Reverse Engineering an Expository Paragraph for Students with Mild to Moderate Disabilities and English Learners

Kathy Ewoldt
ewoldtk@gmail.com

Follow this and additional works at: https://digitalscholarship.unlv.edu/thesesdissertations
Part of the Special Education and Teaching Commons

Repository Citation
https://digitalscholarship.unlv.edu/thesesdissertations/3250

This Dissertation is brought to you for free and open access by Digital Scholarship@UNLV. It has been accepted for inclusion in UNLV Theses, Dissertations, Professional Papers, and Capstones by an authorized administrator of Digital Scholarship@UNLV. For more information, please contact digitalscholarship@unlv.edu.
REVERSE ENGINEERING AN EXPOSITORY PARAGRAPH FOR
STUDENTS WITH MILD TO MODERATE DISABILITIES
AND ENGLISH LEARNERS

by

Kathy Burns Ewoldt

Bachelor of Science – Human Resources/Management
Park University
2001

Master of Education – Special Education
University of Nevada, Las Vegas
2011

A dissertation submitted in partial fulfillment
of the requirements for the

Doctor of Philosophy - Special Education

Department of Educational and Clinical Studies
College of Education
The Graduate College

University of Nevada, Las Vegas
May 2018
Dissertation Approval

The Graduate College
The University of Nevada, Las Vegas

April 10, 2018

This dissertation prepared by

Kathy Burns Ewoldt

entitled

Reverse Engineering an Expository Paragraph for Students with Mild to Moderate Disabilities and English Learners

is approved in partial fulfillment of the requirements for the degree of

Doctor of Philosophy - Special Education
Department of Educational and Clinical Studies

Joseph Morgan, Ph.D.  
Examination Committee Chair

Tiberio Garza, Ph.D.  
Examination Committee Member

Tracy Spies, Ph.D.  
Examination Committee Member

Kyle Higgins, Ph.D.  
Examination Committee Member

Erin Hannon, Ph.D.  
Graduate College Faculty Representative

Kathryn Hausbeck Korgan, Ph.D.  
Graduate College Interim Dean
ABSTRACT

Reverse Engineering an Expository Paragraph for Students with High-Incidence Disabilities and English Learners

By Kathy B. Ewoldt

Dr. Joseph J. Morgan, Chair
Assistant Professor of Special Education
University of Nevada, Las Vegas

Writing is a difficult task for most students. Only 27% of all students in America can write proficiently at or above grade level (U.S. Department of Education, Institute of Education Sciences, 2012). With the recent adoption of rigorous standards (i.e., Common Core State Standards, Next Generation Science Standards), secondary students are required to engage in increasingly more expository writing tasks, a difficult challenge for students with high-incidence disabilities and English learners.

During the instruction process, teachers may model an example to show students how experts approach a task, typically in a sequence of beginning, middle, and ending steps. This intervention applied reverse engineering theory to the modelling step of paragraph writing instruction. The link between the prewriting and drafting steps of the expository paragraph writing process was explicitly taught in a backward sequence. The intervention consisted of nine 30-minute lessons implemented over a period of three weeks. Participants were 42 students in three middle school resource classrooms in a large urban school district in the southwestern United States. Each school was assigned randomly to one of three groups: reverse sequence modeling with a graphic organizer, reverse sequence modeling with a systematic letter-labeled graphic organizer, and typical resource classroom instruction. Students participated in pre-, mid-,
and post-intervention assessments to determine if their knowledge and application of paragraph writing skills improved expository paragraph writing quality.

Results indicate there was not a statistically significant difference between the intervention groups. However, findings indicate practical significance. Students with high-incidence disabilities and English learner scores increased during the three-week intervention with medium to large effect sizes. Responses from social validity measures indicate teachers will change their instruction modeling procedures as a result of participating in the study.
ACKNOWLEDGEMENTS

Completing this journey was only possible by the love and support of many family, friends, and colleagues. To my beloved husband, Matt, your unwavering support and encouragement have been unbelievable. You have given me a life that little girls dream of. You’re my best friend; you’ve been my rock; and I appreciate every single time you asked, “What can I do to help you, honey?”

I also would like to thank my children, Mary, Kyle, Kira, and Michael, who have made many sacrifices along the way without a complaint. I want to thank my sisters, Laurie and Jen, who laughed with me when, “They were doing it awl wrawng,” and who were there to catch every tear I cried. Thank you to my cousin, Diana Gaiter, for the many chats along the way. Thanks Mom and Dad for being my biggest cheerleaders and for helping me to put my blinders on.

My friends have also been instrumental in providing support each time I was able reach out. Thank you, Tara Young, for literally keeping me running. Thank you for your patience Karen Englert and Traci Dong, and for your loyal friendship even though I could only meet for coffee once a semester. Thank you also to the South Side Small Group for continually keeping me covered in prayer.

My UNLV colleagues have taught me in countless ways. Thank you for sharing your valuable experiences. Thank you Joice Higa for paving the way, and Kristen Withey for journeying through this together. I would like to thank my committee members for their service: Dr. Tiberio Garza, Dr. Erin Hannon, Dr. Kyle Higgins, and Dr. Tracy Spies. I would especially like to thank my committee chair, Dr. Joe Morgan, for the amazing guidance and mentorship throughout this process. Your words of wisdom were timely and perfect. You have been an
incredible role model of staying focused on changing the lives of kids with disabilities, and allowing everything else to fall into place.

I would like to thank the people who have paved the way for the school-university partnership between UNLV and Clark County School District (CCSD). To my Crestwood Elementary family, I would like to thank each faculty and staff member for welcoming me onto their campus for the past three years. To Ms. Juliana Urtubey, thank you for teaching me so many lessons during my pilot study. I would also like to thank the CCSD middle school teachers who allowed me into their classrooms to perform my dissertation research: Mr. Mendler, Ms. South, Ms. Saldaña, and Ms. Smith-Mack.

I certainly did not get her on my own. Thank you all for your love and support!
Dedicated to my mom,
Barbara Ann Burns
# TABLE OF CONTENTS

ABSTRACT ................................................................................................................................. iii
LIST OF TABLES ............................................................................................................................ x
LIST OF FIGURES ......................................................................................................................... xi

CHAPTER ONE  INTRODUCTION .............................................................................................. 1

  Expectations for Writing in Academic Setting ................................................................. 2
  Importance of Writing to Postsecondary Outcomes ....................................................... 3
  Writing Skills Acquisition .............................................................................................. 5
  Graphic Organizers as Instructional Supports .................................................................. 8
  Working Memory .................................................................................................................. 11
  Reverse Engineering ......................................................................................................... 13
  Statement of the Problem ............................................................................................... 15
  Research Questions .......................................................................................................... 16
  Significance of the Study ................................................................................................... 17
  Definitions ............................................................................................................................. 18
  Delimitations ....................................................................................................................... 21

CHAPTER TWO  REVIEW OF RELATED LITERATURE .......................................................... 23

  Effective Instruction for Students with Mild to Moderate Disabilities ......................... 24
  Instructional Methods for English Learners ................................................................... 37
  Writing Needs of Students with High-Incidence Disabilities ......................................... 42
  Writing Supports for Students with Mild to Moderate Disabilities ............................ 55
  Summary ............................................................................................................................... 67

CHAPTER THREE  METHODS ................................................................................................. 70

  Research Questions .......................................................................................................... 72
  Setting ................................................................................................................................. 73
  Participants .......................................................................................................................... 74
  Instruments .......................................................................................................................... 79
  Materials and Equipment ............................................................................................... 82
  Procedures ............................................................................................................................ 85
  Experimental Design ......................................................................................................... 92
  Data Analyses ...................................................................................................................... 93
  Summary ............................................................................................................................... 95

CHAPTER FOUR  RESULTS .................................................................................................... 96

  Implementation Fidelity ....................................................................................................... 98
  Baseline Equivalency ......................................................................................................... 99
  Analysis of Writing Quality .............................................................................................. 99
  Analysis of English Learners ............................................................................................ 103

viii
LIST OF TABLES

Table 1  Site Demographics........................................................................................................74
Table 2  Student Participation....................................................................................................76
Table 3  Student participant demographics.............................................................................76
Table 4  Group B Sentence Types and Characteristics..............................................................83
Table 5  Descriptive Statistics Writing Quality Rubric Scores...............................................102
Table 6  Total Number of Words .............................................................................................105
Table 7  Sentence Knowledge..................................................................................................106
Table 8  Writing Quality Maintenance Scores........................................................................108
Table 9  Frequency of Student Survey Responses.................................................................110
Table 10 Word Counts ............................................................................................................112
LIST OF FIGURES

Figure 1  Time and treatment interactions ................................................................. 101
Figure 2  Intervention and maintenance scores ......................................................... 109
CHAPTER ONE
INTRODUCTION

The ability to communicate cogent ideas in writing is a vital skill in academics, social interactions and employment (Bazerman, 2016; Connelley & Dockrell, 2016; Graham, 2006; Graham & Harris, 2013). The expectations for written expression begin to develop in the early elementary grades, and become more rigorous as students move to higher grades (Klein, 2000; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). In secondary grades, writing also becomes an assessment tool for measuring content area knowledge (Connelley & Dockrell, 2016; Graham & Harris, 2013; Graham & Perin, 2007a). Prior to the proliferation of digital devices, practical uses of daily writing were in the form of letters, lists, notes, and forms (Berninger, Barcia, & Abbott, 2009). More recently, technology and social media have brought the use for written expression to the forefront of society as people post and tweet numerous times throughout the day (Lenhart & Page, 2015).

Even with this understanding of the value of writing, and a subsequent increase in research related to writing instruction, students continue to struggle with writing proficiency (MacArthur, Graham, & Fitzgerald, 2016). In the past 20 years no more than 33% of students have been proficient, and according to the most recent national assessment, only 27% of students are able to write at or above grade level (U.S. Department of Education, Institute of Education Sciences, 2012).

Difficulties with writing proficiency span across age groups for a myriad of reasons (Graham, 1990; MacArthur & Graham, 2016). For example, younger students struggle with handwriting, spelling, and grammar (Graham, 1990). When handwriting is laborious, students struggle to fluently produce words and sentences. For older students these issues may persist,
with additional struggles such as word choice, organization, and readability becoming more evident (MacArthur & Graham, 2016). When students are not able to communicate in writing, they may have difficulty proving their level of content material understanding, receive lower grades and struggle to complete coursework (Connelley & Dockrell, 2016). This can result in lower academic achievement and failure to progress to the next grade level.

**Expectations for Writing in Academic Settings**

With the recent adoption of rigorous academic standards, there is a focus on written expression skills across content areas (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010, Next Generation Science Standards Lead States, 2013; Straub & Alias, 2013). Writing is a means of communicating the level of content knowledge understanding that teachers may use as a formal or informal assessment of knowledge. The Common Core State Standards have shifted the type of texts students encounter, with a higher focus on expository texts (i.e., 80% of text used in schools is expository) at the secondary level (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). When students have written expression deficits, their ability to prove academic content understanding can be inhibited. This could lead to lower test scores, which contributes to course failure and decreased academic attainment.

Writing also is a means of processing content learning (Bangert-Drowns, Hurley, & Wilkinson, 2004; Durst & Newell, 1989; Graham & Hebert, 2010; Langer & Applebee, 2011; Klein, 2000). When students engage in the act of writing, they simultaneously engage in reviewing the content, making connections to their prior knowledge, and increasing their ability to retain their new knowledge. The repetitive interaction with the material and the focused
attention on the content aids in the learning process (Weinstein & Mayer, 1986). When students have difficulty writing, it inhibits their ability to write-to-learn.

**Importance of Writing to Postsecondary Outcomes**

Writing is important outside of academics as a means of social communication, cultural propagation, and employment opportunities (Bazerman, 2013; College Board, 2003; Graham, 2006). Ninety-three percent of teenagers report they engage in writing outside of school (Lenhart, Arafeh, Smith, & Macgill, 2008). This is an exceptionally high number considering 60% of teenagers who communicate electronically do not consider this as writing (Lenhart et al., 2008).

The ability to write well is important to cultural progress and communication (Bazerman, 2013; College Board, 2003). Social norms and ideologies are conveyed through language. When the participants in the communication are separated by time or location, written expression allows for these conveyances to continue. For example, individual experiences can be communicated post hoc through written language, allowing others to share in the experience. When the individuals are co-located or contemporaries, this communication may occur through speaking. However, this communication occurs through writing when the individuals are separated by time. Written expression allows people to pass on their experiences, values, and perspectives to generations to come.

Written expression is also important to interpersonal connectedness and self-exploration (College Board, 2003; Graham, 2006). People build relationships through their communication, and this communication can occur asynchronously despite location or time (Bazerman, 2013). Individuals also use writing as a means of self-help (Merz, Fox, & Malcarne, 2014; Smyth, 1998). People can explore the root and effects of their emotions, gain clarification of their value
systems, and process traumatic events through writing (Merz, Fox, & Malcarne, 2014; Smyth, 1998). When people have difficulty with written expression, it may negatively affect their ability to communicate, to build social networks, and to process life events (Bazerman, 2013; Graham, 2006; Merz, Fox, & Malcarne, 2014; Smyth, 1998).

**Writing Indicative of Employment Success**

Writing is a skill necessary in many employment areas (College Board, 2003, 2004). More than half of businesses report that writing is a consideration during the hiring process and during promotion selections (College Board, 2003). Employees are expected to participate in email communication, presentation of visual materials, production of technical reports, and memos (College Board, 2004). Businesses’ increased use of technology to communicate has escalated the need for employees to be more proficient at written expression.

In a recent survey, 80% of employers would like schools to place more emphasis on writing outcomes and 93% say the ability to effectively communicate is a quality ranked higher than a candidate’s major (Hart, 2013). Poor writing skills are costly; businesses report spending more than $3 billion dollars on remedial training in written expression (College Board, 2004).

**Technology Usage of Writing**

Increased access to technology also impacts written expression due to its ubiquitous availability (Pearson, 2015). People use social media to connect with others and to convey important messages (Mauri, Cipresso, Balgera, Villamira & Riva, 2011). Whether discussing a dinner plan, political views, or where to find something in a person’s home, writing via text, instant messaging, social media, or email is a daily occurrence for many people (Lenhart et al., 2008), with the leaders of Facebook alone boasting over 2 billion daily users on their site (Chaykowski, 2017). Lenhart et al. (2008) found that 85% of teens engage in informal
communication via text, email, or social media. Additionally, 86% of teens believe writing skills are important to overall success in life (Lenhart et al., 2008). If students are not able to effectively engage in written communication, they may not be effective participants in technologically-driven social communications. Successful written expression is important to academics and beyond postsecondary education (College Board, 2003; Schultz, Hull, & Higgs, 2016). Understanding how students develop writing skill and knowledge can inform educational practices.

**Writing Skills Acquisition**

Historically, writing skills development was described as a linear progression of tasks (Rohman, 1965). Subsequent literature identifies it as a simultaneous, multi-step cognitive process (Hayes & Flower, 1980). During writing development, there are many skills and concepts that could be difficult for students to understand and master (Graham, 2006).

**Written Expression as a Process Model**

Hayes and Flower (1980) developed the Cognitive Process Theory of Adult Writing, that brought about a shift in the knowledge of engagement in writing tasks. Previously, writing was considered a linear, siloed series of steps in which writers would pre-write, write, and then revise (Rohman, 1965). The earlier models considered writers to progress through and complete each of these steps sequentially to a finished product (Rohman, 1965).

