number of minutes devoted to planning from baseline ($M = 5.71$) to intervention ($M = 7.89$). An overall increase was observed for number of story elements from baseline ($M = 2.94$) to intervention ($M = 4.75$). Organization was measured using an analytic scoring rubric on a 6-point scale. Three out of four participants improved their organization from baseline to intervention. Although the use of the *Kidspiration* software for planning did not produce significant improvement in organization of narrative essays, positive outcomes for the dependent variables of total words written, time spent on planning, and number of story elements were found (Gonzalez-Ledo, Barbetta, & Unzueta, 2015).
Although several limitations to the study were presented, such as small number of participants, the researchers highlighted one limitation in particular – the absence of word processing as part of the intervention; students still wrote their essays with paper and pencil. Since the integration of a word processing program has shown to positively affect writing quality (Graham et al., 2012b), some studies have combined the ability to plan and compose with technology (Englert, Zhao, Dunsmore, Yevgenyevna Collins & Wolbers, 2007; Sturm & Rankin-Erickson, 2002; Evmenova et al., 2015) and are considered next.

Englert et al., (2007) hypothesized that the combination of graphic organizers or mapping tools and assistive technologies would improve students’ writing performance. In fact, the utilization of a computer program that scaffolds the entire writing process has shown to improve essay quality (Englert et al., 2007; Unzueta and Barbetta, 2012) while increasing student independence (Englert et al., 2007) and motivation to write (Sturm & Rankin-Erickson, 2002). These effects of using technology for all aspects of the writing process may be that technology reduces students’ cognitive load (Englert et al., 2007; Sturm & Rankin-Erickson, 2002) supporting students in writing higher-quality essays. Next, each study is described in terms of the procedures and implications for practice.

In a comparison study, Sturm and Rankin-Erickson (2002) studied the descriptive essays of 12 eighth-grade students under three conditions: no-map (without graphic organizer), hand-drawn map (created organizer), and computer-generated map (CBGO). Dependent measures included number of words, syntactic maturity, number of T-units, and holistic writing scores. Additionally, the researchers administered a writing attitude scale, consisting of 18 Likert-scale items to measure students’ feelings and beliefs about their writing ability and tasks from participants, with and without disabilities.
The intervention study consisted of gathering baseline data (two essays), instruction in hand-mapping as a prewriting strategy (five 50-minute lessons), instruction in computer-mapping (five 50-minute lessons), and independent writing using each of the planning strategies (six essays) in a counter-balanced design. Computer mapping software *Inspiration* was used to create the graphic organizers. Attitude surveys were administered at four points during the intervention: following baseline, after each intervention phase, and again at the end of the project.

Data were analyzed across dependent measures using a repeated measures one-way analysis of variance (ANOVA). Significance was found between baseline condition and intervention for the following dependent measures: number of words, $F(3, 11) = 6.8, p < 0.01$; number of T-units, $F(11, 3) = 6.05, p < 0.01$; writing quality, $F(11, 3) = 7.56, p < 0.01$; and, general writing attitude, $F(1, 11) = 4.46, p < 0.06$. No significance was found for the dependent measure syntactic complexity. However, participants’ essay quantity and quality increased over time regardless of condition, possibly indicating that students’ writing may improve with proper instruction and time (Sturm & Rankin-Erickson, 2002).

In terms of participants’ attitudes, survey results suggested that students favored computer-mapping over hand-mapping and no-mapping as a prewriting strategy. Sturm and Rankin-Erickson (2002) postulated that these findings may be attributed to the fact that technology may reduce cognitive load or may be perceived as more enjoyable by students. Furthermore, the researchers noted that attitude about writing can influence students’ willingness and engagement in an activity, and the use of technology may positively impact reluctant writers.

Sturm and Rankin-Erickson (2002) suggested that carry-over effects may have occurred due to the counter-balance design. However, additional analysis was not conducted and authors
stated that “upon a visual examination, students improved over time” (p. 133). Hence, it is unclear if the students benefited from having one condition prior to another. Furthermore, the study included a small number of participants (N=12), limiting the generalization of results. Later research focused on the same computer program with a different population, and small number of participants.

Integrating Inspiration, Unzueta and Barbetta (2012) conducted a multiple-baseline single-subject design to examine the effects of CBGO on the persuasive writing of four Hispanic, middle-school students with specific learning disabilities (SLD). The intervention was conducted after school for four days per week, for twelve weeks. All measures were completed on a laptop computer and essays were analyzed for: 1) total number of words written; 2) total number of minutes spent planning; 3) number of supporting details; 4) number and percentage of supporting details generated in planning that transferred to the composition; 5) syntactical maturity; 6) overall organization, and 7) number of words per minute. After baseline condition, students were given training on the use of a persuasive writing graphic organizer within Inspiration 8.0, a graphic organizer intervention computer application. The program automatically generated an outline from the graphic organizer. The students were then trained how to transfer their outline and develop and essay using Microsoft Word 2007, a word processing program.

Results indicated that the conjoining of the CBGO, Inspiration, and word processing software positively supported students in planning persuasive essays. All four participants improved essay writing across all dependent measures, from baseline to the intervention condition. Three out of four participants more than doubled the mean total number of words composed. All four participants more than doubled the mean total time planning, as well as mean number of supporting details planned, written, and transferred. Syntactical maturity, measured by
T-units, also improved for all participants, along with improvements in overall organization, as measured by a scoring guide. As a result of this study, Unzueta and Barbetta (2012) suggested that persuasive writing instruction could be improved with the utilization of graphic organizers, including a CBGO like *Inspiration*, for students with and without disabilities.

Several limitations are noted in the study. First, essay probes were not analyzed for preference and may have affected students’ motivation to write. Second, small number of participants (N=4) represent a specific student population – Hispanic, middle school students with SLD. Third, beyond the scope of the study, the effects of the intervention are unclear, since generalization and maintenance data were not gathered. Still, Unzueta and Barbetta provided some support for using CBGO for writing with Hispanic, middle-school students. Although CBGOs may have gained some attention, researchers also tested the utility of web-based programs to support students in planning in advance of writing.

Englert et al. (2007) conducted research using a web-based program to focus on a broader scope of students with disabilities through the integration of Technology-Enhanced Learning Environments on the Web (TELE-Web). Researchers employed a quasi-experimental design with elementary students with disabilities (SWD) (N=35), including LD (N=11), cognitive impairments (N=2), emotional impairments (N=2), and other disabilities (N=5). Twenty students were assigned to the experimental condition and 15 students to the control condition. In the control condition, students were taught organizational and planning strategies through the use of a concept map for narrative essays with traditional paper and pencils. In the experimental condition, students were taught to use TELE-Web to compose narrative essays. This internet-based software prompts students to generate appropriate text (e.g. introductory sentence) embedded with self-regulation strategies (e.g. reminders to give supporting details) (Englert et
Posttests were analyzed for the following six genre-related traits: introduction to topic, introduction to category, depth and breadth of categories, the conclusion, and overall organization. Posttests were also analyzed for the following conventions: word choice, spelling, punctuation, capitalization, categories, and total words produced. Results indicated that students in both conditions made gains, but students in the TELE-Web condition made gains that surpassed those of students in the control group.

A multiple analysis of covariance (MANCOVA) revealed that essays produced by students in the TELE-Web condition were significantly better than the control group for the variables of introduction to paper, breadth, conclusion, organization, punctuation, and total words written. Moreover, the essays produced by the students in the TELE-Web condition resulted in greater gains over the control group for the variable of introduction \((F = 2.755; p < .001)\). Results suggested that the components of TELE-Web technology, specifically the prompting and scaffolding of the writing process, may reduce cognitive load and ultimately increase independence for students with disabilities in writing (Englert et al., 2007).

Englert et al. (2007) had not indicated if students were randomly assigned to either group in the study. However, results need to be tempered in light of the noncomparable groups. The TELE-Web group had more participants, more students with disabilities, higher mean age of one year, and higher reading grade level during the time of the study. The effects of these preexisting conditions were unknown. However, Englert and colleagues provided statistically significant results in support of using the TELE-Web technology over paper and pencil planning, crediting the multi-faceted intervention approach of the technology. Similarly, Evmenova and Regan (2012) designed a CBGO with a multi-faceted intervention – combining mnemonic strategy, a graphic organizer, and word processing.
Since the review of CBGOs conducted by Ciullo and Reutebuch (2013), Evmenova and Regan (2012) developed the computer-based graphic organizer (CBGO) – *Project WeGotIT!*—*Writing Effectively. Graphic Organizers, Teachers Integrating Technology*, to be used within the Microsoft Word application. Evmenova et al. (2015) explored the CBGO’s effect on the persuasive essays of seventh- and eighth-grade students with high-incidence disabilities (*N* = 10). Employing a multiple baseline across groups single-subject design, data were gathered throughout the intervention, including baseline, treatment condition, and generalization. Dependent measures included number of words students composed, number of sentences, number of transition words, number of essay parts, and holistic quality.

Prior to instruction, pre-interviews were employed to gather students’ perceptions about writing and technology. Next, students were assessed on their technology skills (e.g. copying and pasting text, typing), and then baseline data were gathered through the administration of five to seven persuasive writing prompts that required students to type their responses in Microsoft Word.

During the intervention phase, students received instruction in using the CBGO in Microsoft Word to plan a persuasive essay. The CBGO includes the mnemonic strategy **IDEAS** to remind students to **I**dentify your opinion, **D**escribe three reasons, **E**xamples of reasons, **A**dd transition words, and **S**ummarize. The CBGO also includes self-regulated learning strategies (i.e., goal-setting, self-monitoring via checkboxes, self-evaluation). Instructional lessons included four, 50-minute sessions with explicit instruction in persuasive writing, the mnemonic, how to use the GBGO and its drop-down menus, and independent practice. Instruction was followed by three maintenance sessions, requiring students to type essays without the CBGO, and then researchers conducted social validity interviews.
Results of the study showed that the intervention of using the CBGO was highly effective and improved students’ writing across all measures. Specifically, eight of the 10 students increased the number of words written, nine of 10 students increased number of sentences, all students increased use of transition words, and all 10 increased essay parts and essay quality over baseline scores. PND between baseline and intervention was reported as 80% for number of words, 90% for number of sentences, and 100% for number of transition words, essay parts, and quality. Interviews revealed that all students were able to recall the mnemonic strategy. In addition, students reported an increase in confidence (N=7) and most felt that the graphic organizer helped them write better essays (N=8), while two student did not feel the graphic organizer was helpful. Overall, components of the application (e.g. goal-setting, copy-paste feature) were viewed favorably by students.

Four important implications arose from this study. First, the CBGO can be integrated into writing instruction for middle-school students, with high-incidence disabilities, to effectively plan and write persuasive essays after four lessons. Secondly, the flexible structure of this CBGO may support various populations of learners. For example, students can choose to brainstorm first or write one idea and a sentence for that idea. Third, adaptive features (e.g. flashing light bulbs) provided feedback for learners to independently engage in self-regulation, regardless of their writing level. Fourth, the fact that CBGOs are used within Microsoft Word, a popular program, and the short learning curve may encourage teachers to implement technology since it does not require teachers to learn a new program (Evmenova et al., 2015), an important implication since some teachers are reluctant to implement technology due to time and space constraints (Graham et al., 2012a).
Although the results were promising, the effect of the technology was unknown since it was not compared to the same paper and pencil activity, as in Englert et al. (2007). It is uncertain if the mnemonic and graphic organizer or the technology attributed to the results. However, this is the first known study that examines the integration of a CBGO within Microsoft Word program. Since technology is ubiquitous and students need to be able to write with technology for standardized assessments, as well as for employment, it may behoove schools to integrate such supports to scaffold students’ writing.

Together these studies provide support for the use of CBGO (Ciullo & Reutebuch, 2013; Evmenova et al., 2015; Gonzalez-Ledo et al., 2015; Lorenz et al., 2009; Sturm & Rankin-Erickson, 2002; Unzueta & Barbeta, 2012) and web-based technologies (Englert et al., 2007) for the planning in advance of writing for students with disabilities. These technologies meld several writing interventions – graphic organizer, mnemonic strategy, word processing, and word prediction. Results have suggested that students seemed more engaged and motivated to plan using technology over traditional paper and pencil methods of writing (Englert et al., 2007; Sturm & Rankin-Erickson; 2002). Although these studies only examined these technologies on a computer, mobile devices preclude some of the issues surrounding the traditional computer lab such as, scheduling conflicts. Therefore, the literature on mobile technology has been reviewed and is discussed in the upcoming sections.

Mobile Technology

Mobile technology is the use of personal wireless devices such as laptops, tablet computers, game consoles, smartphones, and MP3 players (Eisele-Dyrli, 2011). Mobile devices have been favored over personal computers due to their portability, ease of access, data exchange, and customization capabilities (Naismith, Longsdale, Vavoula & Sharples, 2004;
Norris & Soloway, 2003; Roschelle & Pea 2002; Vahey & Crawford 2002). These devices have led to the phenomenon known as mobile learning (M-learning) or the use of mobile devices for educational purposes by students and lifelong learners (Attewell & Saville-Smith, 2005; Sharples, 2000), both within and outside of the classroom environment (Mifsud & Mørch, 2010; Sandberg, Maris, & de Geus, 2010). Traxler (2010) described the omnipresence of mobile technologies as:

Almost everyone owns one and uses one, often more than one. Not only do they own and use them, but they also invest considerable time, effort, and resources in choosing, buying, customizing, and exploiting them. These devices express part or much of the values, affiliations, identity, and individuality of their owners through their choice and use. They are both pervasive and ubiquitous, conspicuous and unobtrusive, noteworthy and taken-for-granted. Their roles are new and completely different from older, static, and less personal information technologies such as desktop computers and TVs. (p. 9)

Mobile technology devices support educational objectives by allowing for multiple intelligences through creative thinking and learner autonomy (Clary, Kigotho, & Barros-Torning, 2013). With such capabilities as accessing the internet, mobile technologies can boost learning by dissolving classroom walls, thus learning has become “more situated, personal, collaborative, and lifelong” (Naismith, Longsdale, Vavoula & Sharples, 2004, p. 5). Learning potential is no longer restricted by one’s age or institution (Sandberg et al., 2010; Sharples, 2000). Additionally, mobile technologies, within an educational context, are supported by the principles of Universal Design for Learning (UDL; CAST, 2011) UDL is defined as:

A set of principles for curriculum development that give all individuals equal opportunities to learn by providing a blueprint for creating instructional goals, methods,
materials, and assessments that work for everyone – not a single, one-size-fits-all solution but rather flexible approaches that can be customized and adjusted for individual needs.

The principles of UDL are:

1) provide multiple means of representation;
2) provide multiple means of engagement; and,
3) provide multiple means of action and expression (CAST, 2011).

Mobile devices and apps allow for multiple means of representation and engagement through digital text, video, audio, graphs, and images to present information (Reid, Strnadova & Cumming, 2013), as well as multiple means of expression, whereby students can demonstrate understanding through various apps and tools (Reid et al., 2013). For example, students can use their finger, stylus, speech-to-text function, or built in keyboard for writing. Furthermore, UDL principles provide a framework for teachers to incorporate instructional technology (Rose & Meyer, 2006).

Mobile technologies, specifically handheld devices (e.g. smartphones and tablets) are now thought of as effective teaching and learning tools (Critchton, Pegler & White, 2012) that may be preferred by students for several reasons: the device's portability, ease of note-taking (EL-Gayar, Moran & Hawkes 2011), wireless access, multimedia capabilities, access to thousands of free apps (Eisele-Dyrli, 2011; Ifenthaler & Schweinbenz, 2013), and popularity (Johnson, Smith, Willis, Levine, & Haywood, 2011). First, portability is relevant for two reasons: 1) students do not have to relocate to a computer lab during class; and, 2) students can use devices outside of the classroom, which have been found to further learning and independence (EL-Gayar, Moran & Hawkes 2011). Second, note-taking functions allow for multiple means of representation, such as video, audio, typed, handwritten with a stylus, or a combination of any of these (Cumming & Rodrigues, 2013). For example, a student can
videotape a lesson, photograph lesson notes, and embed audio into handwritten or typed notes (Cumming & Rodrigues, 2013). Another feature universal to mobile devices is the capability to connect wirelessly to the internet, permitting students to access information, communicate and share documents with others, and access specific locational content with GPS-functionality (Clary et al., 2013; Sandberg et al., 2010). Wireless internet access also includes the benefits of downloading apps from an app market, a type of store with a plethora of free educational apps (e.g. dictionary) (Crichton et al., 2014; Eisele-Dyrli, 2011). Furthermore, these devices have grown in popularity such that they are less stigmatizing for students with special needs (Reid, et al., 2013).

Handheld devices have numerous implications for special education. For example, there are apps that prompt students to self-monitor their own behaviors (Gulchak, 2008). For students with autism spectrum disorder (ASD), handheld devices can deliver instruction via video modeling, (Cihak, Fahrenkrog, Ayres, & Smith, 2010), as well as functioning as a communication device (Van der Meer et al., 2010). Additionally, handheld devices are more socially acceptable for students with special needs over previous more stigmatizing devices such as Pictoral Exchange Communication System, where students carry binders with pictures (Campigotto, McEwen, & Demans Epp, 2013). As of 2013, 90% of students surveyed from grades four through twelve perceived that handheld devices make learning more fun, and over 80% of students already owned a handheld device (Pearson, 2013), making devices commonplace.

For schools, the benefits of utilizing mobile technology is the ease of access to the internet, longer battery life, size, low price point (Crichton et al., 2014) and short learning curve, since many students are already proficient users (Cumming & Rodrigues, 2013). To further
decrease costs school officials have begun to adopt bring-your-own-device (BYOD) policies, where students bring their own mobile device from home (Rivero, 2012).

Currently, there is a scarcity of empirical support for these devices and their effect on student learning outcomes (Huang, Liang, Su, & Chen, 2012; Sandberg et al., 2011; Weisberg, 2011). One device in particular, Apple’s iPad, has been touted as a powerful educational tool with profound results (Apple.com). Research surrounding the integration of the iPad into the classroom and a discussion of the principles of UDL in support of the iPad follows.

**The iPad.** Apple’s iPad is a hand-held device, specifically, a tablet, that includes all of the capabilities and functionality of a mobile device (e.g. Wi-Fi enabled). What sets this brand apart from other mobile devices are their exclusive access to iTunes – a web-based store that hosts hundreds of thousands of educational apps and iTunes University offering free courses. According to Shuler (2012), the most downloaded iOS apps are educational apps that target preschool or elementary age children. Since its introduction in 2010, Apple has claimed that the iPad has transformed education. Apple’s *iPad in Education* report (Apple, 2014) has highlighted many educational accomplishments which they attribute to schools implementing iPads, such as increases in test scores, student motivation and engagement levels, and monies saved on textbooks. For students with special needs, the report claimed that the iPad has provided students with new communication options, increased opportunities for independence, and improved neurocognitive learning capabilities (Apple, 2014). Even in higher education institutions, colleges and universities have implemented one-to-one device initiatives, iTunesU course electives, and iPad teacher preparation programs (Apple, 2014). The iPad’s proliferation in education has gained the attention of journalists and educators alike, but research has been slow
to examine how technology improves outcomes, in areas such as writing (Peterson-Karlan, 2011).