In viewing writing development from a process approach, Hayes and Flower (1980) allowed for a more iterative writing process in which planning, translating, and reviewing are performed to produce a written product. They identified three key pieces in a writing task: (a) task environment, (b) writing process, and (c) long-term memory. They believe that the
components of these three tasks occur simultaneously, recursively, and to varying degrees as a text is written.

Berninger and Swanson (1994) modified the writing process developed by Hayes and Flower (1980) and applied it to children. In their model, children develop skills at the word, sentence, and text level. Each level requires translation of ideas into written text through two separate activities: (a) text generation (i.e., the language of an idea), and (b) transcription (i.e., the physical writing/typing of the idea). Writers must have an idea of what they will write and also have the ability to get these ideas onto paper. For early writers, the transcription process is not fluent and therefore requires more attention (McCutchen, 1988). Once fluency is attained, writers free up that transcription attention to allow higher-level processes to occur such as substantively revising a text to meet the needs of the audience and task (Graham, 1990). Skill development with the process model can be used as instructional design aides to teach students with writing difficulties (Berninger & Swanson, 1994; Hayes & Flower, 1980).

**Written Expression Difficulties**

Ninety-five percent of students with disabilities have difficulty with written expression (U.S. Department of Education, Institute of Education Sciences, 2012). Students with mild to moderate disabilities struggle with several different aspects of writing (Englert, Raphael, Fear, & Anderson, 1988; Gillespie & Graham, 2014; Wong, 1997). They may experience difficulty with handwriting, spelling, punctuation, grammar, content, organization, relevancy, and coherency. Some students have difficulty with the physical process of transferring their thoughts into text on a page (Graham & Weintraub, 1996). When the physical process does not become fluent, students are at an increased risk for writing deficits (Berninger, 2004). Some students have difficulty with lower-order writing skills such as the mechanics of proper capitalization,
punctuation, and spelling (Graham, 1990). Others may have difficulty with the executive
function skills needed to manage higher-order writing skills such as considerations of what
content to include and how to effectively organize ideas and supporting details (Bourdin &
Fayol, 1994; MacArthur & Graham, 2016). Students with disabilities often focus on lower order
writing skills such as spelling and punctuation (Gillespie & Graham, 2014; Wong, 1997), and
tend to string ideas together with little regard to content organization or reader experience
(Bereiter & Scardamalia, 1987; Graham & Harris, 1989). Each unit of their writing serves as the
impetus for the next unit, which tend to be linear in thought. In addition to students with
disabilities, English learners also have difficulty with written expression (Echevaria, & Graves,
2015).

Written Expression for English Learners

Students who are English learners are at a greater risk of being identified as a student
with disabilities (Maheady, Algozzine, & Ysseldyke, 1984; Samson & Lesaux, 2009). Possible
reasons for this over-identification are lack of culturally relevant pedagogy (Sullivan, 2011),
poor assessments (Zhang, Katsiyannis, Ju, & Roberts, 2014), and similarities in characteristics to
students with disabilities. Poor assessments have been identified as a factor leading to the
overrepresentation of students from diverse groups in special education (Zhang, et al., 2014).
This over identification may result in a high percentage of English learners in special education
resource classrooms.

English learners have difficulty attaining English literacy (Ellis, 2006). In writing, only
1% of English learners with limited English proficiency are able to write at or above grade level
(U.S. Department of Education, Institute of Education Sciences, 2012; U.S. Department of
Education, Office of Elementary and Secondary Education, 2016). Simultaneous instruction of
English and content area knowledge is a common recommendation in current second language acquisition research (Schleppegrell, 2014). When writing instruction is included as part of a language instruction program, second language acquisition is more rapid (Ellis, 2002). Students learning a new language require explicit instruction in how to write as well as topic understanding to have content to write (Ellis, 2006). Developing written expression skills is important to learners, particularly for students with disabilities and students learning English.

Students with disabilities and English learners who struggle as writers need direct and explicit instruction using scaffolded supports (Antmann, Abbot, and Berninger, 2008; Ciullo, Falcomata, & Vaughn, 2015; Hough, Hixson, Decker, & Bradley-Johnson, 2012; Lara-Alecio et al., 2012). These supports help identify key concepts and free up cognitive resources, which can facilitate efficient learning of the multiple, simultaneous writing demands (Ausbel, 1963; Dye, 2000). Graphic organizers and instruction using self-regulated strategy development model provide such supports (DiCecce & Gleason, 2002; Singleton & Filce, 2015).

**Graphic Organizers as Instructional Supports**

Graphic organizers are visual representations of information that allow users to see connections between concepts (Dunston, 1992; Meyen, Vergason, & Whelan, 1996). Schema theory (Ausubel, 1963) is the premise of how graphic organizers aid student learning. Schema theory is a cognitive approach to understanding how new information is organized and integrated into prior knowledge. Ausubel (1963) maintained that as new information comes in, learners organize it and commit it to long-term memory via channels already established from prior learning. Graphic organizers aid this channel function by explicitly showing how information is organized (Dye, 2000) and by chunking the information, thereby reducing the number of stimuli...
that are taxing the working memory (Sweller, 1994). Easing the complexity of new, incoming information aides this integration (Paas & Sweller, 2014).

Historically, they were used as pre-reading advanced organizers to provide explanations of texts that used difficult vocabulary as a means of activating background knowledge (see Barron, 1969; see Earle, 1969). Graphic organizers emerged using only key ideas with understandable words instead of prose (Dunston, 1992). These were easier for students to understand because only key words were used and the information was situated in a way that visualized how ideas were conceptually related. In the 1970s, using graphic organizers evolved into during- and post-reading comprehension and learning strategies (Dunston, 1992; see Barron, & Stone, 1974; see Bean, Singer, Sorter, & Frazee, 1986). Typically, graphic organizers are a type of multimedia that provide an organizational structure (Darch & Eaves, 1986). The media of a graphic organizer are the written text of the concepts and the connection lines diagramming how concepts are related. These media can have a variety of design types (Dexter & Hughes, 2011; Singleton & Filce, 2015).

**Types of Graphic Organizers**

Graphic organizers have several different design variations. Venn diagrams, hierarchical maps, webs, tables, lines, family tree networks, and matrices are some of the types of graphic organizers used to show relationships (Dexter, 2001; Dexter & Hughes, 2011; Singleton & Filce, 2015). Spider maps, web diagrams, and series of events chains are graphic organizers that use connecting lines with additional text to show organization relationships. One type of graphic organizer is the concept map, which consists of nodes and labeled connection lines (Rovira, 2016). The connection lines between nodes are strategically placed to aid identification of how information is organized.
Graphic Organizer Construction

Graphic organizer construction can vary by the timing within the learning process where the construction occurs, and by the generative source of the construction (Dunston, 1992; Stull & Mayer, 2002). Graphic organizers can be used before, during, or after the presentation of new information to learners or in any combination of these during the instructional sequence. The organizers themselves can be constructed by the teacher, by the students, co-constructed, or more recently by computer generation (Cañas, Coffey, Carnot, Felovich, & Novak, 2003; Stull & Mayer, 2002).

Concept maps are made up of nodes and connecting lines (Rovira, 2016). Nodes contain one or two vocabulary words that depict a key concept. Connecting lines show how node concepts relate to other nodes. These lines and nodes can be graphically altered into a variety of shapes and sizes. The specific placement of the nodes and their connecting lines identifies how ideas are related (Dexter & Hughes, 2011; Lohse, Walker, Biolsi, & Rueter, 1991). A key difference between concept maps and other graphic organizers is the labeling of connection lines (Rovira, 2016). However, this delineation is not strictly adhered to and much of the research on graphic organizers does not include labeled connection lines.

Academic Supports

Graphic organizers are known to assist struggling readers and writers (Cañas et al., 2003; Dexter, 2001; Dexter & Hughes, 2011; DiCecco & Gleason, 2002; Dunston, 1992; Kim, Vaughn, Wanzek, & Wei, 2004). In reading, they help students understand relationships among ideas in a text (DiCecco & Gleason, 2002) and organization of the information for recall (Dunston, 1992; Kim, et al., 2004). In writing, graphic organizers are often used as a prewriting activity to promote idea generation and organization (Cañas et al., 2003). When teachers use
graphic organizers as an instructional aid for students with disabilities, it is important to explicitly teach how to use graphic organizers and explicitly identify the connections that show organization (Dexter & Hughes, 2011). Graphic organizers relate information that is more readily available for students to process and learn (Ausubel, 1963; Dye, 2000; Paas & Sweller, 2014; Sweller, 1994)

**Working Memory**

How learners process incoming information while simultaneously connecting this new information to prior knowledge is a complex task managed by one’s working memory (Baddeley & Hitch, 1974). Working memory (WM) is distinguished from short-term memory (STM) based on how information is manipulated (Baddeley, 2012). Both WM and STM consist of the temporary storage of information; however, WM, incorporates an active manipulation of information (Baddeley & Hitch, 1974). Working memory temporarily maintains (i.e., stores) information, while at the same time managing to process it and additional information. It requires the brain to select relevant material to attend to while also prohibiting attention to irrelevant material (Cowan, 2005), a task known to be difficult for students with learning disabilities (Willcut et al., 2010). In working memory, there is a central executive function managing two sub-systems, the phonological loop and the visio-spatial sketchpad. In a subsequent model, Baddeley (2000) added the episodic buffer. Working memory is limited in its capacity and is dependent on the size or amount of information being retrieved (Cowen, 2001; Sweller, 1994).

In addition to the internal management of incoming information, there are external factors affecting working memory, which make learning more difficult for certain individuals. Cognitive load is an external factor that affects learning new content due to the varying difficulty of the task (Sweller, 1994). More difficult tasks place a higher cognitive load on working
memory. Cognitive load theory attempts to work within the limitations of working memory to maximize learning.

Cognitive load originally consisted of two components, with a third subsequently teased out (Sweller, 1994; Sweller, Van Meriënboer, & Paas, 1998): (a) intrinsic load, (b) extrinsic load, and (c) germane load. Intrinsic load is determined by the difficulty of the content or task being learned. Extrinsic load is created and determined by the instructional design and refers to the load necessary to process the presentation of the content or task. Germane load is teased out from extrinsic load as the external, minimum load needed to process the content or task. It is distinguished from extraneous load in that it is required. The extraneous load is not required for processing, but can become an inhibitor to comprehension (Sweller, et al., 1998). Extraneous load is an important consideration in instructional design, especially when the intrinsic load is high; tasks with excess load, regardless of the source, are not learned as easily. Therefore, instructional designers attempt to limit the extrinsic load to each acquisition of new material. Aligning the design demands to the learners’ limited working memory capacity is important if learners are to efficiently learn the new content, particularly for students with working memory deficits (Cowan, 2005; Fuchs, Fuchs, Schumacher, & Seethaler, 2013; Paas & Sweller, 2014; Sweller et al., 1998).

**Deficits in Working Memory**

Working memory deficits affect students with disabilities across all academic areas and are known to affect the results of interventions (Swanson & Zheng, 2013). Students with mild to moderate disabilities have deficits in working memory that tend to remain over time (Swanson, Zheng, & Jerman, 2009). These deficits are not only in relation to the working memory process, but also the reduced speed at which the processes occur (Moll, Göbel, Gooch, Landerl, &
For students with disabilities who are English learners, working memory deficits also contribute to poor language acquisition and literacy skills (Swanson, Orosco, & Lussier, 2015; Swanson, Saez, & Gerber, 2004).

**Reverse Engineering**

Reverse engineering involves taking apart a man-made product into its subcomponent parts, with the goal of learning each component’s responsibility (Ingle, 1994). It may or may not also include the reassembling back to a whole state for production or improvement purposes. It differs from scientific investigation in that it involves a man-made product as opposed to a naturally occurring phenomenon (Eilam, 2005).

Reverse engineering examples can be found in the Middle Ages, the Industrial Revolution and World War II (Messler, 2014). The most wide-spread use of reverse engineering has occurred in the analysis and reproduction of war weapons (Messler, 2014). Today it continues to be used in product manufacturing and has had a resurgence in computer software development methods (Ingle, 1994). In the computer age, reverse engineering is used to recreate and improve legacy computer programs (Chikofsky & Cross, 1990), which is particularly necessary when integrating technologically advanced programming with older systems. In education, reverse engineering may prove to be a viable instructional design method.

**Reverse Engineering in the Field of Education**

In science, reverse engineering (RE) has been used as a model to teach students to solve everyday problems (McGowan, Ventura, & Bell, 2017). However, used in the context of science instruction, it is more closely related to designing the instructional scope and sequence to foster inductive reasoning. Students were presented with a challenge and asked to solve it. They
applied previously learned concepts to a novel situation and discussed the scientific reasoning to explain how their applications were supported. The reverse engineered model of instruction used in this intervention deconstructed a finished product to help students see how it was developed, but it occurred subsequent to students applying previous knowledge. It was used as a supplement, not an initial presentation of new material. Also, reverse engineering is different than simply reversing the instructional sequence as in backwards chaining.

**Compared to reverse chaining.** Chaining is a process where students are incrementally taught a component step in a process (Spooner & Spooner, 1984), which stimulates the next step (Kelleher & Gollub, 1962). To use chaining as an instructional method, teachers typically complete a task analysis of a skill or concept into its discrete components and then teach one component at a time (Spooner, 1984). In forward chaining, students are taught the first step in a process, until it is mastered. The subsequent step then is taught as a response to the previous step and as a stimulus for the next step. The step is taught until the student has mastered the stimulus/response of that particular step before moving on to learn the next step. This process is repeated until all the steps in the total task are learned. Similarly, backward chaining is teaching incremental steps that serve as a stimulus and then a response, but starting with the last step and then teaching each preceding step as its stimulus/response.

Reverse engineered instruction differs from reverse chaining. In reverse engineered instruction, the teacher models deconstruction of the whole task into each of its components until the entire task has been fully deconstructed. Students are involved in the deconstruction by observing this process as a means of analysis of the responsibility of each component as it is abstracted from the whole to determine its purpose, relationship, and responsibility to the whole.
Conversely, reverse chaining is taught discretely to mastery before instruction of the previous step.

**Compared to Problem Solving.** Reverse engineered instruction is somewhat like backwards problem solving (Shapiro, 2000). In backwards problem solving, a specific unknown is the final target of a solution to a problem. When a portion of information is known, it can be used in a series of steps to calculate the unknown. This unknown becomes the known for solving the next unknown. This process continues until the final unknown is solved. For example, in a math story problem: *A pair of shoes costs $5 less than an outfit. T-shirts cost half the price of the shoes and $6 more than the socks. If the socks cost $5, how much does the entire outfit cost?*

The known amounts (i.e., cost of socks) could be used in a backwards process to solve for the unknown (i.e., cost of shoes followed by cost of outfit). However, reversed engineered instruction is not used to solve a problem; it is used as a means for students to learn how the parts of a task come together to form the whole.

Deconstructing an expository paragraph into its component sentences is a form of reverse engineering. Using this during the modeling step of explicit instruction may help students with mild to moderate disabilities understand how the sentences work together in a whole paragraph. However, due to working memory difficulties, the cognitive load to make the necessary connections may be too difficult. Graphic organizers help manage this load. By providing a graphic organizer with a systematic labelling system that matches the labeling system used in identifying the component parts (i.e., sentences), students may be more successful.

**Statement of the Problem**

Students with high incidence disabilities and English learners often lack the ability to write a cogent expository paragraph (U.S. Department of Education, Institute of Education
This may be in part due to their inability to maintain the appropriate information in their working memory while a teacher is providing instruction related to the writing process (Cowen, 2001; McCutchen, 1996; Sweller, 1994; Willcut et al., 2010). Teachers use modeling for students to observe the processes they use as an experienced writer when progressing from a completed graphic organizer to a drafted paragraph, which includes idea development. This typical forward sequence may be exceeding the amount of information students with disabilities or English learners are able to handle in their working memory (Baddeley, 2015; Cowen, 2001). This also may be in part due to their inability to observe the connections between the one or two words used in a graphic organizer to the multiple words in a completed sentence within a drafted paragraph. This difficulty could further be exacerbated by the fact that how a writer develops an idea into a complete sentence is a difficult process to explicitly teach because of the multiple, simultaneous processes required, which are difficult to articulate during the process. No research exists modeling this connection by reversing the draft and prewrite steps to demonstrate how students should write a complete sentence in a well-organized paragraph from a graphic organizer. Therefore, this study examines reverse engineering a draft paragraph, with and without using a labeled graphic organizer as a working memory support, to demonstrate these connections.

**Research Questions**

The purpose of this study was to examine the effect of reversing the instructional sequence of explicitly teaching the draft and prewrite steps of the writing process, with and without a labeled graphic organizer as a working memory support, for students with mild to moderate disabilities. The researcher implemented a quasi-experimental research design. The research questions were:
1. Does reverse engineering the drafting step of the writing process improve expository paragraph writing quality compared to business as usual writing instruction in a typical resource classroom?

2. Does adding a systematic letter coded graphic organizer to reverse engineering the drafting step of the writing process improve the writing quality of an expository paragraph?

3. Does knowledge of four sentence types contained in an expository paragraph predict paragraph writing quality?

4. For students with disabilities who are English learners, does using a graphic organizer, with or without a systematic letter code, improve writing quality and total number of words written?

**Significance of the Study**

Writing ability is imperative in school and beyond as a college and career readiness skill. The ability to compose cogent writing has become increasingly necessary in school and beyond (Bazerman, 2016; Graham, 2006; Graham & Harris, 2013). The adoption of the Common Core State Standards by 42 states increases the rigor of writing in school, and requires writing instruction be embedded into curricula across all content areas (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). However, few teachers feel capable or prepared to teach writing skills (Graham, Capizzi, Harris, Hebert, & Morphy, 2014; Harris, n.d.).

Writing is important beyond school as well. Employers spend millions of dollars annually to remediate writing deficits (College Board, 2006). Writing ability is used by employers in hiring and promotion decisions, and more than 80% of employees consider writing to be a
critical skill in their everyday activities (College Board, 2006). Despite the growing need for writing skills, only 27% of all American students are capable at writing at or above grade level (U.S. Department of Education, Institute of Education Sciences, 2012).

Students with learning disabilities and non-proficient English learners have even more difficulties with writing proficiency, with less than 6% able to pass the writing proficiency assessment (U.S. Department of Education, Institute of Education Sciences, 2012). When content area classes require students to convey their content understanding in writing, these deficits may mask a student’s true capabilities, leading to lower course grades and poor graduation rates (College Board, 2004, 2005). It is imperative that students be taught written expression skills for success in school and employment. (College Board, 2004).

This study examined an instructional sequence anchored in the Model It! step of Self-Regulated Strategy Development (Harris, Graham, & Mason, 2003). This sequence involved reverse engineering the drafting step of the expository paragraph writing process. This intervention also incorporated a graphic organizer as a working memory support for one of the treatment groups. The effectiveness of this intervention could lead to increased writing quality, increased content area grades, higher graduation rates, and better employment opportunities for students with high incidence disabilities and English learners.

**Definitions**

**Autism.** A spectrum disorder that significantly affects verbal and non-verbal communication and social skills adversely affecting academic achievement and not primarily due to an emotional disturbance (N. A. C. § 388.028, 2016).
**Business as usual.** The typical middle school resource English language arts classroom instruction that is replaced by the intervention in treatment classrooms. It was taught in the comparison classroom.

**Conclusion sentence.** A general statement about the topic that wraps up the paragraph; it may include the author’s feelings about the topic (Kemper, Sebranek, & Meyer, 1998)

**Detail sentence.** A phrase that provides information to describe the main idea of the paragraph (McWhorter, 2015).

**English learner (EL).** A student who has a native language other than English whose oral or written language difficulties impede the ability to achieve academically or participate fully in society (U.S. Department of Education, Office of Elementary and Secondary Education, 2016).

**Explanation sentence.** A phrase that provides information to describe a detail sentence (Kemper, et al., 1998).

**Expository paragraph.** A group of sentences around an idea that are designed to inform, persuade, or convince the reader (Kemper, et al., 1998).

**Graphic organizer.** A group of symbols arranged to show relationships between the ideas that are placed in each symbol (Darch & Eaves, 1986).

**Hearing impairment.** An impairment of hearing mechanisms which affect sound integration and prevents or delays the normal development of speech and language (N. A. C. § 388.047, 2016).

**Learning disability.** A disorder in one or more of the basic psychological processes involved in understanding or using spoken or written language, not primarily the result of a
visual, hearing or motor impairment, mental retardation, serious emotional disturbance, or an environmental, cultural or economic disadvantage (N. A. C. § 391.117, 2006).

**Licensed guest teacher.** An individual who has met the minimum education requirements for certification: (a) 60 credit hours from an accredited college or university, or (b) conferred associates degree or higher from an accredited college or university (N. A. C. § 391.332, 2016).

**Licensed special education teacher.** A person who has met the minimum competency and education requirements for certification in special education, including a Bachelor’s degree or higher from an accredited college or university (N. A. C. § 391.3393, 2011).

**Mild to moderate disabilities.** A group of students identified as having a disability who spend at least a portion of their day in general education classrooms. In this study it includes students with learning disabilities, autism, and hearing impairments (Gage, Lierheimer, & Goran, 2012).

**Reverse engineering.** A process of deconstructing a man-made item from its whole into its subordinate parts to understand the interconnections for the purpose of reassembly with improvements (Ingle, 1994).

**Topic sentence.** A sentence that generally tells the reader what the paragraph is about without providing specific details (D’Angelo, 1986).

**Total number of words.** A measure of syntactic maturity determined as a count of words written in a paragraph (Moran, 1981).

**Urban classroom.** A classroom located in a school with greater than the local school district average of students receiving free or reduced lunch and greater than the local school
district average of students who are English learners, as identified by the school district’s 2013-2014 accountability report (U.S. Department of Commerce, Census Bureau, 2010).

**Working memory.** A temporary storage system that allows for simultaneous manipulation of information (Baddeley & Hitch, 1974).

**Writing quality.** The degree to which the topic, detail, explanation, and conclusion sentences are included in a paragraph as measured by an identified metric (Troia, Lin, Monroe, & Cohen, 2009).

**Delimitations**

1. The sample was a convenience sample and the students were part of a specific and narrow subset of the general population. Participants were middle school students in an urban setting with high English learner populations and low socioeconomic status. Caution should be used when generalizing results to other populations.

2. Students’ prior knowledge and application of graphic organizers were not assessed. Higher prior experience with graphic organizers or varying levels of graphic organizer usage proficiency may have influenced the results.

3. The comparison group instruction was not controlled. The comparison group’s improvement in paragraph writing knowledge or quality improvement may be due to the practice included in the business as usual instruction.

4. The measurement tool used to assess the paragraph writing quality was created by the researcher. A validated expository paragraph writing tools does not exist. Most norm-referenced validated writing tools assess narrative writing or assess writing at the sentence or essay level. However, this intervention is expository and at the paragraph
level so the researcher developed an instrument. Quality measured using a different instrument may alter the results.

5. Only four student writing samples were assessed (i.e., pre, post, two-weeks post, four-weeks post). A reliable total number of words measurements requires 14 writing samples, and a reliable writing quality measurement requires 11 writing samples (Graham, 2016). The writing samples provided by students may or may not be a reliable and/or valid demonstration of the student’s true expository paragraph writing quality capability.
CHAPTER TWO
REVIEW OF RELATED LITERATURE

Secondary student writing requirements have changed over the past few years due to the adoption of new, more rigorous academic content standards designed to improve critical writing skills identified for college and career readiness (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). It is hoped that this increased rigor may also combat the historically low growth in writing achievement (Graham & Harris, 2013).

Simply increasing the rigor and focus on writing may not necessarily result in improved capabilities for students unless effective instructional practices are used (Graham, Harris, & Chambers, 2016; Troia & Olinghouse, 2013). This is especially important for student populations known to require additive instructional supports such as children with mild to moderate disabilities and English learners (ELs; Echevarría & Graves, 2015; Swanson, 2001).

Writing is a difficult task due to the sustained level of highly-demanding cognitive activity (Graham, 2006). To be effective writers, students must understand, process, and simultaneously apply a variety of skills necessary for, and related to, the writing task (Englert et al., 1988; Graham & Harris, 2009; Graham & Weintraub, 1996). They must also have the knowledge and skills necessary to address the content of the writing task by drawing on and retrieving their content knowledge at precisely the proper moment to get that idea onto paper. Additionally, these multiple and simultaneous processes require the cognitive resources necessary to maintain, manage, and apply all this knowledge and understanding (McCutchen, 1996). Developing these cognitive capabilities requires educators to consider and apply strategic instructional methods designed to support learners in achieving the writing task (Straub & Alias, 2013).
Effective Instruction for Students with Mild to Moderate Disabilities

To maximize efficiency of learning, educators design methods, sequences, strategies, activities, environments, content, delivery, and scaffolds so that all students have the opportunity to learn (Elliot, 2015). Educators consider content and activities that will maximize efficiency for students to incorporate new knowledge to their prior experiences, skills, and understandings. These activities are philosophically influenced by the learning theories to which the designer ascribes. Bruner (1960) proposed that a critical element to learning is how the content is delivered in the environmental context that the instructor creates. Introducing basic concepts followed by more difficult ideas gradually increases difficulty. Aligning the initial concepts to student’s prior knowledge allows students to construct new knowledge. The gradual increase in difficulty can be orchestrated by the teacher when planning instruction. Bruner addressed the idea of intentional instructional design as part of his cognitive development research.

One such instructional practice, direct instruction, is a cognitive, behaviorist approach and involves variables highly related to student achievement (Bandura, 1971; Rosenshine, 1976). In a specifically sequenced delivery of content that is highly structured to anticipate and eliminate areas of potential learning difficulty, the teacher scaffolds the instruction with corrective feedback in a gradual release from teacher-directed activities to student independent practice (Kame’nui, Fien, & Krogesaar, 2013). These cognitively-focused methods may include the teacher’s clear and deliberate conversation and behaviors that direct student’s attention (Baker, Gersten, & Graham, 2003; Rosenshine, 1987). Direct and explicit instruction uses methods that teachers employ to facilitate effective learning and have emerged as instructional methods that are predictive of high levels of efficiency in the teaching and learning process for students with mild to moderate disabilities (Carmine, 1997; Swanson, 2001).
Explicit Instruction

Explicit instruction occurs when teachers fully explain the content and skills a student is expected to learn (Clark, Kirschner, & Sweller, 2012). It is characterized by clearly stated learning goals, strategically sequenced delivery, a variety of examples, and opportunities to practice guided by immediate corrective feedback (Coye, Kame’enui, & Carnine, 2011). A solid research base exists supporting the effectiveness of explicit instruction for students with disabilities in a variety of academic and behavioral tasks (Archer & Hughes, 2011; Baker et al., 2003; De La Paz & Graham, 1997; Mason & Graham, 2008; Swanson, 2001), and is evidenced by the incorporation of this instructional method into the Institute of Educational Science’s practice guides (Baker et al., 2014; Herrera, Truckenmiller, & Foorman, 2016; Kamil et al., 2008; Mason, & Graham, 2008). More recently, explicit instruction has been identified as one of 22 high-leverage practices in special education (McKleskey et al., 2017). Recent research has examined explicit instruction in a variety of content areas for struggling students; this review is not limited to writing instruction, but rather to the global impact of explicit instruction on the content outcomes of students with disabilities.

Hough, Hixson, Decker, and Bradley-Johnson (2012) performed a multiple baseline across participants, single-case research design study examining the Quickwrite (Maloney, 1998) explicit story-writing program. Quickwrite has many of the features of self-regulated strategy development (SRSD) but differs in timing. Each step in SRSD is explicitly taught and students implement the steps over an unspecified period. In contrast, the steps in Quickwrite are purposefully limited so that students have a rough draft in a very short amount of time (e.g. 10 minutes).
Five second grade students identified by their teacher as struggling writers, who were not receiving special education academic support and who scored at or below the 25th percentile on a 3-minute curriculum-based measurement, participated in the narrative writing intervention. The seven lessons were administered during the school day in a quiet office separate from the classroom over the course of 8 to 12 sessions per student. Students moved to subsequent lessons after meeting a success criterion for each lesson. Using explicit instruction, students learned component parts necessary for a story (i.e., who, what, when, where) and the four steps of the Quickwrite drafting method in the first four lessons. The final three intervention lessons were devoted to practicing the Quickwrite technique. For this intervention, the timing was modified to 12 minutes (i.e., brainstorming for 2 minutes, planning for 1 minute, drafting for 6 minutes, revising for 3 minutes).

Results of the intervention were mixed. The quality of writing improved, but the total number of words written decreased. Quality was measured by the inclusion of story elements (e.g. character, setting, events) on a researcher-modified rating scale. Researchers attribute the decrease of number of words written to a shift in focus from simply getting random words onto paper simply for the sake of writing, to strategic selection of words that fulfill a purpose that leads to improved writing quality. The effectiveness of the explicit instruction on this population was evident by the quick progression of each student through the seven lessons. All students averaged no more than 2 sessions to meet the lesson criteria. These researchers implemented an intense dosage on consecutive days for less than three weeks. They conclude explicit strategy instruction lessons have a positive impact on student writing achievement.

Explicit instruction has also been examined for teaching reading skills. In a multi-tiered instructional delivery model, Fien et al. (2015) examined the impact of Enhanced Core Reading.
Instruction, which included explicit instruction and increased opportunities to learn, on first grade at-risk student’s reading achievement. Both treatment and comparison groups participated in interventions delivered through a multi-tiered systems of support (MTSS) decision-making framework. Random assignment at the school level resulted in 120 students in the treatment and 147 in the comparison condition at 16 schools in Oregon. Of these at-risk students, 3.3% in treatment and 6.8% in the comparison group were receiving special education services and 12% were English learners. Both groups received 90 minutes of core reading instruction from their classroom teachers in tier 1, and an additional 30 minutes of instruction in tier 2 for an entire academic year.

The comparison group teachers used the district-approved core reading program. In Tier 1 they reported engaging in whole group, small group, and independent activities. In Tier 2, they used a variety of published and teacher-made material. The intervention groups Tier 1 instruction used additional instructional mapping and templates that focused on explicit instruction routines. Their Tier 2 instruction was aligned to the Tier 1 reading instruction.