McMahon and Walker (2014) claimed that Apple’s mobile devices are “excellent educational platforms because of the many ways they embody the principles of UDL” (p. 41). For example, the iPad’s built-in accessibility features, including zoom capabilities, color schemes, voiceover, and speak selection, correspond with UDL’s multiple means of expression principle. The camera, multi-touch inputs, writing apps, calendar, notes, and reminder functions correspond with UDL’s multiple means of action and expression principle; while the music app, Safari app, iTunes U, guided access, timer, alarm, and stopwatch functions support multiple means of engagement (McMahon & Walker, 2014).

A small body of research exists for the iPad, claiming its benefits on outcomes in reading, writing, and across content areas, for both students in general education and special education, from primary classrooms to higher education institutions (Milman, Carlson-Bancroft, & Vanden Boogart, 2014). Most of these studies employed qualitative approaches to research, such as observations, interviews, and case-study methods, for the exploration of teacher implementation, student communication, and student engagement or motivation (Garwood, 2013). The iPad has been examined for its effect on learning outcomes, specifically in the areas of early literacy (Lynch & Redpath, 2014), reading (Delacruz & An, 2014; Getting & Swaine, 2012; Huang, Liang, Su, & Chen, 2012; Pollitt, 2013; Simpson, Walsh, & Rowsell, 2013), mathematics (Carr, 2012), science (Boyce, Mishra, Halverson, & Thomas, 2014; Schneps, Ruel, Sonnert, Sussault, Griffin, & Sadler, 2014; Ward, Finley, Keil & Clay, 2013), science, technology, engineering and math (STEM) (Hu & Garimella, 2014), social studies (Friedman & Garcia, 2013), handwriting
The iPad has also been researched as an assistive technology for students with special needs, specifically in the areas of communication (Bouvat, Kangas & Szczeck, 2014; Desai, Chow, Mumford, Hotze & Chau, 2014; Gevarter, O'Reilly, Rojeski, Sammarco, Sigafos, Lancioni, Lang, 2014; Hill & Flores, 2014) and behavior modification (Flower, 2014). For example, researchers have examined the iPad's ability to capture and deliver video content to teach a variety of skills through video modeling (Burton, Anderson, Prater, & Dyches, 2013; Hart & Whalon, 2012). The iPad’s utility for delivering content through various apps has also been investigated across content areas, including reading (McClanahan, Williams, Kennedy, & Tate, 2012; Retter, Anderson, & Kieran, 2013), English Language Arts (Flewit, Kucirkova, Messer, 2014;), mathematics (Haydon, Hawkins, Denure, Kimener, McCoy, Basham, 2012; O'Malley, Jenkins, Wesley, Donehower, Rabuck, & Lewis, 2013; O'Malley, Lewis, & Donehower, 2013), science (Miller, Krockover, & Doughty, 2013), and STEM (Aronin & Floyd, 2013). Additionally, researchers have explored the iPad's functionality and efficacy for supporting multiple functions for those with specific disorders, such as developmental disabilities (Cumming, Strnadova & Singh, 2014; Kagohara et al., 2013; Rodriguez, Strnadova, & Cumming, 2015), LD (Rodriguez, Strnadova, & Cumming, 2014), and ASD (Strnadova, Cumming & Rodriguez, 2014; O’Malley, Lewis, & Donehower, 2013). The next section reviews those studies that have specifically examined apps that support writing on the iPad.

Writing and the iPad

Few studies have examined the iPad as a medium for written expression. In preschool, iPad apps, such as Our Story – a digital story telling app, was observed during free play and was
found to engage students in a meaningful way, based on Bangert-Drowns and Pyke’s engagement taxonomy (Kucirkova, Messer, Sheehy, & Panadero, 2014). Multimodal literacy skills were examined with primary students (Pilkington, 2012). The app, *Doodle Buddy*, was utilized in a study in conjunction with SRSD (Dunn, 2014), and Milman, Carson-Bancroft, & Vanden Googart (2014) examined the implementation of an iPad initiative in an independent school, grades pre-k through fourth. The next sections describe each of these studies in greater detail.

Kucirkova, Messer, Sheehy, and Panadero (2014) conducted a qualitative study that examined the effects of the iPad and the *Our Story* app on learning engagement. Two classrooms, including forty-one four and five year-olds and their teachers, participated as part of a larger school-wide project. Prior to the study, students were able to choose the iPad in an unstructured activity during free time, exploring any app they wanted. On day one, the researchers showed the participants how to use the *Our Story* app, followed by assistance only when needed for two additional days.

Data were collected using observations and video recordings over three days while the participants interacted with the app. Participants created stories through digital audio-visual texts. Engagement was coded using Bangert-Drowns and Pyke’s (2001) taxonomy. Results indicated that students’ engagement was meaningful, based on Bangert-Drowns and Pike’s 7-point scale:

1- literal thinking;
2- critical engagement;
3- self-regulated interest;
4- structure dependent engagement;
5- frustrated engagement;
6- unsystematic engagement; and,
7- disengagement.
At five time points, data were gathered on student engagement with various apps. While using the *Our Story* app, engagement levels ranged from two through four. Whereas, when students used the drawing apps, engagement levels were reported at a level four or level six. However, exploratory talk was greater during the use of other apps, such as drawing apps. Although student engagement was more meaningful with *Our Story*, they verbalized more with the drawing apps. Limitations, such as possible observer-effect and little instructional guidance, were discussed. Overall, the study provided support for open-ended content and ease of use of the iPad, since students seemed to be able to easily manipulate the screen (Kurcirkova et al., 2014).

Another study that focused on primary-school children was conducted using a case study method to explore the utility of the iPad on the literary skills of primary students (Pilkington, 2012). Participants included parents (*N*=10), students (*N*=6), and one teacher. The students were identified as English language learners from the United Kingdom, but no other demographic data was provided. Employing qualitative methods, Pilkington collected data from three sources: 1) two focus groups comprised of students’ parents; 2) observations of students interacting with the iPad; and, 3) teacher’s analysis of work samples. Students were given an iPad to take home, access to the internet, and low cost apps to support their writing. Homework assignments included directions for using *iGoogle*, *iBooks*, and *iBookCreator* apps. Students were also encouraged to download other apps.

During focus group meetings, parents mostly commented on their child’s engagement levels and developing maturity in relation to ownership. They also discussed the device’s ease of use and research capabilities. Results from the teacher’s analysis of students’ work samples indicated that all but one student achieved literacy targets. It was noted that the one student who
did not achieve literacy targets was absent from school for several weeks. Furthermore, improved writing structure was noted in students’ iBooks over their handwritten essays. Students embedded their own voices and photos pertaining to the subject matter with their essays, indicating that “children [can] develop multi-modal literacy skills with the iPad” (Pilkington, 2012, p. 8).

Although this study provides some preliminary support of students’ preference for technology and promising outcomes for writing in early elementary grades, no empirical evidence was presented in the article. Furthermore, few studies have examined empirical evidence.

In one of the only studies to examine empirical outcomes, Dunn (2014) conducted a mixed-methods study with a single-subject design to explore the use of a mnemonic strategy as part of a Tier 2 intervention on the content and quality of essays, written by eight struggling writers, in second-, third-, and fourth-grades. Data were collected through curriculum-based measurement scores in story content and quality. Students took an initial writing interest survey and were interviewed about the intervention. The study was conducted over 31 days, consisting of baseline phase (four sessions), training (four days), intervention (16 days), and maintenance. Intervention specialists used the **STORY** mnemonic strategy within self-regulated strategy development (SRSD; Graham & Harris, 1989). **STORY** reminded students to: Start thinking about WWW, W=2, H=2 questions (who, what when, where, what happens then, what happens with the other characters, how does the story end, how does the character(s) feel); Thing about your answers and illustrate them; Organize and say your story out loud; Revise your text’s ideas and write it on paper; You can make edits and read it to others. Next, interventionists modeled
how to use the strategy on an iPad with the *Doodle Buddy* app (Pinger, Inc, 2011) to draw their answers to WWW, W=2, H=2 questions.

Results showed that six out of eight students met the 150% above baseline criterion for written content and quality. Qualitative data revealed that students believed the mnemonic helped them to write better stories. Also, students enjoyed using the iPad which increased motivation during the intervention, specifically stating that it was easy to revise their work. Teachers felt that the word count function was reinforcing while the mnemonic was helpful for those who struggle with writing (Dunn, 2014).

Generalization of the results are limited due to the small number of participants Dunn recruited (N=8). Furthermore, the participants were all identified as struggling writers, but not identified as having a disability. Hence, the appropriateness of the strategy, including the use of the iPad as a tool for writing, for students with disabilities, as well as above-average writers, is uncertain. A larger and more diverse sample would be fitting, such as that in Milman et al. (2014).

To study a school-wide iPad implementation initiative over the course of an academic year, Milman et al. (2014) employed a mixed method approach to their research. Participants included both teachers (N=7) and students (N=17) from grade levels pre-k through fourth, across disciplines. In a school-wide initiative, all faculty and students received training on how to use the iPads. Data were gathered through interviews, observations, and teacher surveys. Observation protocols were adapted from the International Society for Technology in Education’s (ISTE; 2008) classroom observation.

Results from the year-long study indicated that teachers had a positive perception of integrating iPads for student engagement, as well as for learning outcomes. Observations
revealed that teachers used the iPad to supplement and differentiate instruction across content areas. The percentage of time students utilized iPads across content areas were was reported for math (17.7%), writing (8.8%), social studies (8.8%), and for combining content areas (39.7%). In terms of writing, the iPad supported students’ creation of blogs, books, and presentations across writing genres. Apps, such as Book Creator and Pages, were used to create story structure, multimedia presentations, and graphic organizers. Students used a combination of pencil and paper activities with the iPad and also used the iPad to write in other content areas (e.g. social studies).

Teachers’ survey responses revealed that they felt that the iPad improved students’ engagement and motivation (84.9%) and student work ethic (58.1%). In terms of academic areas, when teachers were surveyed about the iPad’s effect on student achievement, teachers indicated that they had no opportunity to observe, declined to observe, observed no effect, or observed an improvement in student achievement. Teachers reported an improvement in student achievement while using the iPads in across the following areas: Art (14.8%), Math (55.6%), Music (3.7%), Physical Education (10.3%), Reading (53.6%), Science (46.4%), Social Studies (51.9%), Spanish (28.6%), Spelling (28.6%), Technology (85.7%), and writing (51.7%). During interviews, teachers stated that the benefits of using the iPad included: 1) all-in-one feature; students did not have to leave their seats to get various tools; 2) the students delved further into content; 3) the ability to use multimedia in presentations; and, 4) an improvement in student demonstration of understanding (Milman et al., 2014).

Milman et al. (2014) added to the literature base in support of iPads as a way to engage students and for teachers to differentiate content, across grade levels and content areas. However, the effect of the iPad on writing achievement is unknown due to the dearth of empirical evidence
in the current literature. At present, the limited body of research suggests that the iPad, paired with an educational app, may be engaging (Milman et al., 2014; Pilkington, 2012), may improve preschoolers’ writing (Pilkington, 2012), and aid struggling writers with composition skills (Dunn, 2014). However, these studies are absent of empirical evidence, lack a diverse sampling of participants for generalization, and are devoid of any comparison that purports that writing with the iPad can meaningfully improve the quality and quantity of essays over handwritten essays.

Conclusion

CCSS require students in fourth grade, and beyond, to type written responses on state assessments. Many students already own and use a mobile device (Pearson, 2013; Traxler, 2010). One device, in particular, Apple’s iPad, has infiltrated schools, allowing for multiple pathways for learning ( McMahon & Walker, 2014) and computing portability. Researchers have found that the iPad has the potential to increase student engagement and motivation to write (Dunn, 2014; Kucirkova et al., 2014; Milman et al., 2014; Pilkington, 2012), promote student independence, and improve students’ self-efficacy and attitude (Campigotto, McEwen, & Demmans Epp, 2013). Collectively, these improvements attributed to the iPad may lead to an increase in student achievement in writing (Dunn, 2014; Milman et al., 2014). Paired with an educational app, the iPad may be the ideal tool for composing for students that struggle with writing. However, there is no known research that compares students’ writing quality and quantity on the iPad to paper.

How This Study Extended Prior Research

This study extended prior research on writing interventions in several distinct ways. First, it expounded upon existing research in the areas of planning with a computer-based
graphic organizer, embedded with self-regulation strategies, from using a traditional computer to the iPad. Second, it added to existing research in the areas of planning with a computer-based graphic organizer, embedded with self-regulation strategies, for seventh- and eighth-grade students with disabilities to fourth-grade students, with and without disabilities. Third, this is the first known quasi-experimental study that will compare students’ persuasive essays composed with an iPad to essays composed with traditional paper and pencil. Finally, this study examined the generalization of the strategy for students in both conditions. Chapter three explains the components of the proposed intervention including the research design, the participants, setting, materials, procedures, and the analysis.
CHAPTER III
Methodology

The purpose of this chapter is to present the design and procedures of the current study, which examines the impact of writing instruction in two conditions: with a graphic organizer on paper, and with technology, an iPad and graphic organizer app, on the persuasive writing essay scores of students in two fourth-grade inclusion writing classes. The following sections describe the design of the study, participants, instruments, dependent measures, procedures and instruction, data collection and scoring, and finally, data analysis.

Design

This study employed a mixed method approach. First, quantitative data was gathered from a quasi-experimental, switching replications design. The independent variables were the conditions under which persuasive essays were written: planning with a paper graphic organizer, or planning with a technology-based graphic organizer (TBGO) app, *Project WeGotIT!* (Evmenova & Regan, 2012), on an Apple iPad. Dependent measures were the scores on student persuasive essays. The generalization of the skills practiced during both graphic organizer conditions to a traditional paper and pencil condition was also examined. In addition, qualitative data about students’ perceptions about the technology were explored through semi-structured interviews.

Although a randomized experimental design is a preferred design, since it supports robust testing of causal factors (Check & Schutt, 2012); randomized assignment could not be achieved in this study due to the preexisting enrollment of the fourth-grade classes. Since the implementation of the treatment is replicated, the switching replications design is an ethical way to conduct research because every student received both treatments (Guthrie & Klauda, 2014).
This design was chosen for two reasons: 1) it may enhance generalizability; and, 2) individual differences will not be considered as a confounding variable, and therefore eliminates the need for randomization (Guthrie & Klauda, 2014). Switching replication designs have been used in education to examine effective strategies in reading comprehension (Bulgren, Marquis, Lenz, Desher, & Schumaker, 2011) and math instruction (Bottge, Rueda, LaRoque, Serlin, & Kwon, 2007). This design is also effective for delivering an intervention to all students when resources are limited (Guthrie & Klauda, 2014).

This design allowed for data to be analyzed at six points: pretest before instruction O₁, pretest after instruction O₂, posttest O₃ during condition 1 (mean of two samples collected during condition 1), posttest O₄ after condition 1, posttest O₅, during condition 2 (mean of two samples collected during condition 2), and posttest O₆ after condition 2. The design is indicated in the following way, using standard notation:

\[
\text{Cohort A} \quad O_1 \times O_2 \times X_1 \quad O_3 \quad O_4 \quad X_2 \quad O_5 \quad O_6 \\
\text{Cohort B} \quad O_1 \times O_2 \times X_2 \quad O_3 \quad O_4 \quad X_1 \quad O_5 \quad O_6
\]

In the first phase, the classes were randomly assigned to either the technology sequence or the paper sequence. All students wrote the first persuasive essay for pretest O₁, received instruction in persuasive writing X, and then wrote the second persuasive essay for the second pretest O₂. Next, Cohort A received instruction in planning with Project WeGotIT! app with the iPad (X₁) while Cohort B received instruction in planning with a paper graphic organizer (X₂). The average of the two persuasive essays written during condition X₁ for Cohort A and Condition X₂ for Cohort B were collected at O₃. These scores were analyzed to assess if there was a difference between the essays written in the iPad condition and the paper graphic organizer condition. Thus, the first segment of the study (O₂-O₃) followed a pretest-posttest control group
design. Second, in order to answer the research question on the impact of the technology, the persuasive essays written for posttest O4 were composed without any graphic organizer support, and served as a measure of the generalization effect of the intervention for both cohorts.

In the next phase of the study, Cohort A received instruction in planning with the paper graphic organizer X2 while Cohort B received instruction in planning with the paper graphic organizer X1. The average of the two persuasive essays written during condition X2 for cohort A and Condition X1 for Cohort B were collected at O5 for students in both cohorts. These scores were analyzed to assess if there was a difference between the essays written in the iPad condition and the paper graphic organizer condition, examining the effects of technology on the persuasive writing. All students wrote a final essay, posttest O6, which served as a measure of the generalization of the effect of the intervention for both cohorts.

**Participant Characteristics**

**Students.** Two fourth-grade classes in a suburban New York elementary school participated in the study. All students in the classes received the instruction, since the school was using it as part of their writing curriculum; however, only those students who had obtained parental consent for their data to be included in this study and who volunteered to be interviewed are considered study participants.

Thirty-six students participated in the study. Cohort A (N=17) included 10 female students and seven male students. Of those participants, 11 students were identified as Caucasian, five as Asian, one as “other” ethnicity, and two students were identified with a speech and language disability. Cohort B (N=19) included seven female students and 12 male students. Of those participants, 13 students were identified as Caucasian, five as Asian, and one as “other” ethnicity. One student in this cohort was identified with a speech and language disability, one
student was classified as Autism Spectrum Disorder, and one student as having a Traumatic Brain Injury. Two students were also identified as English Language Learners. Table 3.1 presents the participants’ demographic data by cohort.