Researchers used standardized assessments to measure reading progress and achievement, as well as observation scales for instructional activities employed in classrooms. Reading assessments were administered in the fall, winter, and spring and measured reading achievement, nonsense word fluency, oral reading fluency, comprehension, word recognition, and word analysis. These scores were also used to contrive a total reading score. Researchers used a modified version of the Classroom Observations of Student-Teacher Interactions (Smolkowski & Gunn, 2012) to measure participant interactions and record contextual conditions.
The treatment group received *Enhanced Core Reading Instruction* (ECRI; Fien et al., 2015) which is designed to improve MTSS by focusing on three areas: (a) Tier 1 focused on 5 core reading elements (i.e., phonemic awareness, phonics, fluency, vocabulary, comprehension), (b) Tier 2 highly aligned to Tier 1, and (c) continuous professional development. In Tier 1, teachers followed specific instructional maps designed to increase explicit instruction and opportunities to learn. They reported an average of 57 minutes per day of whole-group instruction, 29 minutes of small group instruction, and 35 minutes of independent work. In Tier 2, they used materials directly related to the daily Tier 1 instruction and instructional maps consisting of specifically timed activities: (a) phonemic awareness (1 min.), (b) irregular word reading and sound spelling (2 mins each), (c) reteaching (3 min), (d) blending and word reading (4 min.), (e) encoding practice (5 min), and (f) fluency (12 min).

Results of the intervention on proximal assessments were mixed. Students in the treatment group scored statistically higher on the fall to winter measures than students in the comparison group. However, even though treatment students scored higher than comparison student on the winter to spring assessments, the scores were not statistically significant. Researchers point out that higher gains from fall to winter measures than on winter to spring are typical. They recommend further research to determine if the gains were due to the alignment of the tiers or to the specificity and explicitness of the teacher instruction in the treatment groups. On distal measures, there was an effect size of greater than .25, but the differences in scores between the groups were not statistically significant. Researchers suggest this phenomenon may be since the comparison group was receiving quality tier 1 and tier 2 support that contained explicit instruction and scaffolds with high fidelity.
In a multiple-probes across participants research design, Ciullo, Falcomata, and Vaughn (2015) examined the effects of explicit instruction on informational text comprehension. Seven participants aged 10-11 years old in two different schools participated in a 6-week intervention implemented by one researcher-trained, former middle school reading teacher with 6-years’ experience. The measurement instruments included a social studies content knowledge pre- and post-test and daily 10-question quizzes. The quizzes were parallel assessments in terms of format, design, and difficulty level but were unique to each day’s content. The inclusion criterion was a word-reading level of grade 2.5 or above on the Test of Word Reading Efficiency, sight word efficiency subtest (Torgesen, Wagner, & Rashotte, 1999).

During the intervention phase, students met daily for 45 minutes with the interventionist who implemented identical procedures using different daily content. The teacher previewed the text by defining key terms, discussed graphics in the text (e.g. maps, pictures, charts), and stated an overview of the topic. During reading, the teacher and student alternated reading the text aloud, with error correction provided for miscues. After reading, a graphic organizer containing key elements of the text was presented and discussed. To keep the students actively engaged, every third graphic organizer had two blank blocks that the teacher and student completed together. The teacher explicitly taught the content of each block in the graphic organizer and the student parroted what the teacher had read. The teacher also asked probing comprehension questions. Following the explicit instruction, the student was given an opportunity to role-play the teacher by explaining the main events and teaching the interventionist. The daily 10-question comprehension quiz was then administered. Implementation validity was 100%; inter-rater reliability of scoring the daily measurements was 92%. Social validity was deemed favorable based on the post-intervention participant survey.
When compared to baseline, the explicit graphic organizer instruction improved comprehension quiz scores for all participants. The authors attributed the increased comprehension to the explicit instruction. For two of the participants, the authors acknowledged that although the scores improved, the increase was relatively mild. They suggest additional strategy intervention may be necessary for students with similar results of participation. Authors also suggest that future research examine the rigor of the social studies instructional practices for upper elementary students and the potential of technology-based graphic organizers that could incorporate tech-afforded features (e.g. text-to-speech, picture insertions). Additionally, they recommended conducting the research on a more diverse group to include English learners and implementing a group-design in a general education setting to increase the sample size.

Antmann, Abbot, and Berninger (2008) studied explicit instruction in spelling. They used confirmatory factor analysis to further analyze a data set from a previous intervention study that examined how students responded to explicit instruction in spelling. The data set included 24 data points for 127 low-achieving second-grade students. Because this data set was generated from three different treatment condition groups, the researchers controlled for these differences during their modelling processes.

Students were given a bank of six correctly spelled words at the top of a lined piece of paper, and a prompt 24 times, during a four-month period. They were instructed to use as many of the given words as possible to answer the prompt and were given a three-minute time limit. Students used pencils without erasers and told to cross out anything they would have erased and to rewrite it instead. The measure used to determine response was the number of correctly spelled words.
Researchers used a growth mixture model looking at initial scores and rate of growth. They classified students into three categories: (a) low initial and low growth, (b) high initial and low growth, and (c) high initial and high growth. Researchers found that students in the high initial low growth group required 40 minutes of additional instruction compared to the high initial high growth group. Remarkably, the low initial low growth group required double that amount of time (i.e., 80 minutes). Researchers suggest that explicit writing instruction is beneficial and does in fact transfer to student usage in their compositions. However, some students may require longer intervention periods before the effects will be realized.

Explicit instruction improves achievement for students with disabilities and is a fundamental component of tier 2 interventions (Gersten et al., 2009). The strategic lesson implementation, clear goals, varied examples and multiple opportunities to engage with the material guided by corrective feedback are essential elements fostering the improved achievement (Coye et al., 2011). Providing students with strategies to enlist during learning aide in this instructional process.

**Strategy Instruction**

Strategies are steps one goes through to complete a task (Carmine, 1997). The structure of these steps falls along a continuum from highly-specific to loosely-defined and mirror behaviors used by people who are skilled at performing a particular task. Strategies guide learners during new content learning as they increase in their abilities to perform the task and are used by more knowledgeable students during application of previously learned content or skills (Prawat, 1989; Rosenshine, 1995). A key aspect of instructional design is to aid students in acquiring strategies developmentally and cognitively matched to where they most-efficiently acquire knowledge (Carmine, 1997). For some students, these strategies are evident without
educator interference. For others, particularly students with mild to moderate disabilities, educators must direct the learner’s attention and explicitly expose the use of a strategy and model its implementation (Carmine, 1997).

In a group study descriptive research design, Monroe and Troia (2006) set out to determine if explicit instruction in a set of writing strategies could improve the writing skills for middle school students with mild disabilities. Three middle school students with language learning disabilities participated in a seven-week intervention that explicitly taught them to use four different mnemonic strategies. The DARE and SPACE strategies were used for planning to write a persuasive and narrative essay respectively. The CDP strategy was used for revision purposes, and the SEARCH strategy was used for self-regulation.

Students learned to use all four of these strategies in only three weeks in the middle of the intervention period. The beginning of the intervention period was used to introduce the students to the study and collect pre-intervention data. The end of the intervention period was used for students to practice the strategies and take post-intervention data. The three students were taught by the researcher as part of their specially designed instruction in a resource room setting. The instruction took place in a quiet room separate from the rest of the class.

Using a six-trait writing quality rubric, the participant’s pre-and post-intervention writing scores were compared. Their post-intervention scores were also compared to three students who were receiving special education services in a language arts resource room and six general education peers, all of whom did not receive the intervention instruction.

A comparison of pre- and post-intervention scores indicated students receiving instruction in planning, self-regulation, and revising strategies improved writing quality over students with disabilities who did not receive the intervention. Two of the three students came
close to the same overall quality level of the general education control group. Students with lower writing abilities made more gains than students with higher writing ability indicating that combinations of multiple strategies may accelerate achievement gap closure. Explicit instruction in using multiple strategies was effective for improving writing quality. Although the results were promising, the intervention group was very small, so the results should be applied judiciously.

Olson, Matuchniak, Chung, Stumpf, and Farkas (2017) conducted a multi-state two-year study examining secondary student’s writing when their teachers were participants in the Pathway Project. The Pathway Project provided teachers with training to incorporate cognitive strategy use in their writing process instruction. The cognitive strategies targeted specific activities students are required to perform during reading and writing (i.e., summarize, infer, analyze, evaluate, assess, draw conclusions, revise, and reflect). Students learned these strategies and were provided with classroom posters and bookmarks as scaffolding supports. Teachers also learned how to use student writing as a baseline formative assessment to develop individually-tailored explicit instruction and participated in collaborative mentoring partnerships. Researchers hypothesized that incorporating strategy instruction would decrease the cognitive burden required of reading and writing. The study used an experimental, randomized controlled trial design to determine the effect of teacher participation in the Pathway Project on student writing achievement. Researchers also examined the impact membership of racial subgroup populations had on writing outcomes. They specifically looked at the impact on English learners.

Participants were 7th through 10th grade students from 98 teachers who were equally divided into a comparison and intervention group. Teachers had an average of 14.82 years teaching experience and 77% held Master’s degrees. There was not a statistically significant
difference in teacher characteristics between the groups. Data taken from 20 randomly chosen students in each classroom were analyzed. Researchers created a 6-point holistic rubric, based on two state-mandated assessments and the National Assessment of Educational Progress, to evaluate on-demand essays. Additionally, they examined data from the state’s annual summative assessment. However, during the research period, the state changed to a new annual assessment. Data analysis separated the effect of the Pathways Program for each of the two years.

On the writing quality assessment, there were large effects of the intervention for 7th and 11th grade and English-proficient students who were English learners. The Pathway Project had larger effects on Hispanic students than Caucasians. The passing rate for males, students who were not English learners, Hispanics, and students receiving free and reduced lunch increased with a large effect size. In the second year, scores also increased, especially for Hispanics and Asians. However, regression analysis didn’t reach statistical significance. Researchers speculated this may have been due to the relatively smaller sample size in the second year due to teacher attrition. Researchers concluded explicit instruction of the writing strategies used by proficient writers helps close the achievement gap for English learners.

Berkley, Mastriopieri, and Scruggs (2011) examined the effects of strategy instruction on 7th, 8th, and 9th grade students with learning and other mild disabilities. Participants qualified for special education services and received specialized instruction in reading as part of their individualized education plan. The 59 students participated in three different conditions: reading comprehension strategy (RCS), reading comprehension strategy and attribution retraining (RCS + AR), or the Read Naturally (RN) curriculum. All three groups received 360 minutes of instruction over four weeks. The instruction consisted of 20 minutes of primary instruction with 10 minutes of supplemental instruction.
The reading comprehension strategy (RCS) group learned to use six different reading comprehension strategies during their primary instruction time (i.e., setting, purpose, previewing, activating background knowledge, self-questioning, summarizing, strategy monitoring). Their supplemental time was used for a read aloud. The students selected short stories and the teacher modeled fluent reading.

The reading comprehension strategy with attribution retraining (RCS+AR) group received the same strategy instruction during their 20 minutes of primary instruction. In contrast, their 10-minute supplemental time was used to learn attributes designed to improve self-efficacy, effort, and persistence by re-teaching students how to accurately attribute success to strategy usage, which is within their locus of control. This population typically attributes success to external causes such as luck and failures to internal causes such as their own inadequacies (Tabassam & Grainger, 2002). The comparison group did not receive strategy instruction nor attributional retraining. During their primary instruction time, they used a reading comprehension program consisting of repeated readings followed by comprehension questions. During their supplemental time, they listened to the teacher read-aloud.

Four measurement tools were used for the pre- and post-intervention assessments. The researchers used a standardized, criterion-referenced comprehension test. The researchers also created a passage-specific comprehension assessment. An abbreviated version of the Meta-Comprehension Strategy Index was used to measure strategy implementation, and an adapted version the Reading Attribution Scale was used to measure how students attributed their success and/or failure during reading.

Results indicated that both groups receiving the strategy instruction had improvement of their reading comprehension criterion-referenced scores with a large effect size. These
improvements were maintained at the 6-week post-intervention maintenance probe. However, the large effect size maintained for the group that received the attribution retraining whereas the strategy only group maintained improved comprehension but to a lesser degree.

There was not a statistically significant difference in the scores of the passage-specific comprehension test between the three groups. The researchers attribute this to the fact that students in the comparison group were getting practice with answering passage-specific comprehension tests as part of their primary instruction programming.

Both groups receiving the strategy instruction scored statistically higher than the comparison group on the *Meta-Strategy Index*. There was a large effect difference for the attribution retraining group on the attributions for reading success portion of the *Reading Attributions* post-test, with no statistically significant difference between the other two groups. Conversely, there was no statistically significant difference between the three groups on the attributions for reading failure portion.

The researchers discussed the importance of maintaining the effects of the strategy instruction on the 6-week post-intervention assessment. This population of students typically does not generalize strategy instruction to novel situations, nor do they maintain strategy usage well-beyond an intervention period. The researchers concluded the positive impact of attribute retraining aided in maintaining the large effect size across the month and a half interval until the maintenance probe.

This study used student self-reporting to measure the strategy usage and attribution measures. In future studies they recommend using a direct measure instead. An additional limitation cited was the possible impact of the wording on the attributions assessment. Some of the items used a double negative which may have confused students.
Using explicit instruction, teachers intentionally direct attention to various aspects of the content to proactively mitigate potential barriers to the learning process (Coye et al., 2011). Research indicates explicit instruction for students with disabilities is effective in multiple content areas (Antmann, Abbot, & Berninger, 2008; Ciullo et al., 2015) including written expression (Hough et al., 2012). However, this research typically addresses elementary age students and therefore tends to focus on narrative writing. For secondary students, the majority of writing they will encounter in school shifts to expository writing (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). Therefore, it is important to further explore evidence-based methods for teaching students expository writing skills.

Strategy instruction teaches students to use the methods and processes used by people who already know how to accomplish the task or content being taught (Rosenshine, 1995). Strategy instruction is effective for students with disabilities (Berkeley, Mastriopieri, & Scruggs, 2011; Monroe & Troia, 2006; Olson et al., 2017). When secondary students are taught cognitive strategies to apply to their reading and writing, the quality of their writing improved (Olsen et al., 2017). These effects were noted to be larger for students who were English learners. There is a need to apply explicit, strategy instruction for expository writing to secondary students with disabilities and English learners.

**Instructional Methods for English Learners**

Students with disabilities are one subgroup of the diverse learner population currently attending public schools (National Center for Education Statistics, 2017). Another growing group of students in need of effective instruction are English learners (ELs). There is some overlap of membership between disability and EL categories (Zhang et al., 2014). Students who
are learning English do not necessarily have the same cognitive deficits or learning obstacles to overcome as students with disabilities. However, they do have barriers to their learning relative to academic language development and vocabulary (August & Shanahan, 2006). English learners (ELs) reach higher levels of academic achievement when language is integrated in content-area instruction (Janzen, 2008). Some components of effective instructional practices for ELs match effective practices for students with disabilities. Explicit instruction and the use of scaffolds have improved learning efficiency for English learners (Lara-Alecio et al., 2012; Olson et al., 2017).

Examining teacher pedagogical practices can inform researchers and practitioners of effective practices to improve outcomes for English learners. As part of a larger study on the effects of language development activities embedded into science classroom instruction, Garza et al. (2017) analyzed the observational data of teachers’ instructional practices. Eight fifth-grade teachers were observed to identify commonalities in pedagogy that occurred for students who significantly improved their language and science achievement.

The observations consisted of 60 20-second observations within a 90-minute science class at the beginning, middle, and end of the school year. Observation researchers were trained to use the Transitional Bilingual Observation Protocol (TBOP; Bruce, 1995). This tool is designed to capture teacher implementation of generic best-practices in EL instruction. It is not specifically developed to measure language instruction within content areas, nor more-specifically to measure science instruction. The four main domains of the TBOP are activity structure, communication mode, language content, and language of instruction.

Activity structures were described as the types of activities the teacher chose to employ such as lectures, demonstrations, evaluations, or observations. There were 21 identified combinations of teacher behavior and student behavior (e.g. teacher evaluates while student
performs). The communication mode included oral, written, receptive, and expressive language. The observers also identified when there were instances of combined forms of language communication and when there was a lack of communication. Language content was further classified as academic or social, and according to the cognitive demand (i.e., light, dense). The language of instruction was either the native or second language and delineated if the content was delivered in one language and if it included the other language for support.

Treatment classrooms had more occurrences of student-centered activities and fewer interruptions. Student-centered activities provided Els with multiple opportunities to practice their language skills with their peers. There were also more instances of teacher leading followed by students performing, and teacher observations of students engaging in cooperative learning. For the communication domain, treatment classrooms had higher occurrences of students engaging in language usage and less teacher-talking students-listening time. In the treatment group, the language was rigorous and afforded cognitively demanding activities and communication with higher instances of explicit teacher modeling. These classrooms were engaging and used academically rich vocabulary in oral and written language. Scaffolding the language with these activity and communication structures allowed students to advance in both content and language acquisition. Explicit instruction within science inquiry and scaffolding supports were effective instructional methods for English learners.

In another study of effective instruction for English learners, Lara-Alecio et al. (2012) provided professional development and specific science lessons for teachers to implement in their fifth-grade classrooms. The purpose of the study was to examine the effects of science instruction containing embedded literacy development on science and reading achievement. The
research took place at four intermediate schools in an urban district in Texas. The participants were low economic status non-English learners and English learners.

The professional development (PD) consisted of 3-hour bi-weekly meetings for the teachers and monthly meetings for the paraprofessionals. During the PD, researchers discussed the upcoming scripted lesson plans, clarified science concepts and performed experiments to anticipate student learning barriers, reflected on pedagogy and student learning, and learned language development strategies (i.e., questioning strategies, visual and language scaffolds, advanced organizers, realia, technology integration, and concept connecting). Based on data from the larger project, teachers noted their own improved capabilities to: (a) integrate reading, writing, and speaking, (b) build vocabulary, (c) incorporate questioning techniques, and (d) use their time more efficiently.

The instructional materials embedded language development into the science content instruction. Teachers followed the same lesson plan format (i.e., 5-E) each day: engage, explore, explain, evaluate, and elaborate. Their embedded activities included direct and explicit instruction; daily oral language practice; integration of writing; decoding, vocabulary, and comprehension strategies; scaffolding; and technology integration within the inquiry-based science instruction.

The comparison classrooms were observed, and researchers analyzed their instruction. Teachers followed the district-provided curriculum which was aligned to the state standards. Classroom instruction included only one 5-E lesson plan format each week. Some language development strategies were included in the curriculum, with the implementation being varied among the classrooms. Vocabulary instruction included use of a word wall and dictionary
definition searches. Teachers participated in their typical required professional development of 30 hours in the science content area.

Measurement tools included the state standardized assessments in reading and science, district benchmark assessments in reading and science, and oral reading fluency. Researchers also measured vocabulary, comprehension, and non-verbal abilities in order to ensure between group baseline equivalency. They used a quasi-experimental design; there were 166 students in the treatment condition, 80 students in the comparison group, and a total of 12 teacher participants.

There was a statistically significant improvement in three of the five science benchmark assessments, but not a statistically significant different on the distal annual state standards assessment in science. The reading benchmarks yielded similar results on the same three of five benchmark assessments. There was a statistically significant difference favoring the treatment group on the state reading-standards assessment. Both groups had a significant improvement in their post-intervention oral reading fluency tests, with a statistically significant improvement of the treatment group over the comparison group. Researchers state the embedded literacy instruction within the science curriculum allowed students to make greater gains on the reading assessments. The researchers noted the sample size at the teacher and school level, as well as varied participation in enrichment activities as limitations to their research. This was also the first year of a multi-year project so there was no comparison of year over year improvements.

English learners do not have the same learning needs as students with disabilities. However, the strategies employed to meet the diverse needs of each group do have some overlap. Garza et al. (2017) found that using scaffolds with explicit instruction allowed ELs to participate in academically rich discourse in student-centered activities. Embedding explicit language
instruction into content areas improved literacy skills even when the content skill may not have shown significant improvements (Lara-Alecio et al., 2012). Both explicit instruction and scaffolding supports are effective pedagogical tools teachers can employ to improve student achievement. However, there is a need to more fully explore the role of evidence-based instructional practices used during writing to support both students with disabilities and ELs.

**Writing Needs of Students with High Incidence Disabilities**

Writing skills consist of multiple tasks and skills that operate independently and in conjunction at various times throughout executing a written task (Connelly and Dockrell, 2016; Graham 2006; Graham, Harris, & McKeown, 2013; Graham & Perrin, 2007b). Under development of any one of these tasks can cause negative effects on a student’s ability to express ideas in a coherent manner. In his seminal work on writing, Graham (2006) identified four factors that are important to the development of written expression: self-regulation (addressed in a previous section), skills, knowledge, and motivation. Additionally, he describes the need for instructional programs to address each of these needs. More recently, Hayes and Berninger (2014) developed a broader framework of writing development for students with mild to moderate disabilities that includes the factors identified by Graham.

**Skills**

In order to write effectively, students need to possess and apply various skills (Graham, 2006). There are a wide number of cognitive and physical skills necessary to write. Students must know the genre, purpose, audience, ideas, conventions, organization, and vocabulary. They also must have the gross and fine motor skills required to get their words onto paper (Graham & Weintraub, 1996). These required physical skills effect student writing fluency.
Fluency. Once students have committed to writing certain words, their ability to get those words from memory into text quickly effects their writing ability. Graham (1990) examined the effects of using different methods of expression on the writing quantity and quality of students with mild to moderate disabilities. Students wrote opinion essays on three different occasions, each time employing a different expression method. The counterbalanced methods consisted of speaking their composition into a recording device which was subsequently transcribed by a researcher, orally dictating a composition to a researcher who typed the words into text in vivo, and personally handwriting the text. When students appeared to complete their text, they were prompted 3 times to extend their writing. The rate of production, total number of words, and writing quality were examined.

Graham (1990) found that students who personally wrote the text were significantly slower in production rate and total number of words. They also scored lower on the quality measurement. There were significant differences in writing quality between the oral dictations with post transcription and the oral dictation with in vivo transcription, but no difference in the amount of text produced.

Student engagement in the physical transcription process of writing negatively affected their cognitive ability to maintain the ideas and vocabulary. The act of producing text impeded their ability to write an organized essay with well-developed ideas. When students were prompted to compose additional text, they extended their writing and the quality typically improved when they did not have to physically transcribe their ideas into text. Increasing fluency through transcription may have been effective by freeing up some cognitive resources, which then became available to allow the student to focus on text generation and idea organization.
Providing students with a support to cognitively maintain their ideas while engaging in text production may improve their ability to write a quality text.

Transcription fluency during composition continues to affect the quality of student writing through the upper elementary school years. Wagner et al. (2011) examined total composition production, letter-writing fluency, and writing quality of first and fourth grade students. Researchers analyzed writing samples from 98 first-grade and 88 fourth-grade students from two public schools in a small southeastern city. Students were given a prompt that was relatively non-content dependent and allowed to compose an expository text explaining their desired type of classroom pet. During the 10-minute timed writing, students were instructed to write continuously, cross through text instead of making erasures, and sound out spelling to the best of their ability. Subsequently, students were given one minute to write as many times as possible a pangram requiring every letter in the English alphabet (i.e., The quick brown fox jumps over the lazy dog).

Student compositions were analyzed for a variety of metrics using a combination of automated writing evaluations and rubrics. The automated writing evaluation (i.e., Systematic Analysis of Language Transcripts) measured semantics such as total number of words, number of different words, and the type-token ratio (TTR; i.e., number of different words divided by total number of words). These measures were used to derive the mean length of type-token ratios (i.e., mean T-Unit).

Using confirmatory factor analysis, Wagner and colleagues found a remarkable effect of handwriting fluency, which was known to be evident at first-grade, and its influence on student composition production and quality even in upper elementary grades. The researchers theorize that in addition to the relationship between handwriting fluency and composition quality due to
working memory capacity limits, there may be an added benefit of rich-language connection. Student handwriting fluency, which develops with practice, may also help students to connect language networks and allow students to access more rigorous language features. These language features help to improve student writing production and quality. Therefore, because of the constructive effects, writing fluency leads to improved composition quality.

The presentation method of the prompts also affects student writing fluency (Hudson, Lane, & Mercer, 2005). Hudson and his colleagues examined the effect of six different ways of presenting a writing prompt on typical and struggling writer’s fluency and production. The participants were second grade students from four elementary schools in north-central Florida. More than half of the participants received free- or reduced-lunch and 27% were identified as special education students (i.e., including students eligible in the speech or gifted categories). For the purposes of this study students were identified as having spelling or handwriting difficulties based on results of the initial battery of assessments.

The six presentation methods had different variations of the teacher reading the prompt, the student’s copying the prompt after the teacher read each word, and the inclusion of a topical discussion prior to the students starting to write. Researchers were trying to determine the priming effect the prompt presentation had on the writing composition of students with higher degrees of writing fluency based on the total number of words written and on spelling acumen. Fluency played a role in student’s writing production. Students who were more proficient wrote more words during each timed segment and an overall greater number of total words. A lack of fluency had the opposite effect.

When typical students (e.g. higher transcription rate, improved spelling ability) discussed the topic and then copied the prompt, their total number of words written increased. However,
this did not hold for students who were struggling writers. The authors hypothesize the delayed writing commencement due to the time decreased the priming effect of the prompt. Interestingly the authors found that when struggling writers are given specific words to begin (e.g. a story/sentence starter), their idea generation suffered, possibly due to disrupting the student’s own planning. Researchers did not examine the effect of reversing the order of discussion and copying. Using a working memory support that could reduce the cognitive load during the time delay may have mitigated the negative effect for less-fluent writers.

Knowledge

Knowing about writing allows students to have the background understanding needed to apply the skills necessary to write effectively (Graham, Harris, & McKeown, 2013). It involves ideas such as the different types (i.e., genres) and purposes (e.g. inform, persuade, entertain) of writing, as well as the series of steps in which writers engage to effectively communicate their message. Knowledge about writing can be effectively taught using the self-regulated strategy development (SRSD) instructional design (Harris & Graham, 1985; Graham et al. 2013). Students with high incidence disabilities have been taught about writing using both group and single-subject research designs as well as qualitative and quantitative types of research.

Miller and Lignugaris-Kraft (2002) used a multiple-baseline across multiple genres to determine the effects of teaching paragraph structures on students’ paragraph writing quality, as well as explore the amount of training required for students to a targeted criterion related to writing performance. The three participants were secondary students with learning disabilities who received written instruction in a resource classroom.

The students learned the characteristics of four paragraph genre text structures (i.e., definition, comparison, process, contrast). Students were taught components of each type of
paragraph and key words used with each specific paragraph type. For example, students were taught that a process paragraph contains an introductory topic sentence and a sequential set of four or five steps and uses key words such as first, second, after, then, or finally. To measure student mastery of this knowledge, they completed a discrimination assessment. Students read a prompt and two paragraphs. Students had to identify which of the two paragraphs answered the prompt. To measure application of the knowledge, students read a stimulus passage and a writing prompt and were asked to write a four-paragraph written response. The paragraphs were assessed for text structure by examination of t-units and inclusion of structural key words within the t-units.

During the intervention, student learning of the types and characteristics also consisted of a discrimination assessment, but this was at the sentence level. A question was presented along with two topic sentences, one which contained the critical components and a non-example. These were followed by each subsequent sentence in the paragraph as an example and non-example. Students chose the examples, which remained on the table. The non-examples were removed so that after correct discrimination of each sentence, the sentences could be arranged and read as a complete paragraph. Students had to meet mastery on definitions and compare structures before they moved on to the process and contrast structures. As each new text structure was introduced, students required fewer sessions to meet criteria due to similarities in components. Knowledge of text structure, as measured by discrimination, improved writing quality for all three students, but two students needed reteaching of the second phase of the intervention to improve paragraph writing scores.

In the second phase, students practiced reading a prompt, identifying the text structure necessary to answer the prompt, and a sample written response. In the response, students had to
discuss then underline critical elements required in the identified structure. Incorrect responses were guided with a reminder to restate the critical elements required for the text structure. To meet criteria for the second phase, students had to successfully complete six consecutive trials with 100% accuracy in identifying the critical text structure components and 85% accuracy identifying the components within a sample text. Students subsequently applied this knowledge to their own written responses to general education stimulus paragraphs and required written responses.

In the third phase, students read a prompt aloud and discussed the appropriate response text structure and critical elements. Then they wrote a response followed by analysis of their own written text. They met criteria when correctly identifying text structure and critical elements with 100% accuracy and providing a written response containing the critical elements with 85% accuracy.

A pre- and post-intervention generalization writing assessment was administered. The passages and prompts were taken from the student’s general education texts. The post-intervention generalization scores were compared to scores of peers without disabilities. The percentage gains from pre- to post-intervention generalization assessments ranged from 40% to 55%. All three students scored at or above their general education peers’ mean score on the post-intervention assessment.

Students with LD benefited from frequent opportunities to practice written expression skills, and knowledge of text structure improved inclusion of appropriate structural elements. Researchers suggested that future replication studies counterbalance the presentation order of the types of text structure. They also acknowledged the sentences produced were relatively brief and
not varied and suggested simultaneous instruction in the writing process may help alleviate this limitation on student’s writing.

Lin, Monroe, and Troia (2007) examined how the knowledge of skilled and struggling writers develops over time. Participants in fourth through eighth grades, who were identified by teachers as struggling or typical, were interviewed about their writing knowledge. The topics included the writing process, purposes, genres, and what students know about how to apply this knowledge during a writing activity.

For struggling writers, answers to the study interview questions were less detailed and tended to focus on physical results such as legible penmanship. These students also only saw a need for writing as a school assignment for their teachers; they did not have sufficient knowledge of out-of-school writing. Compared to other steps during the writing process, struggling writers were able to identify more prewriting strategies, but were unable to elaborate on how to implement the strategies during a writing task. When considering revisions, students with difficulties tend to focus on low-level skills such as capitalization, punctuation, and spelling; they do not have the necessary knowledge of higher-order skills such as revising to improve organization or genre-specific effectiveness. As typical writers develop, their knowledge of different types of writing (i.e., genres) tends to increase. Conversely, younger typical writers and all struggling writers tended only to be capable of identifying narrative text. Middle school struggling writers and elementary typical writers tended to have a similar lack of ability to define writing domain terms and had a similar, limited understanding of writing purpose.

Saddler and Graham (2007) examined the differences in writing knowledge between struggling and skilled writers and explored if writing knowledge is predictive of writing length and quality. Twenty fourth grade students were grouped based on scores of three subtests of the
Test of Written Language (TOWL-3; Hammill & Larson, 1996). The struggling writers scored below the 25th percentile whereas the skilled writers scored above the 50th percentile.

Students were given 15 minutes to write a story from a picture prompt of their choosing. The following day, students were given 15 minutes to revise their story. These writing samples were assessed for quality using a holistic rubric, and the total number of words written. Students also answered a 9-item questionnaire that measured their knowledge about the purpose of writing, the actions of good versus poor writers, and writing strategies.