Table 3.1

<table>
<thead>
<tr>
<th>Participant Data</th>
<th>Identifier</th>
<th>Cohort A</th>
<th>Cohort B</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
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<td>47</td>
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<tr>
<td>Male</td>
<td>7</td>
<td>12</td>
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<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
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<td>13</td>
<td></td>
<td>67</td>
</tr>
<tr>
<td>Asian</td>
<td>5</td>
<td>5</td>
<td></td>
<td>28</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>1</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td><strong>Disability Type</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLI</td>
<td>2</td>
<td>1</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>ASD</td>
<td>0</td>
<td>1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>TBI</td>
<td>0</td>
<td>1</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>ELL</td>
<td>0</td>
<td>2</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Note: SLI = Speech and Language Impairment, ASD = Autism Spectrum Disorder, TBI = Traumatic Brain Injury, ELL = English Language Learner

**Teachers.** The teachers during the instruction included one of the school district’s fourth-grade writing teachers and the researcher. The writing teacher is certified New York State Elementary Education teacher (B-6) with 12 of teaching experience and two years of experience teaching writing. The researcher is a doctoral student and a New York State certified special education teacher (K-12) and elementary school teacher (PreK-6) who taught grades K-12 for over nine years in nearby school districts prior to pursuing her doctoral degree. Furthermore, the
The researcher holds a Master’s degree in Special Education and in Elementary Education and a Certificate of Advanced Studies in School Building Leadership. The researcher delivered the direct instruction, using scripted lesson plans, while the classroom teacher supported students during guided practice. Additionally, the classroom teacher served as the fidelity monitor.

**Setting and Scheduling**

This study took place in a public school setting in the Capital District of New York, with The University of Albany/SUNY Institutional Review Board’s permission to conduct the research. The sessions (N=15) were held during the students’ regularly-scheduled writing instruction, and lasted approximately 40-50 minutes. On the occasion of student absences, session make-ups were provided based on students’ availability.

**Instruments**

Data were gathered from three sources; a standardized test, the *Test of Written Language-Fourth Edition* (TOWL-4; Hammill & Larsen, 2009), students’ persuasive essays, and semi-structured interviews. The following sections describe each of these sources in detail.

**TOWL-4.** The fourth edition of the Test of Written Language (Hammill & Larsen, 2009) is a norm-referenced test of written expression. In this study, the Contextual Conventions Subtest (Subtest 6) was used as to evaluate general writing ability on a spontaneous writing task. The instrument was chosen for its psychometric properties to evaluate writing quality (McCrimmon & Climie, 2011). For this subtest, the students were given a stimulus picture and they wrote a story in response; points were earned related to requirements related to orthographic (e.g., punctuation, spelling) and grammatical conventions (e.g., sentence construction, noun-verb agreement). Scores on the TOWL-4 subtest can range from 0 to 37.
**Persuasive essays.** Students' persuasive essays were collected at eight points during the study, and are considered pre-tests, samples, or post-tests in different phases of the study (see Table 2). All writing activities included a choice of two valid, randomly-assigned, prompts for persuasive writing (See Appendix C) used in prior research (e.g. Asaro-Saddler & Bak, 2012). All prompts addressed general knowledge topics to minimize student differences. Additional persuasive prompts were used during instruction (e.g. ice cream is the best summer dessert).

The first persuasive essay (Pre-test 1) was collected before the instruction on writing a persuasive essay; this allowed the researcher to determine students’ persuasive writing ability before any instruction was provided. The second essay (Pre-test 2) was collected after the instruction on the persuasive essay, but before either intervention, allowing the researcher to examine how the students wrote after persuasive writing instruction only; this is essentially to establish writing ability after instruction but prior to the commencement of the experimental conditions.

Two additional persuasive essays (Sample 1 and Sample 2) were collected during each of the interventions for a total of four additional persuasive essays; two times while using the paper graphic organizer, and two times while using the iPad app. Scores on the two essays for each condition were averaged and this new score was used in the analysis. These scores allowed the researcher to look at the effectiveness of each intervention. After intervention, the next school day, a posttest persuasive essay was administered without the use of either the paper graphic organizer or the iPad app. The purpose of this posttest was to examine what affect, if any, the graphic organizer or TBGO had on traditional paper and pencil writing. Since the posttests were collected after each intervention, there were two post-tests (Posttest 1 and Posttest 2) persuasive essays for each student.
**Interviews.** Following the intervention, semi-structured interviews were conducted with student volunteers from each cohort to assess the social validity of the use of the technology. The interview protocol was adapted from Pollitt (2013) such that questions regarding reading with an iPad were changed to questions about writing. The interview questions for the current study were:

1. Have you ever used an iPad or tablet in school or at home before this lesson?
2. If yes, how have you used an iPad or tablet in home or at school?
3. What specifically did you like about using the iPad app for writing a persuasive essay?
4. What specifically did you dislike about using the iPad app for writing a persuasive essay?
5. How do you feel about writing an essay with the iPad app as compared to writing with paper and pencil?
6. Now that you have used an iPad app for writing, what suggestions might you have for your teacher?
7. Is there anything else that we did not discuss today about using the iPad that you would like to share?

**Intervention Materials**

Student materials for this study included typical classroom materials such as lined paper, pencils, erasers, and student folders, as well as the researcher-developed paper graphic organizer, transition word list, and sample essays. Additionally, each student had a charged iPad Air 2 preloaded with the *Project WeGotIT!* and *iBooks* app (Apple, 2013), as well as a book stand to support the iPad at each student’s desk.
The researcher developed the paper graphic organizer and the criteria sheet (See Appendix D) to mimic components of *Project WeGotIt!* app (See Appendix B). The app features the mnemonic IDEAS designed to help students organize the planning and writing process, prompting them to:

- Identify your opinion (i.e., what do you want the audience to know);
- Determine reasons (i.e., why is your opinion a good idea);
- Elaborate with examples (i.e., these support the reasons);
- Add transition words as you go; and,
- Summarize (i.e. write a strong ending sentence).

In addition to the student materials, the teachers also used a projection system (ELMO) to demonstrate the iPad app, a white-board, markers, and persuasive essay prompts.

**Graphic Organizer vs. TBGO.** In order to determine if the *Project WeGotIT!* app and iPad technology are effective for planning and writing, the components of the app were replicated as a graphic organizer on paper. However, due to the capabilities of the technology, some features could not be duplicated. For example, the app has adaptive features that darken certain fields, depending on the user’s writing goal. The self-assessment column of the app automatically checks off when the user has included an opinion, three supporting reasons, examples, transition words, a summary, and punctuation. Additionally, the app has text exemplars embedded, flashing light bulbs to prompt the user what to do next, word prediction and text-to-speech (TTS) capabilities, copy function (text from sentence boxes are copied into a text box as a paragraph), and a publishing option. These features could not be replicated in the paper condition, as they are ubiquitous to technology. The one feature that could be replicated is the provision for transition words. In the app, if the user touches a text box, a pop-up menu
appears containing a list of appropriate transition words (i.e. first, next). For the paper version, a list of transition words (See Appendix E) was provided in an attempt to duplicate this component. Table 3.2 presents features unique to each medium.

Table 3.2

*Paper Graphic Organizer vs. iPad app Graphic Organizer*

<table>
<thead>
<tr>
<th>Graphic Organizer</th>
<th>iPad app Graphic Organizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mnemonic IDEA</td>
<td>Mnemonic IDEA</td>
</tr>
<tr>
<td>Brainstorm textbox</td>
<td>Brainstorm textbox</td>
</tr>
<tr>
<td>Self-Assessment check-list</td>
<td>Adaptive Self-Assessment</td>
</tr>
<tr>
<td>Set features</td>
<td>Adaptive features (e.g. number of reasons)</td>
</tr>
<tr>
<td>List of transition words provided</td>
<td>Pop-up menu prompting for transition words</td>
</tr>
<tr>
<td>Evaluation criteria sheet</td>
<td>Evaluation component for persuasive writing</td>
</tr>
<tr>
<td>Emoticon choices (3)</td>
<td>Emoticon choices</td>
</tr>
<tr>
<td>Text exemplars</td>
<td>Copy function</td>
</tr>
<tr>
<td>Copy function</td>
<td>Word prediction</td>
</tr>
<tr>
<td>Goal setting for next essay</td>
<td>Highlighted prompting</td>
</tr>
<tr>
<td>Publish function (email, iBook, or print)</td>
<td>Spell-Check Function</td>
</tr>
<tr>
<td>Text-to-Speech</td>
<td>Timer function</td>
</tr>
</tbody>
</table>

The following section describes the procedures in detail.
Procedures

The two classes were randomly assigned to one of two groups (Cohort A or Cohort B). During the first two sessions, both groups were administered the TOWL-4 Subtest 6, and a Persuasive Essay Pretest. All persuasive essays followed the same directions and provided the students with a choice of two prompts. In the third and fourth sessions, both cohorts received instruction on writing persuasive essays, followed by another Persuasive Essay Pretest at the fifth session.

Following those sessions, during the sixth session, the first experimental condition began. Cohort A received instruction in persuasive writing using the *Project WeGotIt!* app and the iPad. Cohort B received instruction in persuasive writing using the paper graphic organizer. Persuasive essay samples were collected during the experimental conditions, and then after the intervention, a posttest persuasive essay was collected without any graphic organizers. After the first experimental condition, the groups switched conditions.

In experimental condition two, Cohort A received instruction in persuasive writing using the paper graphic organizer; while Cohort B received instruction in persuasive writing using the *Project WeGotIt!* app and the iPad. Persuasive essay samples were collected during the experimental conditions, and a posttest essay without any graphic organizers was collected after the intervention.

In the last phase, student volunteers were interviewed to investigate their perceptions about writing with the technology. See Table 3.3 for the intervention sequence. Details on each of the instructional procedures are presented in the next section.
### Table 3.3

**Intervention Time Table**

<table>
<thead>
<tr>
<th>Day</th>
<th>Group 1</th>
<th>Group 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TOWL-4</td>
<td>TOWL-4</td>
</tr>
<tr>
<td>2</td>
<td>Pretest 1</td>
<td>Pretest 1</td>
</tr>
<tr>
<td>3</td>
<td>Instruction on persuasive essays</td>
<td>Instruction on persuasive essays</td>
</tr>
<tr>
<td></td>
<td>Criteria for strong persuasive essays</td>
<td>Criteria for strong persuasive essays</td>
</tr>
<tr>
<td>4</td>
<td>Pretest 2</td>
<td>Pretest 2</td>
</tr>
<tr>
<td>5</td>
<td>Graphic Organizer</td>
<td>Training w/ App</td>
</tr>
<tr>
<td>6</td>
<td>Sample 1</td>
<td>Training w/ App</td>
</tr>
<tr>
<td>7</td>
<td>Sample 2</td>
<td>Sample 1</td>
</tr>
<tr>
<td>8</td>
<td>Post Test 1</td>
<td>Sample 2</td>
</tr>
<tr>
<td>9</td>
<td>Training w/ App</td>
<td>Post Test 1</td>
</tr>
<tr>
<td>10</td>
<td>Training w/ App</td>
<td>Graphic Organizer</td>
</tr>
<tr>
<td>11</td>
<td>Sample 3</td>
<td>Sample 3</td>
</tr>
<tr>
<td>12</td>
<td>Sample 4</td>
<td>Sample 4</td>
</tr>
<tr>
<td>13</td>
<td>Post Test 2</td>
<td>Post Test 2</td>
</tr>
<tr>
<td>14</td>
<td>Interviews</td>
<td>Interviews</td>
</tr>
</tbody>
</table>

**Phase 1 – Instruction in persuasive writing.** Two instructional sessions were dedicated to teaching background knowledge on persuasive writing and the components of effective persuasive essays. The next two sections provide more detailed descriptions of this instruction for both cohorts.
Lesson 1. During the first lesson, the teachers provided explicit direct instruction to the whole group by providing background knowledge of persuasive elements. Additionally, the mnemonic device, IDEAS, was introduced and its importance explained. The researcher presented the following topics: opinions, supporting reasons, transition words, and summarization, while soliciting students’ background knowledge. The researcher demonstrated the use of the mnemonic to plan a persuasive essay on a topic of the students’ choice. The researcher then reviewed the ideas generated and summarized the lesson (See Appendix F).

Lesson 2. During the second lesson, the researcher provided explicit direct instruction to the whole group on the characteristics of an effective persuasive essay. First the researcher explicitly explained the characteristics (i.e. thesis or opinion, organization, reasons and support) of an effective persuasive essay. The students were given two persuasive essays (See Appendix G) to evaluate based on the rubric. Once the teachers felt that the whole class had a basic understanding of the rubric, they distributed and read the first essay aloud.

The first essay, a nonexample of an effective persuasive essay, was intentionally disorganized, absent of a thesis, and contained grammatical errors. The teacher modeled how to score the essay, using the criteria checklist below the essay on opinions, reasons, and examples. With guided practice, the students were then asked to score the essay, addressing the last two items of the rubric (transition words and summary). This was followed by a whole-group discussion in which the teacher modeled how to add up the scores to “grade” the essay. Next, the second essay was distributed for students to score independently.

The second essay, an example of an effective persuasive essay, was read aloud and the students were asked to score the essay independently. Once students finished scoring, they were asked to discuss their scores with a prearranged partner and to come to an “agreed upon score”
for each criteria item. Five to eight minutes were allocated for this discussion, and then the students were prompted to return to whole-group instruction. The teacher asked students to state their scores, to assess if students were generally correct and if any “off the mark” scores needed to be discussed further. Lastly, the teacher concluded the lesson with a review of the rubric and why it is important to think about the characteristics of an effective persuasive essay during planning. The students then moved into the next phase of the study.

**Phase 2 – Experimental conditions.** This section provides a more detailed description of the instruction that occurred during the two experimental conditions: 1) persuasive essay writing with a paper graphic organizer, and 2) persuasive essay writing with a TBGO and the iPad. Cohort A received instruction in using the TBGO and the iPad first, while Cohort B received the graphic organizer instruction. Then, they switched conditions.

**Graphic organizer- Lesson 1.** The teacher provided direct instruction, guided practice, and independent practice on preplanning strategies using the graphic organizer (See Appendix H). The graphic organizer (Appendix D) featured the mnemonic IDEAS and self-assessment components, similar to the iPad graphic organizer. Explicit instruction in the importance of planning, and how the graphic organizer can assist with planning, was presented. Using the topic discussed in a previous lesson (i.e. what toy should your friend buy), the teacher displayed the completed chart paper of the ideas generated during that session. Next, the teacher introduced the graphic organizer, emphasized the mnemonic IDEAS, and discussed what belongs in each box. Then the teacher modeled how to complete the graphic organizer, while soliciting participation from the class. The teacher then modeled how to transfer the sentences into a paragraph and self-assess using the evaluation prompts. Next, the students were given guided practice in using the graphic organizer to compose a persuasive essay.
The teacher wrote a prompt on the board and distributed the paper graphic organizer to each student. The teacher modeled how to complete half of the graphic organizer while students followed along. Finally, the students were given the opportunity to complete the other half of the organizer and transfer their sentences independently. The teacher reviewed the evaluation components as a whole group and concluded the lesson.

**Independent practice with the graphic organizer.** Lessons two and three are identical since these served as the independent practice for planning with the graphic organizers. The teacher provided two persuasive prompts (See Appendix C) and instructed the students to choose one topic for their essay. The teacher read the same directions as in the pretest and posttest conditions. At the end of each session, the essay was collected and labeled with student’s identifying code for later scoring.

**Posttest.** Following independent practice, the teacher administered a posttest in the same manner as the pretest. Students were given two sheets of lined paper; the teacher provided two persuasive prompts (See Appendix C) and instructed the students to choose one topic for their essay. The teacher read the same directions as in the pretest condition. At the end of each session, the essay was collected and labeled with student’s identifying code for later scoring.

**iPad-Lesson 1.** The teacher provided direct instruction, guided practice, and independent practice on using the TBGO and the iPad for planning and writing a persuasive essay (See Appendix I). On the first day of instruction, the teacher projected the iPad so the entire class could see it and introduced the iPad and the *Project WeGotIT!* app, featuring the mnemonic IDEAS. The teacher provided explicit instruction in the importance of planning and how a graphic organizer can assist with planning. Using the lesson embedded in the app (ice cream is the best dessert ever), the teacher introduced the graphic organizer, emphasize the mnemonic
IDEAS, and discussed what belongs in each textbox. Then the teacher modeled how to complete the graphic organizer, while soliciting participation from the class. Next, the teacher modeled the cut and paste feature and how to self-assess using the evaluation prompts. Finally, the students were given some time to explore the app.

The teachers distributed iPads and stands to each student and prompted students to open up the lesson in the app, and to fill in the missing boxes in the organizer, using the built in, partially-completed activity. Using the cut and paste feature, the students reviewed their paragraph and evaluated their work. The teachers reviewed the evaluation process as a whole-group activity and concluded the lesson.

**iPad app - Lesson 2.** The second day of instruction, the teacher provided guided practice in using the iPad and app for planning a persuasive essay. The teacher reviewed the mnemonic, importance of planning, and the safe-handling procedures for using the iPad. The teacher displayed the topics from the previously-discussed lesson on persuasive essays and distributed the iPads and stands. The teacher walked the students through the process of filling in the organizer from the information on the chart paper, including the selection process for transition words, cutting and pasting their work, and revising their paragraph. The evaluation process was modeled and discussed, and the teacher reminded the students about the importance of saving their work and publishing it to the *iBook* app. Finally, the iPads were collected and the lesson concluded.

**Independent practice with the iPad.** During the third and fourth lessons with the iPad, the teacher distributed the iPads and stands and provided students with two persuasive prompts (See Appendix C) and instructions to choose one topic for their essay. The teacher provided instructions in the same manner as the pretests and posttests persuasive essays, and the students
completed the task using the iPad and the app. These essays were saved to the iBook app with each student’s identifier code for later downloading and scoring.

**Posttest.** Following independent practice, the teacher administered a posttest in the same manner as the pretest. Students were given two sheets of lined paper; the teacher provided two persuasive prompts (See Appendix C) and instructed the students to choose one topic for their essay. The teacher read the same directions as in the pretest condition. At the end of each session, the essay was collected and labeled with student’s identifying code for later scoring.

**Phase 3 – Interviews.** The last phase was dedicated to interviewing the students. Student volunteers were recruited from each cohort. The researcher made an announcement to the whole class asking if anyone would be interested in talking with her about their thoughts on using the iPad for writing. The researcher conducted the interviews in a quiet section of the classroom and typed each response, verbatim.

**Treatment Integrity**

The integrity of the lessons was ensured in two ways. First, each lesson was scripted with embedded check-off boxes. This helped ensure that the same lessons were taught in the same order to both groups. Secondly, the classroom teacher checked-off each step as it was taught, serving as a fidelity monitor. A sample of the scripted lesson plans can be found in Appendixes F, H, and I.

**Summary**

All students received instruction in planning with both media – paper graphic organizer and TBGO. The instructional design for each condition followed the same sequence of direct instruction, guided practice, and independent practice. The iPad condition received one extra day of instruction to ensure that students are competent with the technology prior to the assessment.
Data Collection and Scoring

All assessments, persuasive essays, and interview data were collected and scored with identifying information removed and replaced by codes. The TOWL-4 subtest was scored by a graduate student who was naive to the study, according to the directions in the manual and the descriptive statistics of each cohort reported.