The researchers ran an analysis of variance (ANOVA) and a regression analysis. For skilled writers there was a strong correlation between knowledge and quality. However, for poor writers there was not a statistically significant correlation. The researchers posit that struggling writers not only have less knowledge of writing but are also less likely to implement their knowledge during a writing task. Most students identified lack of ideas and deciding what to write as reasons why some students have difficulty writing. Students identified using a graphic organizer as part of their planning process.

On the questionnaire, skilled writers identified more reasons for the importance of writing and better understood possible future benefits of writing. They also knew more about writing procedures and were more likely to seek outside help when writing was difficult. On the application task, skilled writers wrote stories that were nearly double the length and quality scores than less-skilled writers.

Zumbrunn and Bruning (2013) used a multiple-probe across participants single-case research design to determine the impact of the self-regulated strategy development (SRSD) instruction model on the knowledge and skills of young writers, extending previous research performed on older children. The first researcher instructed the participants in dyads. The 6-
lesson intervention was delivered in 12, 10, and 11 sessions respectively. Students were taught story writing using the Plan, Organize, Write (POW) and the Who, When, Where, What 2, How 2 (WWW + What = 2 How = 2) strategies using the six steps of the SRSD instruction model. The measurements were total number of words, number of story elements included, story quality, and a five-question structured interview.

During baseline, students wrote stories based on picture prompts. Baseline probes continued until the previous group moved to the next phase. The criteria to move from intervention to maintenance was inclusion of all seven story elements in an independently written story.

All six students increased the number of story elements included and the overall quality score. The total number of words written had mixed results. The questionnaire responses were qualitatively assessed. The researchers determined the substance and quality of the responses improved, indicating that student’s knowledge of writing increased. Researchers concluded that the SRSD model of writing instruction is viable at the first-grade level and that SRSD can increase student writing knowledge. However, they did not measure the relationship between knowledge and quality prior to or after the intervention so no comparison of the impact of increased knowledge on writing quality could be established.

**Motivation**

Motivation to write is influenced by a student’s beliefs about the need, benefits, and applicability of a writing task (Bruning & Horn, 2000). Students with mild to moderate disabilities tend to overestimate their ability, but under-value the benefits of writing (Bruning & Horn, 2000). Increasing a student’s desire to produce and succeed with writing is highly affected by the context and presentation set by those who assign the task (Bruning & Horn, 2000).
Gabriel and Davis (2015) investigated the impact the Strategic Instruction Model (SIM) sentence writing strategy had on student writing outcomes. In addition to examining the implementation, the researchers also examined how the student’s attitudes changed over time. The SIM is a framework for instructional delivery that guides teachers to present information in an easy-to-learn manner and teaches students to effectively navigate the learning process (University of Kansas Center for Research and Learning, n.d.). Five rural secondary school teachers participated in the SIM sentence writing strategy training for two days prior to the start of the school year and monthly meetings during the 16-week intervention. Teachers attended a SIM conference and observed model classrooms implementing the model. Researchers provided on-going support through classroom visits and feedback. Additionally, researchers examined the factors surrounding implementation fidelity and the effect fidelity had on student attitudes towards sentence writing.

Prior to the intervention, 18 middle- and 20 high-school students with mild to moderate disabilities who were receiving instruction in a resource classroom provided a writing sample and completed an attitude survey. Teachers then implemented the strategy three times per week for 50 minutes, each in accordance with the strategy instructor’s manual, and maintained implementation logs. At the end of the intervention, students repeated the writing sample and attitude survey assessments.

Researchers analyzed the implementation data based on their observation notes and the teacher’s implementation notes. They analyzed the student outcomes and related the student outcomes to the implementation fidelity. Implementation was rated on dosage, pacing, and adherence to the instructor’s manual. Two of the five classrooms were deemed as having low-level implementation. Students in high-implementation classrooms showed significant gains in
their writing achievement. Student attitudes towards writing were not significantly different between the low- and high-intervention groups. Upon further analysis of individual survey responses, researchers did not find an overall increase in student self-efficacy and perception of the importance of writing skill in both groups.

The SIM strategy implemented in this study used a mnemonic device to remind students of a series of steps to perform to draft a sentence and then to subsequently check the sentence for completeness. It also used a series of daily instructional steps for the teacher to deliver the information on how to use the strategy. Breaking tasks down into smaller steps and teaching these steps in a methodical, repetitive manner was characteristic of the intervention under investigation. Strategy implementation was important to student gains. Additionally, the use of this strategy improved student attitudes towards writing.

As part of their investigation to extend the research of using SRSD for argumentative writing, Ennis and Jolivette (2014) analyzed the impact on student motivation and self-efficacy. Six 9th-grade students receiving special education services for emotional and behavioral disorders participated in the single-case, multiple-probe across participants study.

During baseline, students wrote argumentative essays as part of their typical health class two to three times per week. During intervention, students met in three dyads with the researcher for 40 minutes in a separate classroom. The intervention consisted of using SRSD to teach students to use the Suspend judgement, Take a side, Organize ideas, Plan as you write, Develop topic sentence, Add ideas, Reject other-side argument, and End (STOP + DARE) strategy. To measure student beliefs about their ability to write, students answered an adapted version of the Measure of Self-Efficacy (MSE; Bruning, Dempsey, Kaufman, Haines, & Zumbrunn, 2013; Pajares, & Valiante, 2006). The three sections of the MSE examined approaches to writing,
confidence about writing, and feelings towards writing in a 15-, 18- and 7-item questionnaire. To measure self-efficacy, researchers administered the *Intrinsic Motivation Inventory* (IMI; McAuley, Duncan, & Tammen, 1987). The IMI consisted of a 27-item questionnaire. Both the MSE and IMI were administered pre-and post-intervention.

Researchers had incomplete data for two of the participants. Of the four remaining, two had increases in all areas of the self-efficacy measure, while two had mixed results. For motivation, only one student had increases in all areas, while three had improvements in some, but no change in others. Due to these mixed results, researchers were not able to draw conclusions as to the efficacy of SRSD to improve writing self-efficacy or motivation for students with Emotional Behavioral Disorders in a 9th grade health class.

Written expression skills, knowledge, and motivation are three key elements that impact writing achievement and are required for students with disabilities to become proficient writers (Graham, 2006). For students to perform the various cognitive and physical skills required in writing, they must have knowledge about writing as a process itself, separate from and in addition to the knowledge of content material to include in their writing. When students have the skills, knowledge, and motivation to write effectively, their writing quality improves (Gabriel & Davis, 2015; Miller & Lignugaris-Kraft, 2002; Saddler & Graham; 2007; Zumbrunn & Bruning, 2013). Students must also have the motivation to be able to persist in the writing task in the face of difficulty and the self-regulation to act on necessary behaviors for success.

These abilities and understandings continue to develop over time (Lin, Monroe & Troia, 2007). Knowledge instruction has addressed component characteristics, text structures, and strategies. However, explicitly instructing students how writers develop ideas has not been
addressed. There is a need to direct student’s attention to the decisions skilled writers make when they cross the divide between their prewrite ideas and complete sentences in a draft paragraph.

**Writing Supports for Students with Mild to Moderate Disabilities**

Students with disabilities struggle with a variety of tasks required during successful written expression activity and the high cognitive load of the activity. In addition to explicitly teaching writing strategies, scaffolding these various tasks can reduce the cognitive load and free up memory resources. The scaffolded support used during writing and writing instruction may come from graphic organizers. The media used when working with a graphic organizer can be a paper and pencil product or technology-based.

**Graphic Organizers**

Graphic organizers are visual, organized representations of information that show connected concepts (Dunston, 1992; Meyen et al., 1996; Stull & Mayer, 2002), and they are a component of the SRSD instructional design during the *model it* phase (Harris & Graham, 1985). The visual relationships highlighted by graphic organizers assist students in including organized and relevant ideas into their writing (Englert, Okolo, & Mariage, 2009). For students with mild to moderate disabilities there is a large effect size for using graphic organizers when English, reading, and writing are aggregated (Dexter & Hughes, 2011), but there is a paucity of experimental research that disaggregates graphic organizers as the independent variable specific to expository paragraph writing. Theories of organizational enhancement supports provided by highlighting text structure in reading comprehension, which graphic organizers provide, have been applied to written expression (see Boothby & Alverman, 2010). Designs that include graphic organizers as the independent variable with writing quality as the dependent variable are
beginning to emerge, but many are implementing the use of a graphic organizer in a technology-based medium (see Ciullo, 2013).

Graphic organizers explicitly direct attention to the organization of material (Dunston, 1992; Meyen et al., 1996). This organization of information helps to align the information so that it more readily incorporates into student schemas and connects new information to prior knowledge. Graphic organizers also promote learning by capitalizing on cognitive load theory (Sweller, 1988). By condensing the amount of incoming information, graphic organizers reduce the intrinsic cognitive load and decrease the amount of working memory required to facilitate learning (Fuchs, Fuchs, Schumacher, & Seethaler, 2013). Graham (1990) found decreasing cognitive load by increasing fluency, freed up working memory resources. Using a graphic organizer during the reverse engineering process may have a similar effect.

Bulgren, Marquis, Lenz, Schumaker and Deshler (2009) investigated graphic organizers as a component of the Question Exploration Routine (QER) to determine the impact on content knowledge and writing proficiency. High school students with and without learning disabilities in general and special education classes participated in the two-session experiment. Each session was 89 minutes. During the first session students were instructed to take notes in a format of their choosing. The content was on the depletion of the ozone layer. Students were then given 30 minutes to write an essay in response to a prompt about the ozone layer as their writing pre-assessment. Five days later, the group was divided into intervention and control groups for the second session.

The control group watched a video on ozone layer depletion and was instructed to take notes in their usual manner. After the video, they were given a 4-minute lesson on the
components to include in a 5-paragraph essay, then given 30 minutes to use their notes to write their essay in response to the same prompt given in the first session.

Students in the intervention group received instruction using the QER method and the question-exploration graphic organizer. The teacher modelled how to complete the graphic organizer with the ozone depletion content. The graphic organizer consisted of six sections: critical question, key terms, supporting questions, identification of the main answer, exploration of the main idea, and extension of the main idea. Students were then given the same amount of time and same prompts as the control group but used the question-exploration graphic organizer as the framework for their notes to use during writing the 5-paragraph essay.

The essays were scored using a content analysis rubric and a writing quality rubric. The data were analyzed using a series of ANCOVA tests. For content knowledge, there were significant differences between the pre- and post-assessments for the experimental group but not the control group. Further analysis revealed these findings held true for students with learning disabilities within both the experimental and control groups. The quality scores were statistically significant between pre- and post-assessments for the experimental group, but not the control. However, when the group of students with learning disabilities was disaggregated from the control group, their quality scores were statistically significant.

Although the authors labeled the question-exploration graphic as a graphic organizer, its appearance resembles a form to be completed more than a typical graphic organizer. Reading from top to bottom, the blocks on the form were in the same order as the six sessions listed above. The organization of the information did not align to the organization of a five-paragraph essay, and there were no connecting lines to show relationships between ideas. Also, the graphic organizer was not the only independent variable in this research design and therefore it was not
an isolated difference between the two groups. The control group received a second dose of content exposure that the graphic organizer group did not receive.

**Technology-based graphic organizers.** Flanagan and Bouck (2015) compared student outcomes when using a paper-based versus a computer-based graphic organizer. Nineteen students in two classrooms in a private Midwestern secondary special school for students who had experienced failure in a traditional school were assigned to one of two groups according to their English language arts class. The ninth-grade class used the technology-based graphic organizer and the eleventh-grade class used the paper-based graphic organizer. Fifteen of the 19 participants were eligible for special education services due to their mild to moderate disabilities.

The purpose of the study was to determine the effect of using graphic organizers on written expression, if the modality of the organizer made a difference, and if the students preferred one modality over another. The researchers created a pre-/post-survey to determine the students’ understanding, opinions, and challenges of using technology- and paper-based graphic organizers. Students also took a pre-writing assessment based on a compare/contrast prompt for a three-paragraph essay. The researcher created a rubric to score the essays.

The intervention was a counter-balanced experimental design. Both groups used the technology- and paper-based graphic organizers an equal number of times during the seven-week intervention. Students wrote two essays per week with at least two days between each writing. After the first three weeks, the groups took a post-intervention writing assessment without the use of a graphic organizer, then switched the type of graphic organizer being used. Students used the second type of graphic organizer for three weeks and took another post-assessment of writing quality.
Both groups of students significantly improved their writing quality scores. However, there was not a statistically significant difference between the technology- or paper-based modality regardless of which type was used during the first portion of the intervention. Students perceived the technology-based graphic organizer to be easier, quicker, and more beneficial compared to the paper-based organizer.

For struggling writers, the use of a graphic organizer through technology and on paper to support pre-writing improved student’s writing quality on a compare/contrast three-paragraph essay. The researchers noted students immediately included a greater number of supporting details and fewer unrelated details. The use of technology did not statistically alter the results.

Evmenova et al. (2016) examined the use of a computer-based graphic organizer (CBGO) on persuasive essay writing quality. Three groups of middle school students with mild to moderate disabilities participated in the multiple-baseline single-case research study. The students were included if they were receiving special education services, were struggling writers, could construct a basic sentence, and had proper permissions. The students were grouped based on their class schedule. There were two, three, and five students in the three groups for a total of 10 participants.

During baseline, students wrote during five to seven sessions on two to five days per week. The writing was in response to a choice between two randomly selected persuasive prompts. The teacher read both prompts aloud and students chose one. Students were given a 30-minute time limit to respond and typed their responses on a laptop using a locked version of Microsoft Word. Students weren’t allowed access to any of the editing features of the program.

The baseline data consisted of counts of words, sentences, transitions words, and essay parts and a quality score determined by a researcher-created rubric. Students also participated in
scripted interviews to assess writing perceptions and technology experience prior to the intervention. During the instruction portion of the intervention phase, students participated in four 50-minute lessons. Each group was taught by a researcher and an assistant, but each group was taught by a different researcher/assistant pair. The first lesson taught the students to use the IDEAS mnemonic as a strategy to include particular parts in their essays. The second lesson taught the students to use the CBGO which was developed using Microsoft Office. The CGBO consisted of dropdown menus, text boxes for the students to type into, and the cut-and-paste feature. The CGBO embedded goal setting, self-regulation, color coding, and the IDEAS mnemonic. Students progressed through each portion of the CGBO to create sentences. These were then cut-and-paste into a list format and reformatted into a paragraph by using the backspace key.

The third lesson modelled the use of all five of the CBGO steps in conjunction. The final lesson provided students the opportunity to practice independently. Students were then assessed on their ability to use the CBGO. All students met criteria after the four lessons and did not require remedial instruction in the use of the CBGO.

Students then moved into the CBGO-use portion of the study. They participated in five 30-minute writing sessions. Students were read two prompts and chose one on which to respond. They used the CBGO for their responses. Students were then taught one lesson on writing using only the locked version of Microsoft, without the CBGO, as a maintenance phase.

Results on the number of words, number of transition words, and number of sentences were mixed. However, all 10 participants improved in the number of essay parts included and on the writing quality scores, had 100 percent non-overlapping data, and were able to maintain above-baseline scores during maintenance. Researchers noted the relatively few number of
instructional minutes students required to master the use of the CBGO. Compared to other writing interventions, the use of technology may have been a contributing factor to the efficiency of this instruction. However, they concede when a teacher, who is less knowledgeable of the intricacies of the CBGO, leads the instruction, this efficiency may be negated.

Graphic organizers provide a visual representation of organization. The use of graphic organizers as a writing support for students with disabilities has a positive effect on their writing quality (Bulgren et al., 2009; Evmenova et al., 2016). They have been studied extensively for improving literacy (Dexter & Hughes, 2011). Although applied more often to reading comprehension, the link between reading and writing has afforded graphic organizers a requirement of less empirical research for general application to effective writing. The positive effect of improved writing qualities is evident regardless of the media used (e.g. paper, technology; Flanagan & Bouck, 2015).

The explicitness of graphic organizers may help reduce the cognitive load on working memory, thereby freeing up resources to be available for students to focus on some of the other, multiple components of effective writing. Ciullo, Falcomata, and Vaughn (2015) included graphic organizers in their explicit instruction research but didn’t isolate this as an independent variable. The use of the graphic organizer may have served as a working memory support. There is a need to examine graphic organizers as a scaffolded support during expository paragraph writing for students with disabilities and English learners.

**Writing Instruction for Students with Mild to Moderate Disabilities**

Students with high-incidence disabilities often lack strategies to regulate their own behavior during writing tasks (Gillespie & Graham, 2014). Such self-regulation techniques include monitoring, evaluating, and rewarding behaviors; using self-talk to plan while
progressing through the writing task; and goal setting (Chalk, Hagan-Burke, & Burke, 2005; McKeown et al., 2016; Santangelo, Harris, & Graham, 2013).

Skilled writers are capable of self-regulation by managing the processes required to plan, execute, and evaluate their writing in order to make substantive changes to their texts (Graham, 2006). These processes are also occurring simultaneously to constantly varying degrees (Graham et al., 2013). For struggling writers, the totality of managing and orchestrating these tasks is often beyond their capabilities and requires direct and explicit instruction (Swanson, 2001). One method of direct and explicit strategy instruction in writing is the self-regulated strategy design.

**Self-Regulated Strategy Development**

Self-regulated strategy development (SRSD) consists of six instructional steps used in conjunction with a specific mnemonic strategy that can be substituted depending on the writing purpose (Harris & Graham, 1985). SRSD is the most extensively researched writing intervention (Graham et al., 2013) and has been used to teach other content area skills (e.g. math, science; see Case, Harris, & Graham, 1992, Ennis, 2016). A key feature of SRSD is teaching students to regulate their writing behaviors through metacognitive thinking and goal-setting. Two recent studies examine the self-regulated strategy development instructional method for students with mild to moderate disabilities in writing.

Hoover, Kubina, and Mason (2012) implemented a single-case multiple baseline across-participants study examining the effects of using the self-regulated strategy development (SRSD) in persuasive writing instruction for high school students with learning disabilities. Four female students ranging in age from 16-19 with reading and writing goals as part of their specially designed instruction participated in the five-lesson intervention. The lessons were delivered by the classroom language arts teacher, who was also a doctoral student and the primary researcher,
for 5 to 10 days each. The entire study from the first day of baseline data collection until the last student’s final maintenance probe was 71 calendar days.

The intervention incorporated graphic organizers which served as instructional scaffolds. Teachers also used modelling as a form of instruction within the SRSD prescribed framework. The modeling occurred in a forward progression from the first to last step of the strategy. During baseline, students were given a choice of persuasive writing prompts and composed an essay in a 10-minute timed writing. The essays were evaluated based on the number of included parts of the Topic, Reasons, Examine, Ending (TREE) strategy using a researcher-created rubric, and evaluated for the total number of words written. Five baseline probes were administered to each participant.

The intervention consisted of teaching students the Plan, Organize, Write (POW) and TREE strategy. On the first day, students were introduced to the POW and TREE strategies and how the strategies could improve persuasive writing. They were introduced to a list of possible transition words that could be included in persuasive writing and examined model paragraphs. Afterwards, students examined their own baseline writings to identifying which elements of the TREE strategy were included, and graphed the results.

In the second lesson, the researcher used a graphic organizer and modelled how to implement the strategy from start to finish when given a writing prompt, using a think-aloud format. The student generated a list of self-statements, which had been modeled by the researcher, to be used during her own writing activity. The student practiced implementing the strategy by re-writing her essay that had been analyzed during lesson one. The researcher and student graphed the number of strategy parts included and discussed the improvements.
In the third and fourth lessons, the student practiced using the strategy in an unlimited time format with supports. The graphic organizer, student’s personal self-statements list, and transition word list were used in lesson three, but the transition list was removed for lesson four. After each lesson, the researcher and student examined the writings to determine the number of parts of the TREE strategy that were included and graphed the results.

During the final lesson, the researcher modeled the use of the TREE strategy in a 10-minute timed writing, followed by the student implementing the strategy in a timed response to a prompt of her choosing. She then analyzed her writing and graphed the results. If the student didn’t meet the minimum implementation criteria, lesson five would be repeated. This only happened for one student and only one repeat of lesson five was required.

All students showed improvement in the number of elements of the TREE strategy included in their writing, with three of the four students having increasing trend lines after the intervention. The improvement continued during the maintenance phase of the intervention. The total number of words written had mixed results. The researchers posit that implementing SRSD for high school students’ persuasive writing can have positive impacts on student’s academic success in the classroom and higher achievement on assessments. Social validity results for the intervention indicate high school students with learning disabilities are likely to use the POW and TREE strategies in their persuasive writing tasks.

Adkins and Gavin (2012) investigated using the SRSD method with added explicit instruction to teach students to generalize their improved story-writing skills. Three African-American second- and third-grade students in an urban school where 71% of students were eligible for free and/or reduced lunch, participated. All three students were identified as having an Emotional and/or Behavioral Disorders (EBD) and were receiving special education services
in a self-contained classroom. All three students received specially designed writing instruction as part of their individualized education plan and met the inclusion criteria based on their story construction subtest of the *Test of Written Language – 3* (TOWL-3; Hammill & Larson, 1996).

Intervention measures included number of story elements included, total number of words written, and story quality. For each writing probe, students were given a choice between two picture prompts about which to write a story. Students progressed from intervention to maintenance when they met the minimum number of story elements included criteria. The researcher taught students to use the POW + WWW What = 2 How =2 (, Pick, Organize, Write, Who, When, Where) strategy using the SRSD instructional design method. One modification was made based on the researchers’ pilot study. Student positive self-statements were written prior to student’s evaluating their first writing. The researcher noted this was a necessary differentiation to support students with emotional and behavioral disorders.

In order to promote generalization, instruction included explicit discussions about other times and reasons where this strategy could be implemented. Intervention lessons were delivered three times per week in 45-minute sessions. Students met instruction criteria after 9.5 and 12.5 hours of instruction. The generalization measure was a personal narrative.

Students increased the number of included story elements, total number of words, and quality. These dropped slightly on the post-intervention and generalization measures, but none returned to baseline. The researchers concluded SRSD is a viable writing instructional model for students in a self-contained classroom and that differentiation may be necessary to accommodate students in this type of setting.

Ennis, Jolivette, Terry, Frederick, and Alberto (2015) examined the effect of using SRSD to teach persuasive writing to secondary students in an urban residential facility. The facility was
for students with emotional and/or behavioral disorders. The purpose of the study was to
determine if a decreased intensity of SRSD (i.e., two days per week as opposed to the
recommended minimum of three days per week) could improve writing achievement.

Three language arts classroom teachers implemented the intervention to 44 students using
the STOP + DARE mnemonic over a period of 8 weeks. Each week 40-minute lessons were
taught on Tuesdays and Thursdays, with a prompted writing assessment administered every
Friday. The pre-and post-intervention outcome measurement included the fluency and writing
samples subtests of the Woodcock-Johnson III (WJ-III; Woodcock, McGrew, & Mather, 2001).
The weekly writing probes were assessed for writing quality, total number of correct word
sequences, and number of included elements.

Data analysis included a t-test on the WJ-III scores and a hierarchical linear modeling
(HLM) of the weekly writing measures. One HLM model compared outcome growth to weekly
assessment growth. A second HLM model compared intervention growth of three phases:
baseline, intervention weeks 1-5, and intervention weeks 6-8. Predictor variables were also
examined. The pre-and post-intervention outcome scores were significantly higher on both
subtests of the WJ-III with a .44 effect size for writing fluency and a .96 effect size for writing
samples. A statistically significant amount of growth occurred during intervention weeks 1-5.
Researchers did not find this surprising because during this period, students were learning the
mnemonic whereas in weeks 6-8 they spent more time practicing its use. The researchers were
surprised and encouraged by the high rate of implementation fidelity (i.e., 93%) given that a
residential facility typically focuses on behavior management at the expense of academic rigor.

Proficient writing requires self-regulation to manage the multiple demands of the task
(Graham, 2006). The self-regulated strategy development is the most widely researched writing
intervention for students with disabilities (Graham & Harris, 2009) and continues to have positive effects on writing for secondary students (Ennis et al., 2015; Hoover, Kubina, & Mason, 2012). SRSD is direct and explicit; it shows students how to use writing strategies; and, it interweaves skills, knowledge, and motivation used in effective written expression.

During the *Model It* step of SRSD, teachers engaged in modeling their cognitive writing process in a forward sequence. However, the modeling method was not isolated as an independent variable. There is a need to specifically examine modelling and to determine if modeling in a reverse sequence is an effective instructional strategy. In addition to modeling, SRSD has embedded scaffolds of support in the form of graphic organizers and mnemonic devices.

**Summary**

Effective writing skills are necessary for academic success and beyond secondary education (Bangert-Drowns et al., 2004; Bazerman, 2013; College Board, 2003; Graham, 2006; Langer & Applebee, 2011). Writing proficiency has been historically low, with the most recent research indicating only 27% of all students are able to successfully write at or above their grade level. (U.S. Department of Education, Institute of Education Sciences, 2012). For students with disability and non-proficient English learners, written expressions success is further limited.

Explicit instruction for students with mild to moderate disabilities is an evidence-based practice that has also been effective for English learners (Antmann, Abbot, and Berninger, 2008; Ciullo, Falcomata, and Vaughn, 2015; Hough et al., 2012; Lara-Alecio et al., 2012). Teachers specifically and intentionally direct student’s attention to key components of the content during strategically designed lessons (Antmann, Abbot, and Berninger, 2008; Ciullo, Falcomata, and Vaughn, 2015). Scaffolds and strategies during the instruction allow students to more easily
acquire new information and skills. However, explicit writing instruction tends to focus on elementary level, story writing. When expository writing is addressed, it is typically at the word, sentence, or discourse level (see Antmann, Abbot, and Berninger, 2008; see Gabriel & Davis, 2015; see Ciullo et al., 2015). There is a need to research expository paragraph level writing for secondary students.

English learners benefit from some of the same instructional techniques as students with disabilities (see Lara-Alecio et al., 2012). Explicit instruction, strategies, and scaffolds during content acquisition are effective. Teachers engaging in these practices are able to effectively embed rich, academic language instruction into their lessons (Garza et al., 2017). There is a need to research the effectiveness of these practices related to expository paragraph writing instruction for English learners.

The most extensively researched writing instruction model that incorporates these effective practices is the self-regulated strategy development (SRSD; Graham & Harris, 2009). During the instructional sequence of SRSD, teachers engage in modelling their cognitive processes (Harris & Graham, 1985). Typically, this involves thinking aloud as they progress from a prewriting tool to a drafted paragraph. The graphic organizer has one or two words identifying a main idea to be included as a complete sentence in a paragraph. However, this is less-structured task that is difficult to explicitly teach students. Reversing the instructional sequence may provide a more explicit example for students to observe.

Graphic organizers have been used as an instructional scaffold in the writing process. They allow easier integration of new knowledge to background knowledge because the organization provides for schema alignment (Dunston, 1992; Meyen et al., 1996). Using graphic organizers has improved writing quality for students (Bulgren et al., 2009; Englert et al., 2009;
Flanagan & Bouck). There is a need to determine if systematic design of a graphic organizer provides an effective working memory support to further highlight how an expert writer moves from an idea into a complete sentence.

This study was designed to provide secondary students with an explicit modeled example of how writers develop ideas from a graphic organizer into a well-organized expository paragraph. The graphic organizer uses a systematic labelling code designed to reduce the cognitive load of the information as an additional scaffold to allow for easier understanding. Reversing the steps of the writing process, the teacher models an exemplar text and a labeled graphic organizer for students to observe the source of developed sentences from an idea.
CHAPTER THREE

METHODS

Secondary student writing requirements have changed over the past few years due to the adoption of new, more rigorous, academic content standards (Graham, Early, & Wilcox, 2014). Focusing on writing may not necessarily result in improved capabilities for students unless effective instructional practices are used in classrooms. This is especially important for student populations known to require additive instructional supports, including those identified with mild to moderate disabilities (Graham & Perin, 2007b; Troia & Olinghouse, 2013).

Explicit instruction is known to improve learning for students with disabilities (Berkeley et al., 2010; Corden, 2007; Hough, Hixson, Decker, & Bradley-Johnson, 2012; Swanson, 2001; Vaughn & Linan-Thompson, 2003) and typically incorporates teacher modeling (Archer & Hughes, 2011). Modeling can involve activities such as think-alouds, self-questioning techniques, or examining a finished product (Moon, 2012). Modeling the writing process typically involves beginning with one step in the process and then moving forward to the next (see Cihak & Castle, 2011; Hoover et al., 2012).

Improving writing skills is important for students because written expression is an increasingly necessary skill in school and beyond (Graham et al., 2013; Graham & Hebert, 2010; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010; Straub & Alias, 2013). Currently, only 27% of all students and 5% of students with disabilities are proficient in writing (U.S. Department of Education, Institute for Education Sciences, 2012). The adoption of the Common Core State Standards has increased the rigor and amount of writing required across content areas (Graham & Harris, 2013; Straub & Alias, 2013). In secondary classrooms, informative and persuasive expository writing should comprise 80% of
the writing performed (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

Writing requires multiple simultaneous cognitive processes, often making it a difficult task for students with disabilities and English learners (Harris et al., 2002; Graham, 2006; Graham & Harris, 2016; Rijlaarsdam et al., 2012). One reason for this difficulty is due to the cognitive load requirements placed on students who have working memory deficits (Danemen & Carpenter, 1980; Schuchardt, Maehler, & Hasselhorn, 2008; Swanson & Zhang, 2013; Vanderberg & Swanson, 2007). Reducing the extrinsic load of instruction may reduce cognitive demand, freeing resources to attend to the intrinsic load of the complexity of writing tasks (Paas & Sweller, 2014).

This study was designed to examine a reverse process of modeling to explicitly teach students to write a well-organized expository paragraph. Graphic organizers were used to reduce the cognitive load. Reducing cognitive load during instruction as a working memory support may help students with mild to moderate disabilities manage the multiple, simultaneous, and varying tasks required during writing.

Three groups of resource English language arts middle school students received written expression instruction. The first group reverse engineered the drafting step of the writing process by deconstructing a model paragraph into a graphic organizer. The deconstruction process consisted of reading each individual sentence of the model paragraph and then performing three steps: (1) identifying the sentence according to its type (i.e., topic, detail, explanation, conclusion), and (2) determining a 1-2-word main idea of the sentence, and (3) placing the main idea of the sentence into the corresponding location on a graphic organizer. This corresponding location on the graphic organizer was pre-determined by the sentence type.
The second group also reverse engineered the drafting step, with the addition of a letter-code as a sentence and graphic organizer labeling system. Each sentence in the model paragraph was read, identified by sentence type, and labeled using the letter-code. After all the sentences in the model paragraph were labeled, a 1-2-word main idea of the sentence was determined and placed in the corresponding location on a graphic organizer, which also was labeled with the same letter code. The third group received business as usual written expression instruction aligned to state standards, Individualized Education Plan goals, and written lesson plans.