Persuasive essays. Students’ essays were collected at eight points throughout the study: two pretests, two essays from the iPad condition, two essays from the paper graphic organizer condition, and one posttest following each of the two conditions. Handwritten essays were transcribed using Microsoft Word. All essays were scored for number of words written, number of persuasive elements, and holistic quality. Before scoring, any identifying information was removed, with the exception of the assigned unique identification number, and essays were typed exactly as they appeared on the paper. The researcher emailed each essay from the iBook app on the iPads to an email account dedicated to this study. The essays were in PDF file format, then the researcher cut and pasted the essays into a Microsoft Word document. All essays were printed from Microsoft Word without corrections or deviations from the written sample.

Two graduate students naive to the study were trained by the researcher as raters to score the number of persuasive elements and holistic quality of the essays. Anchor papers from students from another class not included in this study were used to train the raters (See Appendix J). The raters were trained by working together with the researcher on practice persuasive essays with the rubric until at least 80% reliability was established over five essays (See Appendix K). Raters then scored the each essay independently. After independent scoring, discrepancies were discussed. The measures are summarized in the following sections.
**Holistic quality.** Essay quality was assessed using the PSSA Quality Index (Deatline-Buchman & Jitendra, 2006). The rubric includes items such as focus, content, organization, style, and conventions (See Appendix K). Scores on the rubric range from 1, representing the lowest writing quality, to 4, representing the highest writing quality for each item. The total score on this rubric could range from zero (if the essay is off topic) to 20.

**Number of persuasive elements.** The numbers of persuasive elements (adapted from Mason, Kubina & Taft, 2011) served as the primary measure. Students earned one point for the topic sentence, one point for each reason, one point for each explanation, and one point for the ending sentence. Raters were trained to score all essays. The score on an essay could vary depending on the number of reasons and explanations included.

**Total number of words.** The number of words written for each essay was counted using the Microsoft Word’s word-count function. A word was defined as at least one character long, separated by a space before and after it. Essay titles were included in the word count. This measure was used to determine the effect that the intervention has on the length of the participants’ persuasive essays. There is no set range for this measure.

**Interview data.** Student responses from semi-structured interviews were typed verbatim by the researcher. Data were analyzed through descriptive analysis. Answers were tabulated for each question. A descriptive analysis of students’ responses was completed for each research question.

**Statistical Analysis**

All assessment and persuasive essay data were entered into SPSS Statistics Software (IBM, 2013). To answer the first four research questions, statistical analyses were conducted to assess the efficacy of this intervention as indicated by a significant change in the dependent
measures. The data were analyzed graphically to gauge the distribution of scores, followed by calculations of means and standard deviations, and then paired with a statistical model (Field, 2009). Since the analysis was examining three differently-scaled dependent measures (number of words written, number of persuasive elements, or holistic quality) simultaneously and repeatedly, three, separate repeated measures analysis of variances (ANOVA) were employed. This design allowed for a within-subjects factor analysis of the treatment group’s pretest and posttest scores, as well as a between-subject factor analysis of the scores between the two cohorts (Huberty & Olejnick, 2006). If the univariate F test was significant, then independent paired t-tests were conducted.

**Assumptions.** The following assumptions were examined during this analysis: normality, linearity, sphericity, homoscedasticity, and homogeneity of variances. The assumption of normality is that scores are distributed normally and will not be skewed. Linearity is the assumption that the data from this study will align with data from the population and therefore the results will generalize to that population. An examination of the residual plots, skewness, kurtosis, and outliers will verify that the assumptions of linearity and normality were met. Homoscedasticity is the assumption that the residuals have the same variance and can be determined graphically or by the Levene’s test statistic. Lastly, homogeneity of variances, the assumption that the groups in the study come from the same population and the variances should be constant, was tested with the Box M test.

**Control for Extraneous Confounding Variables**

**Noncomparable groups.** Although the two cohorts were comprised of students in the same grade level, randomization could not be achieved due to the students’ set schedules and classroom enrollment. However, the switching replications design allowed for all participants to
receive the treatment. Therefore, selection bias and mortality were inconsequential because each group served as its own control.

**Endogenous change.** Natural developments, such as maturation, were controlled for by the short length of the study; the study was conducted over a three week period. All students in the classes with parental permission, regardless of skill level or disability, were included in the study in order to control for regression effects.

**Treatment misidentification.** The researcher and teacher delivered all of the lessons and administered all of the tests and essay prompts in the same manner to both groups, which controlled for teacher and instrument effect. Scripted lesson plans also aided in preventing this effect.

**Contamination.** To control for contamination, the students were asked to not discuss the study with any other students.
Chapter IV

Results

Overview

This chapter synthesizes the quantitative and qualitative results of the intervention. An investigation was conducted to compare the quantity and quality of persuasive essays composed by fourth-graders by two methods of planning and writing – technology-based graphic organizer (TBGO) on an iPad and a paper graphic organizer. Three dependent measures were analyzed at eight points during the intervention: holistic quality, number of persuasive elements, and number of words written. Additionally, posttests were analyzed to determine what effect, if any, the intervention had on a simple paper and pencil writing task. Lastly, participants’ perceptions of using the iPad for planning and writing were collected through semi-structured interviews and are presented through descriptive analysis. Interrater agreement will be reported separately in the results of each section.

Treatment integrity was addressed through scripted lessons with embedded check-boxes. The classroom teacher served as a fidelity monitor by checking off the steps of the lesson plans as the researcher instructed the class. Treatment integrity was calculated by dividing the number of steps followed by the total number of steps and multiplying by 100.

\[
\text{number of steps followed} \div \text{total number of steps scripted} \times 100 = \% \text{ fidelity}
\]

The fidelity score for Cohort A was 97% and for Cohort B was 92%. The reason for the discrepancy in fidelity score between the cohorts was due to the fact that Cohort B had already used the paper graphic organizer and was already familiar with the strategy. During instruction,
it was observed that they were moving ahead of the instruction, requiring less step by step explicit instruction.

**Quantitative Data Analysis**

This section reports the findings of participants’ scores on the TOWL-4 and repeated measures analysis of variance (ANOVA) of participants’ essays. All results were interpreted at the $p < 0.05$ level, the standard level for statistically significant research results (Fisher, 1925).

**Test of Written Language, 4th edition (TOWL-4) subtest results.** This section describes the results of participants’ writing ability from the Contextual Conventions subtest of the TOWL-4. This test was used to identify preexisting writing ability prior to the intervention. Table 4.1 presents the results from the subtest, specifically the descriptive terms for participants’ writing levels, at the start of the intervention, by cohort.

Table 4.1

| Participants’ Scores from TOWL-4, Contextual Conventions Subtest in Descriptive Terms |
|-----------------------------------------------|-------------------------------|-----------------|-----------------|---------------|
| Descriptive                      | Scaled Score | Cohort A | Cohort B | Total % |
| Very Superior                   | 17-20        | 1        | 3              | 11         |
| Superior                        | 15-16        | 4        | 3              | 20         |
| Above Average                   | 13-14        | 3        | 0              | 8          |
| Average                         | 8-12         | 8        | 9              | 47         |
| Below Average                   | 6-7          | 0        | 3              | 8          |
| Poor                            | 4-5          | 0        | 0              | 0          |
| Very Poor                       | 1-3          | 1        | 1              | 6          |

Results indicate that 47% of all participants scored in the average range on the subtest (8-12), 39% scored between above average (13-14) and very superior (17-20), and 14% scored between below average (6-7) to very poor (1-3). These results show that based on the TOWL-4...
Contextual Conventions subtest for writing, 86% of the participants were at or above grade-level in writing at the time of the intervention.

**Persuasive Essay Results.** This section addresses the first four research questions regarding the difference in quantity and quality of persuasive essays by intervention – technology or paper. Following the TOWL-4 subtest and prior to instruction, a pretest was administered. After the first pretest, two days of the intervention were dedicated to instruction in persuasive writing. Following the instruction in persuasive writing, a second pretest was administered to establish a pretest for persuasive writing. Both pretests were administered under the same conditions. After pretest 2 was administered, Cohort A received two days of instruction on using the technology-based graphic organizer (TBGO) on the iPad to plan and write a persuasive essay, followed by two days of independent writing with the technology. The two persuasive essays, written independently, were averaged and that score was used in this analysis. Meanwhile, Cohort B received one day of instruction on how to use the paper graphic organizer, followed by two days of independent writing with the paper graphic organizer.

Following the intervention, a posttest was administered under the same condition as the pretests, and then the cohorts switched interventions. Hence, Cohort A received instruction with the paper graphic organizer while Cohort B received instruction in the TBGO on the iPad. Participants wrote two independent essays in each condition, scores were averaged, and posttests were administered once again. Table 4.2 displays the means and standard deviations for all students, across the three dependent measures of holistic quality, number of persuasive elements, and number of words written, at all six writing conditions throughout the intervention.
Table 4.2

Means and Standard Deviations for Writing Conditions by Dependent Measures

<table>
<thead>
<tr>
<th>Dependent Measures</th>
<th>Pretest 1</th>
<th>Pretest 2</th>
<th>iPad</th>
<th>Post iPad</th>
<th>Paper</th>
<th>Post Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holistic Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>12.46</td>
<td>14.36</td>
<td>16.76</td>
<td>15.39</td>
<td>16.55</td>
<td>16.60</td>
</tr>
<tr>
<td>SD</td>
<td>2.50</td>
<td>2.65</td>
<td>2.57</td>
<td>2.89</td>
<td>2.35</td>
<td>3.45</td>
</tr>
<tr>
<td>Number of Persuasive Elements</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>5.99</td>
<td>6.59</td>
<td>7.35</td>
<td>6.76</td>
<td>7.48</td>
<td>7.63</td>
</tr>
<tr>
<td>SD</td>
<td>3.17</td>
<td>1.91</td>
<td>1.63</td>
<td>2.03</td>
<td>1.44</td>
<td>1.75</td>
</tr>
<tr>
<td>Number of Words Written</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>107.11</td>
<td>111.89</td>
<td>126.74</td>
<td>102.14</td>
<td>94.15</td>
<td>96.17</td>
</tr>
<tr>
<td>SD</td>
<td>49.00</td>
<td>51.95</td>
<td>53.61</td>
<td>37.34</td>
<td>31.34</td>
<td>36.24</td>
</tr>
</tbody>
</table>

Pretests. A visual analysis of the data indicates that participants benefitted from the intervention in persuasive writing between pretest 1 (no instruction) and pretest 2 (after instruction in persuasive writing), with statistically significant differences found in holistic quality between pretest 1 ($M = 12.46$, $SD = 2.50$) and pretest 2 ($M = 14.36$, $SD = 2.65$) conditions; $t(34) = 4.89$, $p < .005$. Although participants’ scores improved across all dependent measures, no statistically significant difference was found in number of persuasive elements from pretest 1 ($M = 5.99$, $SD = 3.17$) and pretest 2 ($M = 6.59$, $SD = 1.91$) conditions; $t(34) = 1.14$, $p = 0.26$ or for number of words written during pretest 1 ($M = 107.11$, $SD = 49.00$) and pretest 2 ($M = 111.89$, $SD = 51.95$) conditions; $t(34) = 0.94$, $p = 0.36$. Persuasive essays from pretest 1 evidenced that students had prior knowledge of elements of a good persuasive essay.
and included topic sentence, reasons, explanations, and a concluding sentence. Therefore, instruction between pretest 1 and pretest 2 did not impact essays.

To answer the research questions one through three, participants’ scores at Pretest 2 were used as a baseline score in order to account for instruction in persuasive writing, prior to Pretest 2. Scores from the two independent essays from the iPad condition were averaged and the two independent essays from the paper condition were averaged. For the dependent measures of quality and persuasive elements, scores between independent essays had little variability, less than a half a point on average. For the dependent measure of words written, scores varied for Cohort A 27 points on average, but less than one point on average for Cohort B. This averaged score was used in this analysis. Separate factorial, repeated measures analyses of variance (ANOVA) were performed for each dependent measure to test for differences between writing conditions – pretest, iPad, and paper.

**Question 1:** What is the difference in holistic quality of essays composed with a technology based graphic organizer (TBGO) on the iPad compared to essays composed using a paper graphic organizer, as measured by a holistic quality index? Quality scores were determined by two graduate students that were naive to the study, using the PSSA Quality Index (Deatline-Buchman & Jitendra, 2006). The interrater agreement was determined by dividing the number of agreement of scores within two points by the number of agreements and disagreements, and then multiplying by 100. The interrater agreement for quality was 77%. Raters then discussed disagreements to reach 100% agreement (within two points). Those scores that were within two points apart were averaged and the average was used in the analysis.

A factorial, repeated measures ANOVA was conducted to compare the difference in participants’ holistic quality scores between pretest 2 and the iPad conditions, between pretest 2
and the paper conditions, and between the iPad and paper conditions. The fixed, categorical variable was class with two levels – Cohort A and Cohort B. The continuous dependent variable was holistic quality score across conditions with three levels – pretest, iPad, and paper.

Examination of the residual plots confirms the assumptions of linearity, homogeneity, and normality. Mauchly’s test of sphericity is not significant; \( p > .05 \), therefore, the assumption of sphericity was not violated. An examination of Box’s Test of Covariance indicated that the test of equal covariance was not violated; \( p > .001 \). Levene’s Test of homogeneity of variance indicated that assumption of homogeneity was not violated \( p > .05 \). Presented in Table 4.3 is a summary of means and standard deviations for holistic quality in each condition by cohort; a summary of the results of the analysis of variance may be found in Table 4.4.

Table 4.3

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cohort A (N=17)</th>
<th>Cohort B (N=19)</th>
<th>Total (N=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( M )</td>
<td>14.29</td>
<td>14.45</td>
<td>14.36</td>
</tr>
<tr>
<td>SD</td>
<td>2.75</td>
<td>2.55</td>
<td>2.61</td>
</tr>
<tr>
<td>iPad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( M )</td>
<td>16.90</td>
<td>16.64</td>
<td>16.76</td>
</tr>
<tr>
<td>SD</td>
<td>2.76</td>
<td>2.46</td>
<td>2.57</td>
</tr>
<tr>
<td>Paper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( M )</td>
<td>16.90</td>
<td>16.24</td>
<td>16.55</td>
</tr>
<tr>
<td>SD</td>
<td>2.18</td>
<td>2.51</td>
<td>2.35</td>
</tr>
</tbody>
</table>
Table 4.4

*Analysis of Variance for Holistic Quality*

<table>
<thead>
<tr>
<th>Source</th>
<th>df hypothesis</th>
<th>df error</th>
<th>F</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>2</td>
<td>33</td>
<td>50.67*</td>
<td>.75</td>
</tr>
<tr>
<td>Class</td>
<td>1</td>
<td>34</td>
<td>0.11</td>
<td>.00</td>
</tr>
<tr>
<td>Condition X Class</td>
<td>1</td>
<td>33</td>
<td>0.82</td>
<td>.05</td>
</tr>
</tbody>
</table>

*p < .001

Statistically significant difference of within-subjects was found for the main effect of condition, $F(2,33) = 50.67; p < .001; \eta^2 = .75$, indicating a large effect size (Cohen, 1965). However, the test of the between-subjects effects was not significant $F(1,34) = .11; p > .05; \eta^2 = .003$, nor was the interaction of class and condition $F(2,33) = .82, p > .05$. Pairwise comparisons showed significant differences between pretest and the iPad; $t(35) = 9.89, p < .001$, as well as pretest and paper; $t(35) = 6.73, p < .001$. Although quality scores were slightly higher in the iPad condition, no significance was found between iPad and paper; $t(35) = .73, p = .48$. Figures 4.1 and 4.2 display holistic quality means across the three writing conditions – pretest, iPad, and paper for each cohort.
Figure 4.1: Quality Means by Writing Condition for Cohort A

Figure 4.2: Quality Means by Writing Condition for Cohort B
An investigation of the analysis indicates that holistic quality scores increased significantly between pretest and both conditions. Although students scored slightly higher in the iPad condition ($M=16.76$) over the paper condition ($M=16.55$) no significant difference was found between conditions, or between groups. Results suggest that both interventions improved writing quality significantly over pretest; however, neither the type nor the sequence of intervention affected the quality of persuasive essays.

**Question 2: What is the difference in number of persuasive elements produced in essays Composed with the TBGO on the iPad compared to essays composed with a paper graphic organizer?** The number of persuasive elements (adapted from Mason, Kubina & Taft, 2011) was determined by two graduate students. Essays were awarded one point for the topic sentence, one point for each reason, one point for each explanation, and one point for the ending sentence. Reliability was determined by dividing the number of exact agreement of scores within 2 points by the number of agreements and disagreements, and then multiplying by 100. The interrater agreement was 92%. Raters then discussed disagreements to reach 100% agreement (within two points). Those scores that were 2 points apart were averaged and the average was used in the analysis.

A factorial, repeated measures ANOVA was conducted to compare the difference in participants’ number of persuasive elements, between pretest and the iPad conditions, between pretest and the paper conditions, and between the iPad and paper conditions. The fixed, categorical variable was class with two levels – Cohort A and Cohort B. The continuous dependent variable was number of persuasive elements across conditions with three levels – pretest, iPad, and paper. An examination of the residual plots confirms the assumptions of linearity, homogeneity, and normality. Mauchly’s test of sphericity is not significant; $p > .05$, therefore, the assumption of
sphericity was not violated. An examination of Box’s Test of Covariance confirms that the assumption of equal covariance was not violated; $p > .001$. Levene’s Test of homogeneity of variance indicated that the assumption of homogeneity was not violated; $p > .05$. Presented in Table 4.5 is a summary of means and standard deviations for persuasive elements for Cohort A and B between conditions; summary of the results of the analysis of variance may be found in Table 4.6.

Table 4.5

**Means and Standard Deviations for Persuasive Elements by Cohort**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cohort A (N=17)</th>
<th>Cohort B (N=19)</th>
<th>Total (N=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>6.44</td>
<td>6.95</td>
<td>6.71</td>
</tr>
<tr>
<td>SD</td>
<td>1.34</td>
<td>2.49</td>
<td>2.02</td>
</tr>
<tr>
<td>iPad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>7.41</td>
<td>7.30</td>
<td>7.35</td>
</tr>
<tr>
<td>SD</td>
<td>1.62</td>
<td>1.68</td>
<td>1.63</td>
</tr>
<tr>
<td>Paper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$M$</td>
<td>7.71</td>
<td>7.28</td>
<td>7.48</td>
</tr>
<tr>
<td>SD</td>
<td>1.25</td>
<td>1.60</td>
<td>1.44</td>
</tr>
</tbody>
</table>

Table 4.6

**Analysis of Variance for Persuasive Elements**

<table>
<thead>
<tr>
<th>Source</th>
<th>$df$ hypothesis</th>
<th>$df$ error</th>
<th>$F$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Condition</td>
<td>2</td>
<td>33</td>
<td>3.42*</td>
<td>.17</td>
</tr>
<tr>
<td>Class</td>
<td>1</td>
<td>34</td>
<td>0.00</td>
<td>.00</td>
</tr>
<tr>
<td>Writing Condition X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td>2</td>
<td>33</td>
<td>1.08</td>
<td>.06</td>
</tr>
</tbody>
</table>

*p < .05
Statistically significant difference for within-subjects effects was found for the main effect of writing condition, $F(2,33) = 3.42; p < .05; \eta^2 = .17$, indicating a medium effect size (Cohen, 1965). However, statistical significance was not found for the test of the between-subjects effects, $F(1,34) = .001; p > .05; \eta^2 = .00$ or for the interaction of class and condition, $F(2,33) = 1.08, p > .05, \eta^2 = .06$. Pairwise comparisons indicated a statistical significant difference between pretest and the iPad, $t(35) = 2.11, p < .05$, as well as pretest and paper condition, $t(35) = 2.40, p < .05$. However, statistical significance was not found between iPad and paper, $t(35) = .45, p > .05$. Figures 4.3 and 4.4 display the means for number of persuasive elements for the two cohorts, across the three writing conditions – pretest, iPad, and paper.

Figure 4.3: Means for Persuasive Elements by Writing Condition for Cohort A
An investigation of the analysis indicates that the number of persuasive elements employed by participants increased significantly between pretest and the other conditions, but significant differences were not found between iPad ($M=7.35$) and paper conditions ($M=7.48$) or between cohorts. Results suggest that both interventions improved the number of persuasive elements significantly over pretest. However, neither the type nor sequence of intervention affected number of persuasive elements.

**Question 3: What is the difference in the number of words composed with the TBGO on the iPad compared to essays composed using a paper graphic organizer?** All essays were typed by the researcher. Number of words composed was determined using Microsoft Word’s word-count function. A factorial, repeated measures ANOVA was conducted to compare the difference in participants’ number of words composed between pretest and the iPad conditions, between pretest and the paper conditions, and between the iPad and paper conditions. The fixed,
categorical variable was class with two levels – Cohort A and Cohort B. The continuous
dependent variable was holistic quality score across conditions with three levels – pretest, iPad,
and paper.

Examination of the residual plots confirms the assumptions of linearity, homogeneity,
and normality. Mauchly’s test of sphericity is not significant; \( p > .05 \), therefore, the assumption
of sphericity was not violated. An examination of Box’s Test of Covariance indicated that the
test of equal covariance was violated; \( p = .001 \). However, since the sample sizes are unequal, the
test may not be robust (Tabachnick & Fidell, 2013). Levene’s Test of homogeneity of variance
indicated that the assumption of homogeneity was not violated for Pretest 2 or the paper
condition; \( p > .001 \). However, it was violated for the iPad condition; \( p = .009 \), due to unequal
variances between the groups in the iPad. Presented in Table 4.7 is a summary of means and
standard deviations for words written between cohorts for each writing condition; summary of
the results of the analysis of variance may be found in Table 4.8
Table 4.7

*Means and Standard Deviations for Words Written by Cohort*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Cohort A (N=17)</th>
<th>Cohort B (N=19)</th>
<th>Total (N=36)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pretest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>119.47</td>
<td>109.68</td>
<td>114.31</td>
</tr>
<tr>
<td>SD</td>
<td>45.72</td>
<td>60.01</td>
<td>53.22</td>
</tr>
<tr>
<td>iPad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>111.68</td>
<td>140.21</td>
<td>126.74</td>
</tr>
<tr>
<td>SD</td>
<td>26.91</td>
<td>67.37</td>
<td>53.61</td>
</tr>
<tr>
<td>Paper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>96.03</td>
<td>92.47</td>
<td>94.15</td>
</tr>
<tr>
<td>SD</td>
<td>29.90</td>
<td>33.30</td>
<td>31.34</td>
</tr>
</tbody>
</table>

Table 4.8

*Analysis of Variance for Words Written*

<table>
<thead>
<tr>
<th>Source</th>
<th>df hypothesis</th>
<th>df error</th>
<th>F</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Condition</td>
<td>2</td>
<td>33</td>
<td>7.23*</td>
<td>.31</td>
</tr>
<tr>
<td>Class</td>
<td>1</td>
<td>34</td>
<td>0.16</td>
<td>.00</td>
</tr>
<tr>
<td>Writing Condition X Class</td>
<td>2</td>
<td>33</td>
<td>2.94</td>
<td>.15</td>
</tr>
</tbody>
</table>

*Statistically significant difference within-subjects was found for the main effect of writing condition, $F(2,33) = 7.23; p < .01; \eta^2 = .31$, indicating a large effect size (Cohen, 1965). However, statistical significance was not found for the test of the between-subjects effects, $F(1,34) = .16; p > .05; \eta^2 = .005$ or for the interaction of class and condition, $F(2,33) = 2.94, p > .05, \eta^2 = .15$. 
Pairwise comparisons indicated a statistical significant difference between pretest and the paper condition, $t(35) = 2.88, p < .01$, and between iPad to paper, $t(35) = 3.66, p = .001$. However, statistical significance was not found between pretest and iPad, $t(35) = 1.48, p > .05$.

Figures 4.5 and 4.6 display the means for number of words written across the three writing conditions for each cohort.

**Figure 4.5: Means for Words Written for Cohort A**

![Graph showing means for words written across conditions](image-url)
An investigation of the analysis indicates that the number of words written decreased significantly between pretest ($M=114.31$) and the paper condition ($M=94.15$). Additionally, statistical significance was found between iPad ($M=126.74$) and paper condition ($M=94.15$), favoring the iPad condition. However, this trend was not seen for both cohorts – students in Cohort B increased the number of words during the iPad condition, while Cohort A decreased the number of words written in the iPad condition from pretest. Therefore, no statistical significance was found between pretest ($M=114.31$) and iPad ($M=126.74$) conditions. Results suggest that participants in Cohort B wrote more with the iPad than at pretest, but all students wrote significantly more with the iPad than paper.

**Question 4: What effects will the technology-based graphic organizer (TBGO) and iPad have on a paper and pencil writing task written without the graphic organizer?**

Following each intervention, a posttest was administered in the same manner as the pretests. The
purpose of this posttest was to examine the effect that the interventions had on a paper and pencil task, devoid of any graphic organizer or technology. Separate factorial, repeated measures ANOVAs were conducted to compare the difference in participants’ essays for each of the dependent measures: holistic quality, number of persuasive elements, and number of words composed. The fixed, categorical variable was class with two levels – Cohort A and Cohort B. The continuous dependent variables were holistic quality, number of persuasive elements, and number of words composed, across conditions with three levels – pretest, iPad, and paper. Table 4.9 presents the means and standard deviations for the three dependent measures across conditions.

Table 4.9

<table>
<thead>
<tr>
<th>Dependent Measure</th>
<th>Pretest</th>
<th>Post iPad</th>
<th>Post Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holistic Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( M )</td>
<td>14.38</td>
<td>15.39</td>
<td>16.60</td>
</tr>
<tr>
<td>SD</td>
<td>2.61</td>
<td>2.89</td>
<td>3.45</td>
</tr>
<tr>
<td>Number of Persuasive Elements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( M )</td>
<td>6.71</td>
<td>6.76</td>
<td>7.63</td>
</tr>
<tr>
<td>SD</td>
<td>2.02</td>
<td>2.03</td>
<td>1.75</td>
</tr>
<tr>
<td>Number of Words Written</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( M )</td>
<td>114.31</td>
<td>102.14</td>
<td>96.17</td>
</tr>
<tr>
<td>SD</td>
<td>53.22</td>
<td>37.34</td>
<td>36.77</td>
</tr>
</tbody>
</table>

Holistic quality. A factorial, repeated measure ANOVA was conducted to analyze the data for holistic quality across the conditions of pretest, iPad posttest, and paper posttest. An examination of the residual plots confirms the assumptions of linearity, homogeneity, and normality. Mauchly’s test of sphericity is significant; \( p = .02 \), therefore the Huynh-Feldt...
correction was used for the within subjects effect. An examination of Box’s Test of Covariance confirms that the assumption of equal covariance was not violated; \( p > .001 \). Levene’s Test of homogeneity of variance indicated that the assumption of homogeneity was not violated; \( p > .05 \).

Table 4.10 displays the summary of the results of the analysis of variance.

Table 4.10

<table>
<thead>
<tr>
<th>Source</th>
<th>( df_{hypothesis} )</th>
<th>( df_{error} )</th>
<th>( F )</th>
<th>( \eta^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Condition</td>
<td>1.77</td>
<td>60.20</td>
<td>9.68*</td>
<td>.22</td>
</tr>
<tr>
<td>Class</td>
<td>1</td>
<td>34</td>
<td>.00</td>
<td>.08</td>
</tr>
<tr>
<td>Writing Condition X Class</td>
<td>1.77</td>
<td>60.20</td>
<td>3.10</td>
<td>.15</td>
</tr>
</tbody>
</table>

*\( p < .001 \)

A statistically significant difference of within-subjects was found for the main effect of writing condition, \( F(1.77,60.20) = 9.68; \ p < .001; \ \eta^2 = .22 \), indicating a medium effect size (Cohen, 1965). However, no significant difference was found for the test of the between-subjects effects, \( F(1,34) = .00; \ p > .05; \ \eta^2 = .00 \) or for the interaction of class and condition was not significant \( F(1.77, 60.20) = 3.10, \ p > .05, \ \eta^2 = .08 \). Pairwise comparisons showed significant differences between pretest and the iPad posttest; \( t(35) = 2.63, \ p < .05 \), as well as pretest and paper posttest; \( t(35) = 3.96, \ p < .001 \). Although quality scores were higher in the paper posttest condition, no significance was found between iPad posttest and paper posttest; \( t(35) = .195, \ p > .05 \). Figure 4.7 displays the holistic quality means across the five writing conditions.
Persuasive elements. A factorial, repeated measure ANOVA was conducted to analyze the data for number of persuasive elements across the conditions of pretest, iPad posttest, and paper posttest. An examination of the residual plots confirms the assumptions of linearity, homogeneity, and normality. Mauchly’s test of sphericity is not significant; $p > .05$, therefore, the assumption of sphericity was not violated. An examination of Box’s Test of Covariance confirms that the assumption of equal covariance was not violated; $p > .001$. Levene’s Test of homogeneity of variance indicated that the assumption of homogeneity was not violated; $p > .05$. Table 4.11 displays the summary of the results of the analysis of variance.

Table 4.11

<table>
<thead>
<tr>
<th>Source</th>
<th>$df_{hypothesis}$</th>
<th>$df_{error}$</th>
<th>$F$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Condition</td>
<td>2</td>
<td>33</td>
<td>3.75*</td>
<td>.19</td>
</tr>
<tr>
<td>Class</td>
<td>1</td>
<td>34</td>
<td>0.16</td>
<td>.00</td>
</tr>
<tr>
<td>Writing Condition X Class</td>
<td>2</td>
<td>33</td>
<td>0.24</td>
<td>.01</td>
</tr>
</tbody>
</table>

*p < .05
Statistically significant difference of within-subjects was found for the main effect of condition, $F(2,33) = 3.75; p < .05; \eta^2 = .19$, indicating a medium effect size (Cohen, 1965). However, the test of the between-subjects effects, $F(1,34) = .16; p > .05; \eta^2 = .005$ was not significant and neither was the interaction of class and condition $F(2,33) = 0.24, p > .05, \eta^2 = .01$.

Pairwise comparisons showed significant differences between pretest and the paper posttest; $t(35) = 2.41, p < .05$, as well as iPad posttest and paper posttest; $t(35) = 2.41, p < .05$. The difference between pretest and the iPad posttest was not statistically significant; $t(35) = .15, p > .05$. Figure 4.8 displays the means for persuasive elements across the five writing conditions.

**Figure 4.8: Number Persuasive Elements Included Across Conditions**

*Words written.* A factorial, repeated measure ANOVA was conducted to analyze the data for number of words written across the conditions of pretest, iPad posttest, and paper posttest. An examination of the residual plots confirms the assumptions of linearity, homogeneity, and normality. Mauchly’s test of sphericity is significant; $p = .02$, therefore the Huynh-Feldt correction was used for the within subjects effect (Tabachnick & Fidell, 2013). An examination of Box’s Test of Covariance confirms that the assumption of equal covariance was not violated;
Table 4.12 displays the posttest results of the analysis of variance for words written.

Table 4.12

<table>
<thead>
<tr>
<th>Source</th>
<th>df hypothesis</th>
<th>df error</th>
<th>F</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Writing Condition</td>
<td>1.77</td>
<td>60.25</td>
<td>3.93</td>
<td>.10</td>
</tr>
<tr>
<td>Class</td>
<td>1</td>
<td>34</td>
<td>1.23</td>
<td>.03</td>
</tr>
<tr>
<td>Writing Condition X Class</td>
<td>1.77</td>
<td>60.25</td>
<td>0.61</td>
<td>.02</td>
</tr>
</tbody>
</table>

Statistically significant difference was not found for within-subjects main effect of condition, $F(1.77,60.25) = 3.93; p > .05; \eta^2 = .10$, or for the test of the between-subjects effects, $F(1.34) = 1.23; p > .05; \eta^2 = .03$. The interaction of class and condition, $F(1.77,60.25) = .61, p > .05, \eta^2 = .02$ was also not significant. Pairwise comparisons showed significant differences between pretest and the paper posttest; $t(35) = 2.43, p < .05$, favoring the pretest condition. A statistical significance was not found between pretest and iPad posttest; $t(35) = 1.76, p > .05$, or for between iPad posttest and paper posttest; $t(35) = .121, p > .05$. Figure 4.9 displays means for words written across five writing conditions.
Figure 4.9: Number of Words Written Across Conditions

A visual analysis of the data indicates that participants wrote lengthier essays in the iPad condition over all other conditions, including pretest. Similar to the trends seen in the other two dependent measures, participants decreased scores in posttests, following the iPad. Results suggest that participants wrote lengthier essays using technology, but then decreased length once the technology was removed. Furthermore, students wrote less during the paper condition than at pretest.

Posttests following the intervention varied depending on condition. Scores decreased in posttests following the iPad condition; however, scores slightly increased in posttests following the paper condition. The next section focuses on the participants identified as having a disability during the time of the intervention.

**Students with Disabilities**

At the time of the study, five of the 36 participants were identified as having a disability. Although their scores were included in the cohort data, they were not statistically analyzed separately, due to the low number of participants. However, these results are pertinent to the
study to gain an understanding of the strategy’s efficacy for this population of students.

Presented in Table 4.13 are these students’ scores for the three dependent measures through the intervention. Pseudonyms have been used to maintain confidentiality.
Table 4.13

*Individual Scores for Students with Disabilities by Dependent Measure Across Conditions*

<table>
<thead>
<tr>
<th>Student (classification)</th>
<th>Pretest 1</th>
<th>Pretest 2</th>
<th>iPad</th>
<th>Post iPad</th>
<th>Paper</th>
<th>Post Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robbie* (SLI)</td>
<td>8</td>
<td>10</td>
<td>12</td>
<td>10</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>Holistic Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persuasive Elements</td>
<td>3</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Words Written</td>
<td>147</td>
<td>138</td>
<td>79</td>
<td>98</td>
<td>83</td>
<td>78</td>
</tr>
<tr>
<td>Jessica* (SLI)</td>
<td>12</td>
<td>9</td>
<td>11</td>
<td>12</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Holistic Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persuasive Elements</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Words Written</td>
<td>78</td>
<td>62</td>
<td>100</td>
<td>75</td>
<td>81</td>
<td>67</td>
</tr>
<tr>
<td>Jason* (ASD)</td>
<td>11</td>
<td>10</td>
<td>13</td>
<td>10</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>Holistic Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persuasive Elements</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Words Written</td>
<td>18</td>
<td>18</td>
<td>64</td>
<td>12</td>
<td>21</td>
<td>-</td>
</tr>
<tr>
<td>Elijah* (SLI)</td>
<td>11</td>
<td>11</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Holistic Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persuasive Elements</td>
<td>8</td>
<td>5</td>
<td>9</td>
<td>8</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Words Written</td>
<td>128</td>
<td>162</td>
<td>254</td>
<td>117</td>
<td>60</td>
<td>115</td>
</tr>
<tr>
<td>Roger* (TBI)</td>
<td>7</td>
<td>12</td>
<td>15</td>
<td>13</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Holistic Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Persuasive Elements</td>
<td>2</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Words Written</td>
<td>37</td>
<td>46</td>
<td>146</td>
<td>42</td>
<td>44</td>
<td>29</td>
</tr>
</tbody>
</table>

*Note.* SLI = Speech Language Impairment; ASD = Autism Spectrum Disorder; TBI = Traumatic Brain Injury; *=Pseudonym
A visual examination of students’ individual scores indicates that the technology-based graphic organizer (TBGO) on the iPad improved scores for three of the five students across all dependent measures. These three students improved scores in all three dependent measures in the iPad condition over pretest, as well as over paper condition, while two students’ scores varied without one condition prevailing. Jason’s posttest scores, following the paper condition, could not be obtained due to his absence that day and at the commencement of the study.

In terms of quality, four out of five students improved in quality over baseline. Jason and Roger wrote their best essays in the iPad condition, and Robbie and Elijah during the post paper condition. Jessica’s scores remained the same score at baseline, paper, and post paper conditions but decreased one point during both interventions. For persuasive elements, scores varied among participants. Jason, Elijah, and Roger included the most elements while writing with the TBGO, Robbie scored the highest at post paper condition, and Jessica scored the highest with the paper graphic organizer, and the two posttests. For number of words written, four out of the five wrote the most in the iPad condition. Specifically, Jason and Roger more than tripled their number of words written. Robbie was the only student who wrote lengthier essays at pretests.

Overall, students’ results varied over the course of the intervention. Three of the five students’ scores were better in the iPad condition over the paper condition, on all dependent measures. One student (Robbie) wrote lengthier and qualitatively better essays in the paper condition. Although Jessica’s quality was similar in both conditions, she employed more persuasive elements in the paper condition, but wrote more in the iPad condition.

**Qualitative Data Analysis**

This section reports the descriptive findings from semi-structured interviews and highlights one student’s case. Following the intervention, semi-structured interviews were
conducted to assess the social validity of the technology as a tool for writing. One case was highlighted in light of the participant’s abilities, essay results, and interview responses.

**Question 5: What are fourth grade students’ perceptions of utilizing the iPad as a writing tool, collected through semi-structured interviews?** Of the thirty-six participants, fourteen students volunteered to be interviewed. Interviews were conducted in the classroom, at a quiet table, and the researcher typed responses verbatim. Responses were then categorized and tallied by the researcher. Table 4.14 displays interviewees’ responses by question.

Table 4.14

<table>
<thead>
<tr>
<th>Participants’ Responses by Question</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Question</strong></td>
</tr>
</tbody>
</table>
| 1. Have you ever used an iPad or tablet in school or at home before this lesson? | Yes (N=12)  
No (N=2) |
| 2. If yes, how have you used an iPad or tablet in home or at school? | Play games (N= 9)  
Search information (N=4)  
Watch videos (N=3)  
Write stories (N=2)  
Listening to music (N=1)  
Texting (N=1)  
Reading (N=1)  
Video Chat (N=1)  
Watch TV programs (N=1)  
Not sure (N=1) |
| 3. What specifically did you like about using the iPad app for writing a persuasive essay? | Cut and paste instead of rewriting (N=4)  
Typing instead of handwriting (N=4)  
App made it easy to organize (N=3)  
Word prediction (N=3)  
Word count function (N=2) |
Choice of topic (N=1)
Planning was easy (N=1)
Revising was easy (N=1)
Fun to use (N=1)

Nothing (N=5)
Transition words pop-up menu (N=3)
Difficulty revising in paragraph mode (N=2)
Tapping between words (N=1)
"Goal not met" pop-up window (N=1)
Word prediction (N=1)
Unsure (N=1)

Preferred iPad (N=12)
  Easier to revise (N=7)
  Easier to plan and writing (N=3)
  Faster (N=2)
  Handwriting hurts (N=2)
  Neater (N=1)
  Write more (N=1)
  Fun (N=1)

Preferred Paper (N=1)
  More freedom (N=1)

No preference (N=1)

Preferred iPad (N=8)
  Prefer touch input (N=3)
  Word prediction (N=2)
  No keyboard or mouse (N=2)
  Adjustable stand (N=2)
  Organization and structure (N=1)
  Typing is stressful (N=1)
  Fun (N=1)
No preference (N=4)
Preferred computer (N=2)
Type faster (N=1)
Easier (N=1)

7. Now that you have used an iPad app for writing, what suggestions might you have for your teacher?

Use iPad for writing (N=5)
Use a computer for writing (N=2)
None (N=2)
Use iPad for other subject areas (N=1)
Kids take less breaks with an iPad (N=1)
iPad is helpful (N=1)
I don't know (N=1)

8. Is there anything else that we did not discuss today about using the iPad that you would like to share?

No comment (N=10)
Easier to use (N=1)
I want to get the app to use at home (N=1)
We should use them again (N=1)
More transitions words (N=1)

The majority of interviewees had used an iPad or tablet prior to the study (N=12), mostly for playing games (N=9). When asked what they liked about the composing on the iPad, the students discussed how the iPad was better than using pencil and paper; specifically, they cited the ease of touch input versus handwriting, deleting versus erasing, and the copy function of the app versus rewriting. When asked what they disliked about using the iPad, five students said “nothing,” one student was “unsure” and the others mentioned technology challenges of the specific app (e.g. transition pop-up menu).

Most students preferred composing essays on the iPad over paper and pencil (N=12), one student preferred paper and one student had indicated no preference. Two students spoke about
how their hand or wrist hurts from writing with a pencil. When asked about the iPad versus a computer, students indicated a preference for the iPad over a computer (N=8), no preference (N=4), or for a computer over iPad (N=2). One student stated that “typing [on a computer] is stressful.” Another student described how h/she liked ability of touching where to type instead of using a mouse.

When asked about recommendations to the teacher, interviewees stated that they would like to use the iPad more (N=5), two students suggested that the teacher should use computers for writing class, and one student wanted the teacher to know that “[with the iPad] kids wouldn’t have to take breaks, pencil writing gets tiring.” When asked if they had any final thoughts one student said they might “ask my Dad to download [the app] and I can write essays at home instead of at school.”

Overall, students’ perceptions were positive about using the iPad as a tool for writing, mostly in terms of its ease of use, functionality of the app, and fun appeal. The students favored the iPad over handwriting due to the neatness of the final product and handwriting fatigue from using a pencil. Many discussed how the writing process was much easier on the iPad in terms of planning and revising an essay. The ability to insert, omit, cut and paste their work with a touch of the finger seemed to be of greatest benefit. One student, in particular, wanted to share his reactions to composing with an iPad. In the next section, Roger’s story is highlighted, for two reasons: 1) he has physical and cognitive delays, and 2) his response to the technology was unique.

**Roger’s Story**

Roger is diagnosed with traumatic brain injury (TBI). One of his accommodations, specifically for writing, is the use of a slant board and enlarged paper. Due to its size, the slant
board is located at a table in the back of the classroom. Each time Roger has to write, he
relocates to the back of the classroom, sometimes away from instruction, and requires one-on-
one assistance to clamp the paper onto the slant board. While using the iPad, however, Roger
was able to sit at his desk, alongside his peers. Figure 4.10 displays two samples of Rogers
essays – one with enlarged paper and pencil and one composed on the iPad.

Figure 4.10: Samples of Roger’s Handwritten Essay and iPad Essay

<table>
<thead>
<tr>
<th>Handwritten Essay</th>
<th>Essay Composed on the iPad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children should not have to go to summer school</td>
<td>Children should not have to go to summer school</td>
</tr>
<tr>
<td>First, Summer is the time of the year to just relax</td>
<td>First, Summer is the time of the year to just relax and spend time with your friends and family</td>
</tr>
<tr>
<td>and spend time with your friends and family For</td>
<td>For example in the summertime your best friend</td>
</tr>
<tr>
<td>example in the summertime your best friend</td>
<td>might invite to the beach and that would also be a</td>
</tr>
<tr>
<td>might invite to the beach and that would also be a</td>
<td>time to just hang out with your friends. Another</td>
</tr>
<tr>
<td>time to just hang out with your friends. Another</td>
<td>reason, is that in the summer time it’s fun to make</td>
</tr>
<tr>
<td>reason, is that in the summer time it’s fun to make</td>
<td>cool summer projects. For example, building a big</td>
</tr>
<tr>
<td>cool summer projects. For example, building a big car</td>
<td>car and building a house</td>
</tr>
<tr>
<td>and building a house</td>
<td>One more, fun thing to do in the summer time is</td>
</tr>
<tr>
<td>One more, fun thing to do in the summer time is</td>
<td>to read lots of books For example, reading diary</td>
</tr>
<tr>
<td>to read lots of books For example, reading diary of a</td>
<td>of a wimpy kid. and so is reading Jack and Annie</td>
</tr>
<tr>
<td>wimpy kid. and so is reading Jack and Annie to learn</td>
<td>to learn So, that is why I think children</td>
</tr>
<tr>
<td>So, that is why I think children should not have to go</td>
<td>should not have to go to summer school.</td>
</tr>
<tr>
<td>to summer school.</td>
<td>In the hallways of Roger’s school, students’ work is on display. Due to Roger’s need for</td>
</tr>
<tr>
<td></td>
<td>enlarged paper, Roger’s work can be readily identified. Not only did Roger’s essays, on the iPad,</td>
</tr>
<tr>
<td></td>
<td>appear the same as his classmates, Roger’s essays on the iPad were lengthier and higher in</td>
</tr>
</tbody>
</table>
quality than his handwritten essays. He seemed excited while using the iPad (i.e. rocking and laughing) and wanted to talk about his success. Roger described using an iPad as:

happy … paper and pencil I have a hard time making it neater. I [get] nervous. On the iPad I just have to think about details what I am going to type and not how neat it looks. On pencil and paper and make it neat and who ever is going to read it …using an iPad is really fun for me and it’s much easier than using paper and pencil for me and it is similar to using computer because you just have to think and type and not worry about neatness.

[It was] really easy for me to compose my essays.

Roger attained the highest scores in the iPad condition over all other conditions. His essays were qualitatively better in the iPad condition \((M=15)\) over pretests \((M=9.5)\), paper \((M=12)\), and posttests \((M=12)\). He included more persuasive elements in the iPad condition \((M=6)\) over pretests \((M=3.5)\), paper \((M=5)\), and posttests \((M=4)\). His greatest gains were made in the number of words written. He wrote more in the iPad condition \((M=146)\) over pretests \((M=41.5)\), paper \((M=44)\), and posttests \((M=35.5)\). Not only did Roger express excitement and preference for writing with the iPad, his scores support his opinion regarding the ease of use.

**Summary**

The analysis examined the results of persuasive essays from six data points throughout the study: 1) prior to persuasive instruction; 2) after persuasive instruction; 3) during independent writing with a TBGO on the iPad; 4) after using iPad; 5) during independent writing using a traditional graphic organizer on paper; and, 6) after using the graphic organizer. Results indicate that participants benefited from the intervention overall, improving the quality and quantity of persuasive essays. Moreover, interview responses provided social validity for iPad as a tool for writing.
Statistically significant differences were found between pretest and the two writing conditions – iPad and paper graphic organizer. Posttest results, in which students returned to paper and pencil conditions without the use of a graphic organizer, were inconsistent. Quality and number of persuasive elements increased after the paper condition, while the iPad posttests scores decreased following the iPad condition. However, for the dependent measure words written, the posttests decreased significantly following paper, with no significant difference following the iPad condition.

Scores from participants identified as having disabilities (N=5) suggested that three of the five participants benefited from using an iPad for writing. Interview results indicated that participants favored the iPad over paper and pencil due to its ease of use. The next chapter will discuss these results as they relate to the literature, as well as implications for practice. Finally, limitations of the study and recommendations for future research are provided.
Chapter V

Discussion

The purpose of this study was to examine the effects of a technology-based graphic organizer (TBGO) and the iPad on the persuasive writing ability of fourth-grade students from two inclusion classrooms. Results indicated that the graphic organizer, with and without the use of technology, had a positive effect on students’ quality and quantity of persuasive essays. This chapter will highlight the findings and discuss implications for practice. In addition, the limitations of the study are presented, followed by recommendations for future research.

Summary of Findings

This study extends previous research of writing with a computer-based graphic organizer with an embedded mnemonic strategy (Evmenova et al., 2015) by comparing fourth-graders’ essays written with the TBGO to essays composed with a paper graphic organizer. Results of the study indicate that students with and without disabilities benefited from planning and writing with a graphic organizer, embedded with a mnemonic, on an iPad and on paper. Students in both cohorts improved on the two dependent measures of quality and number of persuasive elements in both conditions. However, for the dependent measure of number of words written, the results differed by cohort. Posttest results varied by condition. Social validity of the technology was gathered through semi-structured interviews, implying positive perceptions of using the iPad for writing.

Quality. Research has shown that explicit instruction in planning in advance of writing can improve essay quality (De La Paz & Graham, 1997; Graham & Harris, 1989; Graham, Harris, MacArthur, & Schwartz, 1991; Sawyer, Graham, & Harris, 1992; Wong, Butler, Ficzere, & Kuperis, 1996, 1997). Specifically, graphic organizers to support planning have improved
essay quality (Loader, 1989; Sturm & Rankin-Erickson, 2002; Zipprich, 1995). Furthermore, graphic organizers featuring a mnemonic have supported students when writing persuasive essays (Asaro-Saddler & Bak, 2012, 2014; Dexter & Hughes, 2011; DiCecco & Gleason, 2001; Graham & Harris, 1998; Sexton, Harris, & Graham, 1998; Meyer, 1995). This intervention focused on planning and writing a persuasive essay with a graphic organizer, embedded with the mnemonic IDEAS: Identify your opinion; Determine reasons; Elaborate with Examples, Add transition words, and Summarize (Evmenova & Regan, 2012; Evmenova et al., 2015). To assess what effect the technology had on the writing, the strategy was compared across two modes of writing — technology and paper and pencil.

Results of this study suggest that students learned to write significantly better essays using either type of graphic organizers with the IDEAS mnemonic, over pretest ($M=14.36$), with holistic quality scores being slightly higher when students wrote with the iPad ($M=16.76$) than the paper graphic organizer ($M=16.55$). These results support findings from a previous study with the same strategy (Evmenova et al. 2015). Using a holistic quality, eight-point scale, Evmenova and colleagues found that students improved quality over baseline while using the CBGO. This study employed a different quality scale that included criteria, such as writing conventions and style.

However, no significant difference was found between interventions or between groups, indicating that neither the type nor the sequence of the intervention had an effect. These findings corroborate previous literature that asserts students improve essay quality through explicit instruction and additional time to practice the strategy, not condition of writing (Sturm & Rankin-Erickson, 2002). In light of the limited number of days students used the technology ($N=4$), the results are promising and may support the assertion that technology can reduce the
burden of handwriting, allowing students more cognitive energy to focus on higher level processes of writing, thus resulting in higher quality essays (Englert et al., 2007; MacArthur & Graham, 1987; Schneider, Coddington & Tryon, 2013; Sturm & Rankin-Erickson, 2002). The length of the intervention is later discussed as a limitations and a direction for future research.

**Persuasive Elements.** Findings from this study indicate that the number of persuasive elements employed by participants increased significantly between pretest ($M=6.71$) and the iPad condition ($M=7.35$), and paper condition ($M=7.48$). Although scores were slightly higher in the paper condition, no significant differences were found between conditions, or between groups, suggesting that neither the type nor sequence of intervention affected number of persuasive elements. These results may have been due to the constraints of the goal-setting feature of the app, allowing for only three reasons and three explanations, and is a possible limitation of the study. Similar results were found in Evemenova et al. (2015), featuring the same graphic organizer; students in that study improved over baseline, but most students ($N=8$) did not write more than seven essay parts while using the graphic organizer.

**Number of Words Written.** Overall, participants wrote longer essays in the iPad condition ($M=126.74$) than during pretest ($M=114.31$) and significantly longer essays using the iPad than they did writing in the paper condition ($M=96.17$). However, quality was not significantly better in the iPad condition over paper, corroborating previous research that suggested an increase in essay length does denote an increase in quality (Asaro-Sadler & Bak, 2012). Additionally, students decreased in number of words written between pretest and paper, but no significant differences were found between pretest and paper.

Results for the dependent measures also differed by cohort in terms of using the iPad. In Cohort A, the number of words written slightly decreased from pretest to the iPad condition and
decreased again in the paper condition. The decrease in essay length, from pretest to each condition, might be explained by the phenomenon of knowledge-telling (Scardamalia & Bereiter, 1987) or dump writing (Sturm & Rankin-Erickson, 2002). At pretest, students may have written more because they wrote whatever came to mind and essays for this condition included irrelevant statements, such as slang language. For Cohort B, the number of words written decreased from pretest to the paper condition, but then increased in the iPad condition. The increase in the iPad condition could be attributed to the word count function feature. During the intervention, it was observed that students seemed motivated by the number of words they attained, which has also been noted in previous research on the iPad (Dunn, 2014).

Nevertheless, no significant difference was found between groups. The overall increase of words written with the technology are consistent with those studies that also examined computer-based graphic organizers on number of words written (Englert et al., 2007; Evmenova et al., 2015; Gonzalez-Ledo, Barbetta, & Uzueta, 2015; Lorenz, Green, & Brown, 2009; Unzueta & Barbetta, 2012), since the use of technology can alleviate the burden of handwriting (Englert et al., 2007; Kushki, Schwellnus, Ilyas, & Chau, 2011; MacArthur et al., 1991; Sturm & Rankin-Erickson, 2002). Moreover, these results were supported by participant perceptions disclosed during the interviews, in which students claimed that they could write faster, neater, easier, and not forget ideas. One student explained how the iPad helped with organizing thoughts and s/he “didn’t forget what to say.” While writing with paper and pencil, students described the feeling of getting “tired” and “requiring breaks” during writing.

Another explanation for increased essay length is that the use of technology is believed to increase student engagement (Boyce et al., 4004; Jamil & Shah, 2011; Lorenz, Green, & Brown, 2009; Milman et al., 2014; Sherry, Billig, Jesse, & Watson-Acosta, 2001; Wang, Shen, Novak, &
Pan, 2008), and motivation (Ciampa, 2014; Sturm & Rankin-Erickson, 2002). When students are not engaged in writing, their essays tend to be short and not fully-developed (Unzueta & Barbetta, 2012). If students are engaged and motivated to write, they will devote more time to developing their essay. Students who were interviewed described the iPad as “fun and easy to use” for writing; the perception of fun may account for why some students double or tripled their essay length. However, the integration of the iPad has not been extensively studied (Milman et al., 2014) and its long-term appeal is unknown. Once students become accustomed to writing with the iPad, engagement may wear off as the technology becomes commonplace.

**Generalization.** It is advisable to examine the effect of a treatment by understanding the students’ ability to generalize the intervention effects (Kratochwill & Stoiber, 2002). The results of students’ ability to generalize the strategy to a paper and pencil task, without a graphic organizer, differed by condition. In the posttest following the paper condition, participant scores improved across all dependent measures. Conversely, the posttest following the iPad condition, participant scores decreased across all dependent measures.

The discrepancy in scores may be due to the contextual similarity, or near transfer task, of a paper to paper writing task; whereas, the technology to paper task was contextually dissimilar, or far transfer task (Lin & Lehman, 1999). Lin and Lehman (1999) found that college students could generalize skills from a computer-based simulation better on a near transfer task. This may be why eight out of 10 participants in Evmenova et al. (2015) improved in the dependent measures of essay parts and quality following the use of the CBGO to a maintenance task, using Microsoft Word – a proximal task on the same software. Furthermore, research has suggested that students benefit from fading prompts when generalizing a writing strategy (Flanagan, 2012). Additionally, students in this study may have needed more practice to become
proficient with the technology. In a similar study, Graham and MacArthur (1988) found that students successfully generalized a revision strategy, during a transfer task to paper and pencil, following the use of a word processor. However, students in that study were experienced in using a word processor during the time of the study (Graham & MacArthur, 1988) whereas in this study, students only used the iPad for four days. Hence, the two days of instruction on the iPad may have been too short and is considered a limitation since research suggests that interventions should be criterion-based, not time-based (Mason, Kubina & Taft, 2011; Mason, Kubina, & Cramer, 2010; Mason & Shriner, 2008).

**Educational Implications**

The positive results imparted in this study have implications on writing instruction for elementary school teachers. First, the participants in this study were taken from two fourth-grade inclusion classrooms with 86% of writers at or above grade-level in writing, during the time of the intervention. The intervention improved scores across the dependent measures of holistic quality and essay length, suggesting that the strategy improved the quality and quantity of persuasive essays for developed writers, as well as struggling writers. Although the strategy improved writing for the five students identified as having a disability, implications for students with disabilities are tempered, due to the small number of participants. Regardless of students’ abilities, teachers should implement writing interventions that are multifaceted (Graham & Harris, 2006), include research-based strategies for planning, such as graphic organizers (Ciullo & Reutebuch, 2013) and mnemonic strategies (Asaro-Saddler & Bak, 2012, 2014; Graham & Harris, 1998; Sexton, Harris, & Graham, 1998) that have been shown to support students in self-regulation processes during writing.
Second, teachers should provide more opportunities for students to practice writing with technology, in order to prepare for the technology-based, high-stakes, standardized writing assessments (Evmenova et al., 2015). With more opportunities to become proficient with technology, students may be better equipped to succeed in standardized writing assessments (CCSS, 2010). Writing with an iPad, or tablet, could be a viable solution for teachers to easily integrate technology into their classroom, since students would not have to relocate to another room or desk to use the technology. As mobile technology becomes more readily available in schools, students will have opportunities to improve their literacy skill set, including digital literacy (Smith & Okolo, 2010).

Third, allowing students to choose a preferred writing tool may lead to an increase in student engagement and independence (Lorenz et al., 2009). Twelve of the 14 students interviewed preferred writing with the iPad and two students preferred paper and pencil. One perception was paramount – writing and revising was easier on the iPad. In terms of student independence, findings from this study are consistent with previous research that has shown students become self-directed and independent learners while using technology (Lewandowski, Begeny, & Rogers, 2006; Malik & Shabbir, 2008; Saba, 2009). Specifically, the two students that normally required one-on-one assistance, due to cognitive or physical disabilities, worked independently during the entire study, and exhibited gains in the iPad condition over other conditions.

Lastly, the option of writing with a hand-held device, such as the iPad, aligns with the principles of Universal Design for Learning (UDL). The app embodies the principles of UDL through various capabilities and features designed for multiple means of representation, engagement, and expression. The app allows multiple means of representation through its
graphic organizer with embedded mnemonic, transition word lists, magnifying feature and text-to-speech capabilities. Features that support multiple means of engagement include color coding, adaptive features, goal-setting, and prompts for students to self-evaluate their work. It also allows students multiple means of expression through touch technology, word prediction, and table-to-text, feature. Student interview responses encouraged the continuation of use of iPads for writing and other content areas. The next section presents the study’s limitations and future considerations.

Limitations and Future Research Considerations

Limitations of the study include small number of participants, the length of intervention, time of the intervention, possible teacher effect, limitations of the graphic organizers, noncomparable groups in terms of comfort with technology, inconsistent self-assessment, interruptions to instruction, qualitative measures, and lack of engagement measure. Each of these limitations will be considered in terms of this study, as well as suggestions for future studies.

Small Number of Participants. The study included a small number of participants (N=36) with only five of those students identified as having a disability. Future research should include more participants and students with high-incidence disabilities for greater generalizability.

Intervention Length. The length of the intervention is identified as a limitation because of the number of days devoted to the study, to instruction, and to the use of technology. Although the intervention took place over 15 days, only five days were devoted to direct instruction, two of those were instruction on using the TBGO and the iPad, and one day on the paper graphic organizer. Future research should be criterion-based, not time-based (Mason, Kubina & Taft,
2011; Mason, Kubina, & Cramer, 2010; Mason & Shriner, 2008), to allow for more time for independent practice to ensure proficiency with the technology (Graham, 2000; Quinlan, 2004).

**Time of Day.** The time of day is noted as a limitation because the schedule did not allow for the two groups to participate at the same time. Although there were not any significant findings between the groups, Cohort A participated at nine o’clock AM, while Cohort B participated at two o’clock PM. Time of day preferences (Dunn, Beaudry, & Klavas, 2002) could have been an extraneous variable and may be a possible consideration. Future research should conduct the intervention at the same time of day to control for this variable.

**Teacher effect.** The researcher was not known by the participants prior to the intervention, which may have affected students’ participation (Kiuru et al., 2015). Teacher effect can influence achievement (Sanders, Wright & Horn, 1997). Extending this study could include having an existing classroom teacher implement the intervention for an authentic experience by removing the teacher effect variable.

**Graphic Organizer and TBGO Limitations.** During the interventions, it was observed that both graphic organizers may have limited students’ participation. For example, the paper graphic organizer restricted the students’ ability to write several sentences within the boxes and this varied depending on the participant’s handwriting size. This restriction may have hindered students essay length in the paper graphic organizer condition. It was also observed that the TBGO had limitations, such as, the pinch zoom feature was not available with this app and the transition pop-up menu blocked students’ view. The absence of the pinch zoom feature is important because students had difficulty tapping in the small textbox when trying to add or omit words. This was especially true for students with larger fingers and may have impeded the ability to improve their paragraph and affect the quality of their essay. Another limitation to the
technology was the transition word pop-up menu. When the students tapped into the box to write their sentence, a text box popped up allowing them to choose a transition word to start their sentence. However, even after they chose the word, the text box continued to pop up, obstructed their view of the text boxes. It was observed that students became frustrated and needed assistance with removing the text box. Both graphic organizers had limitations that may have differently affected students’ essays – the paper graphic organizer may have restricted essay length while, the TBGO may have impeded essay quality. However, the degree to which these limitations affected student engagement is unknown and could be a future consideration.

**Noncomparable Groups.** The participants may have preexisting biases, attitudes, or comfort levels with technology, specifically hand-held devices. Attitudes toward technology or a familiarity for using hand-held devices among all participants was unknown and may have skewed results. Future studies should examine participants’ attitudes toward technology prior to implementing an intervention.

**Inconsistent Self-Assessment.** Some students self-assessed their work in the iPad condition, while in the paper condition, students neglected to complete the self-assessment prompts, stating “I’m not going to count my words.” It was also observed that the word-count function on the iPad was motivating for some students and encouraged them to write more. The degree to which students engaged in self-assessment practices during the two conditions are unknown and could be a future consideration.

**Interruptions.** In an attempt to conduct research in an authentic environment, the study was implemented during the participants’ scheduled writing period, and interruptions to instruction may have disrupted learning. These interruptions included snow days, snow delays, students’ instrument lessons, students’ related services, and behavioral issues. Although lessons
were made-up between sessions, the effect of disruptions is unknown. Future research should attempt to control for extraneous variables.

**Limited Qualitative Data.** This study employed semi-structured interviews to gather qualitative data regarding participants’ attitudes and perceptions; however a low number of students (N=14) volunteered, and self-reported data is not always reliable (Northrup, 1998). As a result, a limited amount of data was gathered from participants, and that which was collected may not have been representative of the entire population under study. Future research should employ several methods of gathering participants’ perceptions, for example, surveys and written responses. Another consideration is teacher perceptions of the intervention (Witt & Elliot, 1985). Although anecdotal feedback collected from faculty and staff was positive, it was not reported because it was not included in the IRB application. Future studies should include teacher perceptions as an outcome measure.

**Student Engagement Data.** Research has suggested that technology increases student engagement (Jamil & Shah, 2011; Lorenz, Green, & Brown, 2009; Sherry, Billig, Jesse, & Watson-Acosta, 2001; Wang, Shen, Novak, & Pan, 2008). While an increase in student engagement was anecdotally observed in the iPad condition, a method for gathering engagement was not employed in this study. To extend this research, the stop-watch feature embedded in the TBGO may be included to time how long the students spend on planning and composing their essays. This could be utilized to compare students’ on-task behavior between writing conditions.

**Summary**

This is the first known study that examined the use of a TBGO on the persuasive writing of fourth-grade students, with and without disabilities and compared it to a paper graphic organizer. The results from this study are encouraging. Students planned and wrote significantly
lengthier essays, with the TBGO over a paper graphic organizer, despite only receiving two days of instruction on the TBGO and the iPad. Although students had prior experience planning essays with graphic organizers, none of the participants in this study had prior experience with the TBGO. Student interviews provided support for the social validity of writing with an iPad over paper and pencil. This study adds to the literature on using hand-held devices for writing and a TBGO for planning persuasive essays.
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Technology-Related Assistance for Individuals with Disabilities Act of 1988, P.L. 100-407


Appendix A

Search Terms

Academic
App
Concept map
Education
Elementary
Graphic organizer
iPad
Mnemonic
Mobile technology
School
Self-Regulated Strategy Development
Smartphone
Tablet
Writing
Writing instruction
Writing intervention
Writing attitude
## Appendix B

### Project WeGotIT! App

**Pick your goal:**
- I will include 3 reasons and 2 example

**Fill in the chart below.**

<table>
<thead>
<tr>
<th>Main Points</th>
<th>Sentences</th>
</tr>
</thead>
<tbody>
<tr>
<td>I identify your opinion</td>
<td>best dessert</td>
</tr>
<tr>
<td>Determine reasons</td>
<td>flavors</td>
</tr>
<tr>
<td>Elaborate with examples</td>
<td>Click here to enter text</td>
</tr>
<tr>
<td>Determine 2nd reason</td>
<td>Click here to enter text</td>
</tr>
<tr>
<td>Elaborate w/ example</td>
<td>Click here to enter text</td>
</tr>
<tr>
<td>Determine 3rd reason</td>
<td>Click here to enter text</td>
</tr>
<tr>
<td>Elaborate w/ example</td>
<td>Click here to enter text</td>
</tr>
</tbody>
</table>

- Add transition words as you go!
- I have transition words.

- Summarize
- I summarized my opinion.

---

162
Appendix C
Persuasive Probes

**Pretest Probes**

1. Should children give their toys to other children who do not have toys?
2. Should students have to wear uniforms to school?
3. Should children your age have to do chores at home?
4. Should children your age have cell phones?

**Working with the iPad probes**

1. Should children your age be allowed to chew gum in school?
2. Should children have to go to school in the summer?
3. Should children be allowed to eat snacks in the classroom?
4. Should children be allowed to choose their own bedtime?

**Working with the graphic organizer probes**

1. Should children your age be allowed to bring video games to school?
2. Should children your age have to eat vegetables?
3. Should children be allowed to bring their pets to school?
4. Should all children have to learn how to use computers?

**Posttest Probes following the iPad condition**

1. Should you be allowed to watch television in the cafeteria during lunchtime?
2. Should teachers give children your age homework?

**Posttest Probes following the paper condition**

1. Should school vending machines sell soda?
2. Should students go outside for recess every day?
<table>
<thead>
<tr>
<th>Topic:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brainstorm:</td>
</tr>
<tr>
<td>Main Points</td>
</tr>
<tr>
<td>Identify your opinion</td>
</tr>
<tr>
<td>Determine reasons</td>
</tr>
<tr>
<td>Elaborate with examples</td>
</tr>
<tr>
<td>Determine 2nd Reason</td>
</tr>
<tr>
<td>Elaborate with examples</td>
</tr>
<tr>
<td>Determine 3rd reason</td>
</tr>
<tr>
<td>Elaborate with examples</td>
</tr>
<tr>
<td>Add transition words!</td>
</tr>
<tr>
<td>Summarize</td>
</tr>
</tbody>
</table>

Adapted from *Project WeGotIT! Technology-based Graphic Organizer* (Evmenova & Regan, 2012)
Appendix D

IDEAS Graphic Organizer - Page 2

- Copy your sentences from the graphic organizer. Be sure to write it in paragraph form.
- Read your essay and edit it.

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

Evaluate:
How many words do I have in my essay? ________
1. How many sentences do I have in my essay? ________
2. How many reasons do I have in my essay? ________
3. How many examples do I have in my essay? ________
4. Do all of my sentences make sense? ________
5. How do I feel about my essay? 😊 😐 😞

Feedback: I have included ________________ in my essay, which makes me a great writer!

Adapted from Project WeGotIT! Technology-based Graphic Organizer (Evmenova & Regan, 2012)
Appendix E
Transition Word List

1st Reason – First, to begin

Example - for example, to illustrate, specifically

2nd Reason – Second, also, then, next, another reason, likewise, in addition, furthermore, one more

Last reason – Finally, lastly

Summary - In conclusion, to summarize, therefore, so
Persuasive Writing Lesson Plan 1

MATERIALS

- ELMO
- White Board Markers
- IDEAS Mnemonic

BACKGROUND DISCUSSION (10 minutes)

1. Write the word *persuade* on the board.

2. Discuss how people have different opinions about various topics. Give an example of favorite dessert and asking students about theirs.

3. **Ask:** Does anyone know the word for trying to convince someone to change his or her mind about something? (Guide students to the word *persuade* on the board.)

4. **Say:** Sometimes people write in a way that is intended to persuade others. This is called persuasive writing.

5. **Ask:** For what reasons might people use persuasive writing? (i.e., change someone’s mind, politics, accept a point of view or in advertisements to get people to buy a product).

6. **Say:** In persuasion, what we want people to know is called our opinion. In writing this is sometimes called a thesis. Provide some examples of opinions (i.e. cats are the best pets, summer vacation should be longer, McDonalds makes the best hamburger).

7. Project IDEAS paper with ELMO (paper covering definitions)
8. *Say: I have a trick for remembering how to write a good persuasive essay. Have you ever heard of PEMDAS? PEMDAS is a mnemonic for remembering the order of operations in Math. My trick or strategy for writing a good persuasive essay is IDEAS.*

9. Point and discuss each letter and its concept

- **I** – Identify your opinion or thesis (sort of like a topic sent)
- **D** – Determine the reason(s)
- **E** – Elaborate with examples
- **A** – Add transition words
- **S** – Summarize

10. Ask for some suggestions of something the students want the school to buy?

11. Choose one of the topics suggested.

12. Project IDEAS with lines.

13. Have students suggest a sentence for each initial. Try to elicit multiple reasons and examples.
Closure (3-5 minutes)

14. Ask: What is a persuasive essay?

15. How will the mnemonic IDEAS help us to write an effective persuasive essay?
Persuasive Writing Lesson Plan 2

MATERIALS

- Whiteboard markers
- ELMO
- IDEAS mnemonic
- Highlighters
- Criteria Sheet with sample essays
- Transition word list

Introduction (10 minutes)

1. Say: *Yesterday we talked about a type of writing where you try to convince someone to change his or her mind about something.*

2. Ask: *What was that called* (persuasive writing). *Good.*

3. Say: *And I taught you a trick for writing persuasive essays. Do you remember that strategy? Right! IDEAS.*

4. *Do you remember what IDEAS stood for? (Project poster) I is for Identify your opinion, D- Determine reasons, E – Elaborate with examples, A- add transition words, S-Summarize.*

5. *Today, you are going to be the teacher and you are going to grade other people’s persuasive essays.*

6. Project and pass out criteria sheet.

7. *Say: A good persuasive essay has an opinion or thesis statement, reasons, examples for each reason, transition words, and a summary.*

8. *Say: You are going to read some persuasive essays and grade them using this criteria sheet. The author gets a point for each item.*
9. **Ask:** For example, if the author has a clear opinion, three reasons, three examples, some transition words, and a summary sentence, how many points did the author get. (9 points)

10. Pass out the transition words list

11. **Say:** This is a list of transition words. These words help the author to organize their sentences.

**Guided Practice (10 minutes)**

12. **Say:** Let’s do the first one together

13. Project Essay 1 on the ELMO

14. Read the essay out loud.

15. **Say:** Look at your criteria sheet. Does the author have an opinion or thesis statement? Yes, so put a 1 on the line.

16. **Ask:** Does the author give any reasons to support his/her opinion.

   Yes. **Underline the reasons.** (Use the highlighter to underline the 3 reasons) Ok. So put a 3 next to that criteria.

17. **Ask:** Does the author give any examples to support the reasons?

   Yes, 3, (use highlight to circle the examples) **circle the 3 examples.**

   Now give the author 3 points for their 3 examples.

18. **Ask:** Did the author use any transition words? Yes, put a star next to the transition words. **Give the author a point for using transition words.**
19. Ask: Did the author restate their opinion in a summary sentence?
   Yes (highlight the summary), notice how the summary restates the thesis and the reasons.

20. Say: Okay now add up the points and assign a grade to this essay.
   So the author earned 9 out of 9 points. Do you think that is an effective persuasive essay?

Independent practice (10 minutes)

21. Say: Now you are going to grade the next essay on your own. Flip your criteria sheet over.

22. Project Essay 2 with the ELMO

23. Say: Let’s read it together. Read the essay aloud.

24. Say: You have 5 minutes to grade this essay. You may begin.

25. Wait for everyone to get done.

26. Okay, now turn to your partner and discuss the scores and see if you agree. If you do not try to persuade the other person why you are correct.

27. Return to whole group instruction

28. What was the total number of points this person earned? Why?
   Discuss discrepancies.

29. Collect Criteria sheet and transition word list.
Closure (3-5 minutes)

31. Ask: What is a persuasive essay? ✓

32. Ask: What are the criteria for writing an effective persuasive essay?

33. How will the mnemonic IDEAS help us to write an effective persuasive essay?
Essay 1
Cats are the best pets. They are fun. Another reason is they do not need to go outside. I have a cat.

Criteria for an effective persuasive essay
The author should include:

<table>
<thead>
<tr>
<th>Item</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opinion / Thesis statement</td>
<td></td>
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<tr>
<td>Reasons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transition words</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total ___________________/9
Appendix G
Sample Essay - 2

Essay 2
Dogs really make the best pets. Dogs are fun to have as pets. For example, my dog likes to play hide and seek, he always finds me. Second, dogs help kids learn responsibility. In my house, I have to feed and let my dog out. Additionally, a dog can help people become healthy. Walking a dog is good exercise. In summary, everyone should have a dog as a pet to have fun, learn responsibility, and be healthy.

Criteria for an effective persuasive essay

The author should include:

<table>
<thead>
<tr>
<th>Element</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opinion / Thesis statement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reasons</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transition words</td>
<td></td>
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<tr>
<td>Summary</td>
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Total _______________________/9
Graphic Organizer Lesson Plan 1
(Introduction)

MATERIALS

- ELMO
- (22-24) Graphic Organizers for students and (1) Instructor
- Transition Word List
- Whiteboard markers

DIRECTIONS
INTRODUCTION Planning with a graphic organizer (5 minutes)

- Ask: What is a persuasive essay?
- 
- Ask: Why is it important to plan before we write? Solicit answers and write answers on the whiteboard.
- 
- Ask: Does anyone remember the mnemonic for persuasive writing we discussed the other day? Solicit answers (IDEAS).
- 
- 
- Say: I am going to show you how to develop a persuasive essay, using IDEAS on a graphic organizer?
- 
- Project the IDEAS graphic organizer.
- 
- Point out the features of the GO: prompt, goal, brainstorm text box, mnemonic, main points, sentence boxes, “check your work” boxes.
• Say: We are going to plan and write a persuasive essay together using the mnemonic IDEAS and a graphic organizer. Please follow me and do what I do.

• Guided Practice (25-30 min)

• Pass out the graphic organizers

• Say: Now let’s plan a persuasive essay using IDEAS in our graphic organizer. We need a topic. How would you convince your Principal to give you a longer summer vacation?

• Say: First we must “Identify our opinion.” This is the thesis statement.

• Demonstrate how to write a thesis statement in the GO.

• Say: Next, we list the reasons in the D boxes. What does the D stand for again? Determine your reason. Why should you have a longer summer vacation?

• Demonstrate writing reasons in the D boxes.

• Say: Okay, now we need examples for those reasons. Solicit examples for each reason. Demonstrate writing examples in the E boxes.

• Say: the “A” box is there to remind you to ADD Transitions

• Introduce and pass out the transition word list.

• Say: These are transition words, they help the reader know what is coming next. Transition words give your essay more structure and make it sound better.
• Demonstrate adding transition words and writing complete sentences in the boxes.

• **Say:** The last box is S. S is for summarize. We need a summary sentence.

• Demonstrate writing a summary sentence.

• **Say:** Now we need to check our work to make sure we didn’t forget anything. On the right side of your GO are check boxes. Do you see them? Okay, read them with me and check them off.

• **Say:**
  - I included my opinion (check off)
  - I included 3 reasons (check off)
  - I have examples (check off)
  - I used transition words (check off)
  - I summarized my opinion (check off)

• **Say:** If you said yes to all of those, you are ready to write your essay.

• Pass out page 2 of the GO

• **Say:** Now it is time to copy your sentences on the lines here (point to page 2)

• **Say:** Copy your sentences from the graphic organizer. Be sure to write it in paragraph form. Read your essay and edit it.

• Demonstrate copying sentences.
• Say: Let’s read our paragraph out loud together. Okay, do you think it sounds persuasive? All right, now we need to evaluate our work.

• Read through each question and let the students answer the questions. Complete each text box.

• Say: Once we are done with the evaluation, we can circle how we feel about our essay and write 1 thing that we have included that makes us a better writer.

• Solicit answers for the feedback (transition words, examples, summary)

Closure (5 minutes)

• Collect GOs

• Ask: How does the mnemonic IDEA help us to write an effective persuasive essay?

• Ask: How does a graphic organizer help us in planning to write a persuasive essay?

• Ask: Do you think you could write another persuasive essay with this GO? Great, tomorrow you will get to do one on your own.
Graphic Organizer Lesson Plan 2
(Independent Practice)

MATERIALS

- 20 – 22 Graphic organizer
- Transition words list
- Persuasive writing prompts

DIRECTIONS
INTRODUCTION (5 minutes)

Say: Today you are going to use the graphic organizer to help you plan and write a persuasive essay.

Say: A persuasive essay is when you try to convince the reader of something. You are going to do this one by yourself; I cannot help you.

You have a choice of 2 topics (read the two prompts). Please choose only 1 topic. When you are done, you may ____.

- Check progress and time.
- Make notes of any issues.
- Prompt students to complete the self-evaluation, if they have not done so.
Graphic Organizer Lesson Plan 3
(Independent Practice)

MATERIALS

- 20 – 22 Graphic organizer (2 pages)
- Transition words list
- Persuasive writing prompts

DIRECTIONS
INTRODUCTION (5 minutes)

Say: Today you are going to use the graphic organizer to help you plan and write a persuasive essay.

Say: A persuasive essay is when you try to convince the reader of something. You are going to do this one by yourself; I cannot help you.

You have a choice of 2 topics (read the two prompts). Please choose only 1 topic. You have 30 minutes to plan and write your essay. Make sure you complete both pages. When you are done, you may ____.

- Check progress and time.
- Make notes of any issues.

Prompt students to complete the self-evaluation, if they have not...
Technology-Based Graphic Organizer
Lesson Plan 1 (Introduction)

MATERIALS

- ELMO/ Projection cable
- 20 – 22 iPads, Project WeGotIT! App installed
- 22 Book Racks
- Whiteboard markers if needed to circle projected parts

DIRECTIONS

INTRODUCTION Planning & iPad APP (20 minutes)

- **1. Ask:** Why is it important to plan before we write? Solicit answers and write answers on the whiteboard.
- **2. Ask:** Does anyone remember the mnemonic for persuasive writing we discussed the other day? Solicit answers (IDEAS).
- **Ask:** What does IDEAS stand for? Solicit answers.
- **Say:** I am going to show you how to develop a persuasive essay, using IDEAS on my iPad?
- Demonstrate how to start the iPad and launch the app, select Lesson 2.
- **Say:** It is going to ask you your name each time you open the app. Remember you are now secret agents and you are only known as your initials and seat number. Demonstrate typing ID number.
- Say: Ta-dah! This is my IDEAS computerized graphic organizer. Cool huh?

- Point out the features of the app: prompt, goal, brainstorm text box, mnemonic, main points, sentence boxes, “check your work” boxes.

- Ask: What is the topic of this essay? You can find the topic in the Prompt box. Ice cream

- Say: You can find the author's opinion in the I box – Identify your opinion.

- Ask: What is the author's opinion on the topic of ice cream?

- Answer: It is the best dessert ever.

- Say: You can find the reasons in the D boxes. What does the D stand for again? Determine your reason. What reasons does the author give to support his/her opinion? Ice cream has many flavors and it is delicious.

- Say: Let's look that the first reason, the author writes the sentence “First, ice-cream comes in many flavors” but they forgot a main point. How do I know they forgot a main point? It says, “Click here to enter text” Can you all see that? What do you think? Should I click on it?

- Click on the box next to Determine 1st Reason.

- Say: Check that out! The iPad is asking me “What is your 1st reason?” What do you think? What reason did the author give?

- Right, ice cream has many flavors but I do not want to rewrite that. Hmmmm it looks like these MAIN POINT boxes just have 1 or 2 words. I am just going to type flavors in this box.
• Ask: Did you see that? What happens when I type? Yes, the iPad is trying to guess my word. Isn’t that cool?

• Say: Now look at the gray boxes. What is in the gray boxes. What example does the author provide about ice cream. Yes, they wrote “for example, ice-cream can be vanilla or chocolate and you can pick the one you like.” Oh we can come up with more examples than that, right? Let students name some flavors.

• Point out that one of the “E”s are blue and explain that has to do with the Goal: 3 reasons and 2 examples.

• Point out that the “A” box is there to remind you to ADD Transitions

• Click in the Summary text box (transition words pop up).

• Say: Holy cow, what just popped up? Yeah, transition words. You can pick one of theirs or type in your own. Check this out, I can change my transition words and the iPad rewrites my sentence. Let’s try a few. Which sounds the best? Let students pick the transition word.

• Say: As I am typing check out the boxes on the right. What’s going on here? Right, the iPad is checking my work and notice it will not check the boxes off until I use correct punctuation in my sentences.

• Add a period to the Opinion sentence for it to get checked

• Say: Wow the iPad says “Goal is met you can copy now.” I wonder what that means? Should we hit OK to find out?

• Ask: I don’t see anything do you? (light bulb flashing at bottom)

• Ask: check it out blinking bulb… should I click copy? What do you think is going to happen?
• **Say:** Check it out! It’s a paragraph. Is it the sentences from the graphic organizer? Wow, how’d it do that? Let’s read it? Read the paragraph.

• **Ask:** Should we revise the paragraph to add more examples? Let’s go back and add some more flavors? Reread the paragraph out loud.

• **Say:** Okay, do you think it sounds persuasive? All right, now we need to evaluate our work.

- **Read through each question and let the students answer the questions.**
  
  Complete each text box.

- **Say:** Once we are done with the evaluation, we can put one thing we are proud of in the feedback box. If you do that on your essays, I’ll let you choose an emoticon to add to it. Click the emoticon button. I’m choosing the one with the hearts because I love to write.

- **Say:** Final tap AND the most important one… save your work. Click preview then click OPEN iBOOKS. This will save your work.

- **Say:** One little trick, sometimes the keyboard blocks what you are trying to see. If that happens, just click this button to move it down.

- **Ask:** Are you ready to try it out?
SAFE HANDLING INSTRUCTIONS (2-3 minutes)

say: raise your hand if you have ever used an iPad, Kindle, or other tablet. Take notice of those students who do not raise hands; they may need extra support.

ask: Can anyone describe how to safely use an iPad? Call on people to describe how to handle the iPad.

Demonstrate safe handling procedures.

say: Always keep the iPad on your desk, use one finger to touch and swipe. These are very expensive and very fragile.

Demonstrate hitting the home button to turn on and the off button.

Practice (20 minutes)

- Distribute iPads to students.

- Say: If you are having trouble with your iPad, please raise your hand and wait for a teacher to help you.

- Say: Please click the button that says Lesson 2. You are going to complete the graphic organizer about ice cream. Don’t forget to save your work.
Closure (5 minutes)

- Collect iPads

- Ask: *How does the mnemonic IDEA help us to write an effective persuasive essay?*

- Ask: *How does a graphic organizer help us in planning to write a persuasive essay?*

- Ask: *Do you think you could write a persuasive essay with an iPad?*

  Tomorrow, we will write an essay about (topic from previous lesson) from the other day.
Technology-Based Graphic Organizer
Lesson Plan 2- (Guided Practice)

MATERIALS

- ELMO/ Projection cable
- 20 – 22 iPads, Project WeGotIT! App installed
- 22 Book Racks
- Whiteboard markers if needed to circle projected parts

DIRECTIONS

INTRODUCTION (5 minutes)

- **Say:** Today we are going to write a persuasive essay using the topic (topic from Write Persuasively Lesson 1).
- **Ask:** Who remembers the mnemonic for persuasive writing? Remembering the mnemonic is important because it helps us when planning an effective essay.
- Write IDEA on the board vertically.
- **Who remembers the opinion, reasons, and examples for (Topic)**
- Place the 3M chart paper from Lesson 1 next to the mnemonic
- **Say:** Okay, now we are going to use the iPads and the graphic organizer app to help us plan and write a persuasive essay. Remember a graphic organizer helps us in planning an effective essay.
- **Ask:** Who remembers how to safely handle the iPad? Call on people to describe how to handle the iPad.
Demonstrate safe handling procedures.
Distribute an iPad to each student.

GUIDED PRACTICE WITH iPad APP (25 minutes)

Demonstrate how to start the iPad and launch the app, select NEW.

- *Say: It is going to ask you your name each time you open the app.*

Remember you are now secret agents and you are only known as your initials and seat number. Demonstrate typing ID number.

- *Say: You should see a blank IDEAS graphic organizer.* Check for progress.

Demonstrate how to type in topic and goal. Select 3 reasons and 3 examples for goals.

- Solicit answers for brainstorming box.

- Solicit answers for Reason #1. Walk around to check that everyone is at the same step.

- Demonstrate how to choose a transition word and how to type Reason 1 into the sentence text box.

- Repeat with Reasons 2 and 3 and examples. Refer to chart paper.

- Point out the blinking light bulb that tells you what to do next.

- Point out the checkboxes on the right.

- *Say: The checked boxes on the right will tell you if you have written a complete sentence.*

- Solicit questions.
Say: *Eyes on me when you get to the summary text box.*

Demonstrate writing an effective summary sentence.

*Ask: Does everyone get the “Goal is met you can copy now?” If you get it you may move on, if you did not, raise your hand.* Walk around to assist.

*Say: Okay, now you should all have a paragraph. From here you can edit and revise. You can add words or sentences to make it sound better. Be sure to reread your paragraph when you are done.*

Demonstrate adding more detail

*Say: Okay, let’s read our paragraph together.* Read paragraph out loud.

*Ask: Do you think it sounds persuasive? All right, now we need to evaluate our work.*

Read through each question and let the students answer the questions.

Complete each text box.

*Say: Once we are done with the evaluation, we can put one thing we are proud of in the feedback box. What should I write?*

Solicit answers. (i.e. good transition words, strong reasons, etc.)

*Say: If we are all done, we can choose an emoticon.*

Demonstrate clicking the emoticon button.

*Say: I’m choosing the one smiling because I am proud of my work today.* Check that everyone is at the same point before moving on.

*Ask: What is the final AND most important step… Right, save your work. You must click preview then click OPEN iBOOKS. This will save*
your work with your secret agent ID number. Raise your hand when you are done and we will be around to check your iBook.

- Check that everyone saved to iBook, collect the iPad and shut them off.

Closure (5-10 minutes)

- Ask: How does the Mnemonic IDEAS help you write a persuasive essay? ✓
- Ask: How does the graphic organizer help you plan your essay? □
- Ask: How does the app help you to write an effective persuasive essay? □
- Ask: Are you ready to do one on your own? Awesome! You will get to write another one tomorrow.
Technology-Based Graphic Organizer
Lesson Plan 3 (Independent Practice)

MATERIALS

- ELMO/ Projection cable
- 20 – 22 iPads, Project WeGotIT! App installed
- 22 Book Racks
- Whiteboard markers if needed to circle projected parts
- Persuasive writing prompt

DIRECTIONS

INTRODUCTION (5 minutes)

- Say: Okay, now we are going to use the iPads and the graphic organizer app to help us plan and write a persuasive essay.
- Ask: Who remembers how to safely handle the iPad? Call on people to describe how to handle the iPad.
- Demonstrate safe handling procedures.
- Distribute an iPad to each student.

INDEPENDENT PRACTICE WITH iPad APP (40 minutes)

- Say: It is going to ask you your name each time you open the app. Remember your secret agents ID.
- Say: Today you are going to write a persuasive essay. You have two prompts. Please choose 1 to write about. You are going to do this one all by yourself. We cannot give you any help just try your best. When you are done, raise your hand. I will be around to make sure that you save your work properly.
• Check progress and time.
• Make notes of any issues.
• Make sure students to save their work to iBook.
• collect the iPad and shut them off.
• Check the time to see how long it took them to compose.
Technology-Based Graphic Organizer Lesson Plan 4 (Independent Practice)

MATERIALS

- ELMO/Projection cable
- 20 – 22 iPads, Project WeGotIT! App installed
- 22 Book Racks
- Persuasive writing prompts

DIRECTIONS

INTRODUCTION (5 minutes)

- Say: Okay, now we are going to use the iPads and the graphic organizer app to help us plan and write a persuasive essay.
- Ask: Who remembers how to safely handle the iPad? Call on people to describe how to handle the iPad.
- Demonstrate safe handling procedures.
- Distribute an iPad to each student.

INDEPENDENT PRACTICE WITH iPad APP (40 minutes)

- Say: It is going to ask you your name each time you open the app. Remember your secret agents ID.
- Say: Today you are going to write a persuasive essay. You have two prompts. Please choose 1 to write about. You are going to do this one all by yourself. We cannot give you any help just try your best. When you are done, raise your hand. I will be around to make sure that you save your work properly.
- Check progress and time.
• Make notes of any issues.

• Make sure students to save their work to iBook.

• Collect the iPads and shut them off.

• Check the time to see how long it took them to compose.
Prompt: Should children be allowed to choose their own bedtime?

I think kids should be able to choose their own bedtime. To begin, they might have to much homework. Specifically, if they have three pages of Math homework and don't get it done by bedtime, they might get in trouble at school. Another reason, is that kids should be able to be more independent. I would feel more independent if I chose my own bedtime by being responsible for my own rest. Additionally, kids might be doing something fun and do not want to stop the activity to go to sleep. Specifically, maybe they are in the middle of a good movie and do not want to wait to see the end of the movie. To summarize, kids should be able to choose their own bedtime so they can finish their homework, feel more independent, or do something fun. Don't you agree?
All the children in the USA should have a right to choose their own bedtime. To begin, children have a greater idea of when they get tired. For example I lay in bed for about half an hour before I go to sleep because I'm not that tired. Another reason, children are forced to go to bed at like 9:00. To illustrate, most of my friends are going to bed at 9:00 or 9:30. In addition, the early bedtimes are causing us to get up early. Specifically, I usually wake up at about 8:00 AM. In conclusion, children should have a right to when they go to bed.
We should be able to choose because parents are too strict with bedtime. To begin with, kids should stay and watch their favorite TV show. For example, 10:00 or even 9:30 would be good more than ten but really.

Another reason, even sitting in bed and watching TV would be good. To illustrate, this mom and dad. One more reason, we should be able to choose at least one thing by ourselves. And that is why we should be able to choose our own bedtime.
we should choose are bed time if we is 7:00 First. we have to make
parents to let as choose bed time. For example, so We could place with my dad
soccer game.
<table>
<thead>
<tr>
<th><strong>PSSA Quality Index</strong></th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus</strong> The single controlling point made within an awareness of task (mode) about a specific topic</td>
<td>Sharp distinct controlling point made about a single topic with evident awareness of task (mode)</td>
<td>Apparent point made about a single topic with sufficient awareness of task (mode)</td>
<td>No apparent point but evidence of a specific topic</td>
<td>Minimal evidence of topic</td>
</tr>
<tr>
<td><strong>Content</strong> The presence of ideas developed through facts, examples, anecdotes, details, opinions, statistics, reasons and/or explanations</td>
<td>Substantial, specific and/or illustrative content demonstrating strong development and sophisticated ideas</td>
<td>Sufficiently developed content with adequate elaboration or explanation</td>
<td>Limited content with inadequate elaboration or explanation</td>
<td>Superficial and/or minimal content</td>
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<tr>
<td><strong>Organization</strong> The order developed and sustained within across paragraphs using transitional devices, including introduction and conclusion</td>
<td>Sophisticated arrangement of content with evident and/or subtle transitions</td>
<td>Functional arrangement of content that sustains a logical order with some evidence of transitions.</td>
<td>Confused or inconsistent arrangement of content with or without attempts at transition</td>
<td>Minimal control of content arrangement</td>
</tr>
<tr>
<td><strong>Style</strong> The choice, use and arrangement of words and sentences that create tone and voice.</td>
<td>Precise, illustrative use of a variety of words and sentence structures to create consistent writer’s voice and tone appropriate to audience</td>
<td>Generic use of a variety of words and sentence structures that may or may not create writer’s voice and tone appropriate to audience</td>
<td>Limited word choice and control of sentence structures that inhibit voice and tone</td>
<td>Minimal variety in word choice and minimal control of sentence structures</td>
</tr>
<tr>
<td><strong>Conventions</strong> The use of grammar, mechanics, spelling, usage and sentence formation.</td>
<td>Evident control of grammar, mechanics, spelling, usage and sentence formation.</td>
<td>Sufficient control of grammar, mechanics, spelling, usage and sentence formation.</td>
<td>Limited control of grammar, mechanics, spelling, usage and sentence formation</td>
<td>Minimal control of grammar, mechanics, spelling, usage and sentence formation</td>
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<tr>
<td><strong>0 - Non Scorable / Off Prompt</strong> - Incoherent, insufficient to assess - Does not respond to prompt</td>
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Appendix K

PSSA Quality Index