**Research Questions**

The purpose of this study was to examine the effect of reversing the instructional sequence of expository writing to explicitly teach the draft and prewrite steps of the writing process with and without a labeled graphic organizer as a working memory support for students with mild to moderate disabilities. A quasi-experimental research design was implemented. The research questions were:

1. Does reverse engineering the drafting step of the writing process improve expository paragraph writing quality compared to business as usual writing instruction in a typical resource classroom?

The hypothesis was that students participating in the reverse engineered drafting step would score higher on an expository paragraph quality writing rubric and on the total number of words written than students who were not receiving the intervention.

2. Does adding a systematic letter coded graphic organizer to reverse engineering the drafting step of the writing process improve the writing quality of an expository paragraph?
The hypothesis was that students using the letter-coded graphic organizer would score higher on the expository paragraph quality rubric and on the total number of words written than students who used a graphic organizer without the letter labels and higher than students who did not receive the intervention.

3: Does knowledge of four sentence types contained in an expository paragraph predict paragraph writing quality?

The hypothesis was that students who knew the four sentence types contained in an expository paragraph would score higher on the writing quality and total number of words measurements and that the level of knowledge would be correlated to the writing quality and total number of words.

4: For students with disabilities who are English learners, does using a graphic organizer, with or without a systematic letter code, improve writing quality and total number of words written?

The hypothesis was that students who are English learners with disabilities would score higher on the writing quality and total number of words measurements when using the letter-labeled graphic organizer than students who used the graphic organizer without the letter labels.

**Setting**

The instruction was taught in three urban 6th-8th grade middle schools by licensed teachers. All instruction was delivered whole group. One school operated on a traditional schedule where classes met five days per week for 50-minutes each day. The other treatment school was on a modified block schedule. Classes met for a traditional 50-minute period, 3 days per week, and met for an extended 88-minute period one day per week. The comparison school
had two sections of English language arts resource classes, which were taught by two different teachers. These classes met on a typical 5-days per week schedule for 50-minutes per day.

Participants

The research was conducted at three middle school sites in a large, urban school district in the southwest. The population of each school (i.e., N=866, N=1501; N=113) exceeded the state and district averages of English learners and students receiving free and/or reduced lunch (see Table 1).

Teachers

There were four teacher participants, one at each of the treatment schools and two at the comparison school. Random assignment occurred at the school level so there were three groups. The first group was taught by a licensed special education teacher who had two Master’s degrees and seven years of special education teaching experience. The second group was taught by a licensed special education teacher who 20 years of special education teaching experience and a Master’s degree. The third group was taught by two licensed long-term substitute teachers. One is an undergraduate student in nursing with less than one year of teaching experience, and one is pursuing an alternate route to licensure in special education and has two years special education teaching experience.

Randomization occurred at the school level. Therefore, each teacher implemented the same treatment to three and four sections respectively. The teachers were trained by the researcher in one 20-minute face-to-face training session using the researcher-created curriculum materials. The researcher created and used a PowerPoint presentation to ensure similar training to both treatment groups in terms of presentation, content, and timing. The teacher-related data
collection included implementation fidelity data, post-intervention surveys, and structured interview responses.

Table 1

*Site Demographics*

<table>
<thead>
<tr>
<th></th>
<th>Site A</th>
<th>Site B</th>
<th>Comparison Device</th>
<th>District</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 884)</td>
<td>(n = 1,138)</td>
<td>Site (n = 1,481)</td>
<td>320,523</td>
<td>473,647</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>48%</td>
<td>44%</td>
<td>52%</td>
<td>48%</td>
<td>48%</td>
</tr>
<tr>
<td>Male</td>
<td>52%</td>
<td>56%</td>
<td>48%</td>
<td>52%</td>
<td>52%</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African Amer.</td>
<td>19%</td>
<td>8%</td>
<td>10%</td>
<td>14%</td>
<td>11%</td>
</tr>
<tr>
<td>Amer. Indian/AK Native</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>&gt;1%</td>
<td>1%</td>
</tr>
<tr>
<td>Asian</td>
<td>4%</td>
<td>1%</td>
<td>3%</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Caucasian</td>
<td>8%</td>
<td>4%</td>
<td>7%</td>
<td>25%</td>
<td>33%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>65%</td>
<td>85%</td>
<td>77%</td>
<td>46%</td>
<td>42%</td>
</tr>
<tr>
<td>Two or more</td>
<td>3%</td>
<td>2%</td>
<td>-</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>IEP</td>
<td>14%</td>
<td>11%</td>
<td>8%</td>
<td>12%</td>
<td>12%</td>
</tr>
<tr>
<td>English Learners</td>
<td>31%</td>
<td>38%</td>
<td>26%</td>
<td>18%</td>
<td>16%</td>
</tr>
<tr>
<td>FRL</td>
<td>100%</td>
<td>93%</td>
<td>85%</td>
<td>70%</td>
<td>61%</td>
</tr>
<tr>
<td>Daily Attendance</td>
<td>93%</td>
<td>95%</td>
<td>95%</td>
<td>95%</td>
<td>97%</td>
</tr>
</tbody>
</table>

*Note.* WIDA = Worldclass Instructional Design and Assessment.
Students

There were 131 students recruited at the three schools (i.e., \(n = 48\), \(n = 49\), \(n = 34\)). To participate, students had to meet inclusion criteria, return parental consent forms (see Appendix A), and provide student assent (see Appendix B). Parental consent return rates were 47.9%, 25%, and 29.4% with an overall return rate of 34.3%. Of the students whose parents consented, 100% assented.

Forty-five recruited students returned parental consent and student forms (see Table 2).

Table 2

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Comparison Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruits</td>
<td>48</td>
<td>49</td>
<td>34</td>
<td>131</td>
</tr>
<tr>
<td>Assents (^a)</td>
<td>23</td>
<td>12</td>
<td>10</td>
<td>45</td>
</tr>
<tr>
<td>Data Set Without Maintenance (^b)</td>
<td>21</td>
<td>11</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>Data Set with Maintenance</td>
<td>12</td>
<td>5</td>
<td>n/a</td>
<td>19</td>
</tr>
</tbody>
</table>

*Note.* \(^a\)Parent gave consent prior to child assent. \(^b\)Does not include 2- and 4-week post-intervention maintenance data.

All students were eligible to receive special education due to mild to moderate disabilities (see Table 3) and received reading or written expression instruction as part of their individualized education plan. The students ages ranged from 11 to 15 years (\(M = 12.33\), \(SD = 1.03\)).
<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Comparison</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>8</td>
<td>1</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Male</td>
<td>13</td>
<td>10</td>
<td>5</td>
<td>28</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>6</td>
<td>1</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Caucasian</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hispanic</td>
<td>13</td>
<td>9</td>
<td>7</td>
<td>29</td>
</tr>
<tr>
<td>More than 1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Eligibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autism</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Hearing Impaired</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Learning Disability</td>
<td>17</td>
<td>9</td>
<td>10</td>
<td>36</td>
</tr>
<tr>
<td>Age (Mean)</td>
<td>12 Yr. 7 Mo.</td>
<td>12 Yr. 3 Mo.</td>
<td>12 Yr. 2 Mo.</td>
<td>12 Yr. 4 Mo.</td>
</tr>
<tr>
<td>Grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>6</td>
<td>9</td>
<td>22</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>English Learners</td>
<td>n = 11</td>
<td>n = 7</td>
<td>n = 7</td>
<td>n = 25</td>
</tr>
<tr>
<td>WIDA Score(a)</td>
<td>2.27</td>
<td>2.52</td>
<td>3.16</td>
<td>2.65</td>
</tr>
</tbody>
</table>

*Note. WIDA = Worldclass Instructional Design and Assessment. \(a\)Overall composite score.*
**Inclusion criteria.** Upon approval of the university and local school district Institutional Review Boards (IRBs), each school was randomly assigned to an instructional group. The teacher at each school taught the same treatment to all their sections of English resource. All students (i.e., $n = 9–16$) in each of 10 resource classrooms received the instruction (i.e., treatment or comparison), but data were collected only for students who met the inclusion criteria.

Students took a pre-test knowledge assessment and paragraph writing assessment. Students selected for participation received specialized instruction in reading or writing in a resource classroom and scored 1-10 out of 13 possible points (i.e., below 77%) on the knowledge assessment pre-test (see Appendix C) or earned a 1-17 out of a possible 22 points (i.e., at or below 77%) on the paragraph writing quality rubric (see Appendix D).

Additionally, special education teachers verified the student participants were to receive reading or writing instruction in a resource classroom as part of their specially designed instruction in their Individualized Education Program. Selected students were excluded from the study if they were absent for more than 22% of the nine instructional lessons (i.e., two or more) to prevent a falsely-lowered post-intervention mean score, which makes statistical significance more difficult to achieve.

**Attrition.** Not all consented participants completed the intervention (see Table 2). Two students moved and one was absent for more than two lessons. Participant attrition was calculated based on the number of consented participants compared to the number of participants who completed the intervention (see Table 2). The formula used to calculate attrition was:

$$\left(\frac{\text{number of students who did not complete the intervention}}{\text{number of students consented}}\right) \times 100.$$  

The overall attrition rate was 6.7%.
Fidelity Observers

To record the implementation fidelity, two checklists were developed for the treatment groups (O’Donnell, 2008). One checklist is for treatment group A (see Appendix E); it does not include any indication of using a labeling system and applies to instructing students without the use of a letter code. In contrast, the checklist for treatment group B (see Appendix F) includes using the coded paragraph, coded graphic organizer, and using the same letter codes in the paragraph and the graphic organizer.

The researcher trained two doctoral-level graduate assistants to use a Qualtrics-based checklist which monitored the implementation of the intervention for the two treatment groups and documented fidelity. Both treatment groups were observed during the instructional lessons. Twenty two percent of the lessons were also observed by the researcher and compared. Interrater agreement was above 93%.

Instruments

Two assessments were designed as measurement tools. A writing quality tool measured student’s ability to apply their knowledge of paragraph writing into practical performance skills. A knowledge assessment measured what students knew and understood about expository paragraph writing.

Writing Quality

Previous researchers have used primary traits quality rubrics developed specifically for a particular research study (Olinghouse & Santangelo, 2010). These rubrics have been based on characteristics of analytic and holistic rubrics and are typically used in conjunction with quantitative metrics such as total number of words (TNW), and correct word sequences (see Benedek-Wood, Mason, Wood, Hoffman, & McGuire, 2014; Hoover et al., 2012; Kiuhara,
O’Neill, Hawken, & Graham, 2012; Sadler & Graham, 2007). Validated writing assessments (e.g. *Woodcock-Johnson IV* writing sentence and writing fluency subtest, *Test of Written Expression, Test of Oral & Written language*) evaluate narrative text at the sentence or paragraph unit level, but do not have an expository text component. Since a validated rubric for paragraph level expository text does not exist, the researcher created a traits rubric based on the types of sentences used during the intervention instruction.

The primary trait writing quality rubric included the number, types, and characteristics of the sentences included in the writing sample (see Appendix D). The researcher trained seven doctoral students and one assistant professor to type the student’s written responses and correct for minor spelling, grammar, and punctuation errors. These corrections maintained the substantive ideation and organization of the student’s paragraph. Typing student responses and making minor corrections is a common practice in writing research so that quality scores will not be negatively impacted by lower-order writing errors (see Benedek-Wood et al., 2014; Graham, 2006).

**Prompts.** The writing prompts used to elicit an expository paragraph as pre- and post-intervention writing quality measures were developed following the format of writing prompts used on the most recent state writing proficiency exam. Each prompt consisted of three sentences (see Appendix G) The first sentence set the stage and elucidated the student’s background knowledge of the topic. The second sentence was a question about the topic. The third sentence specifically instructed the students to an action based on the question posed. The readability level of the prompts ranged from 5th through 8th grade according to the Flesch-Kincaid scale.

The four-week post intervention prompt had the highest readability level. The other prompts were 5th and 6th grade level. Upon further investigation, the cause of the higher
readability level was the number of words and syllables in the term *social media*. When this term was replaced by the term *pencil pouches* the readability is 6.4. The researcher decided to retain the term social media due to its ubiquity. The researcher read the prompt aloud two times to all students to ensure that student reading levels did not impact their ability to respond to the prompt.

**Knowledge**

The knowledge assessment was a 13-item multiple choice assessment (see Appendix C) created by the researcher. Brame (2013) guidelines for creating valid and reliable questions were used, but reliability and validity of the instrument has not been assessed. The font was sans serif to increase legibility (Haugen, 2010; dos Santos Lonsdale, 2014). The first nine questions contained a stem in the form of a question. There were three choices for students to select, one of which was the correct answer and two plausible distractors. Placement of the correct answers was balanced throughout the nine questions to prevent a discernible pattern. The content of each question in this section was independent so information from one question did not influence a student’s ability to answer a subsequent question.

The last four questions of the knowledge assessment asked students to apply their knowledge of sentence types to an anchor paragraph. Students were given a type of sentence and asked to choose one of three anchor paragraph sentences as the example of that sentence type. One of the choices was the correct answer, and the other two were plausible distracters. Each question followed the same construction guidelines from Brame (2013). The content of each question in this section was independent, so information from one question did not influence a student’s ability to answer a subsequent question. There was a total of 13 multiple choice
questions, each worth 1 point. The researcher graded the knowledge assessments using a scoring key.

**Social Validity**

Teachers and students provided social validity data. Researcher-created surveys and a structured interview tool measured the perception of the intervention’s usefulness and feasibility. Teachers answered survey questions and participated in a structured interview. Students completed a survey.

**Teacher feedback.** A survey and a guided interview (see Appendices H and I) were created to measure the social validity as determined by the teachers who implemented the intervention. The survey consisted of eight statements designed to measure how teachers felt about the effectiveness and usefulness of the intervention. Each statement was scored on a 0 - 2-point Likert scale with choices disagree, neutral, or agree. The survey was administered after the three-week intervention period. The structured interview consisted of 6 open-ended questions designed to determine teacher opinions of how the intervention could be more useful. The interview was administered after the teacher surveys were completed.

**Student feedback.** The survey created for students (see Appendix J) consisted of six statements designed to measure how students felt the intervention affected their knowledge of sentence types and their ability to write an expository paragraph. There was one open ended question for students to give feedback to any portion of the intervention.

**Materials and Equipment**

Materials and equipment were designed to limit the differences between the treatment groups to independent variable. Both treatment groups used the same model paragraphs, but
different graphic organizers. A teacher’s guide was created for each of the three instructional groups.

**Model Paragraphs**

The researcher created the two model paragraphs (see Appendix K) and chose bicycles as the content. The readability grade level of Paragraph A was 2.3 and Paragraph B was 3.0, as measured by the Flesch-Kincaid scale in Microsoft Word. Each model was read aloud by the teacher to ensure that students who may have had reading difficulties would have access to the text. The paragraphs were printed using a sans serif font for legibility of continuous text (dos Santos Lonsdale, 2014). Each paragraph contained a topic sentence and three detail sentences. Each detail sentence had two or three explanation sentences.

**Graphic Organizers**

Graphic organizers were created using Lucidchart software (Lucid Software, 2018). The non-coded graphic organizer (see Appendix L), used by treatment group A, had a black-outlined bubble for the topic, the three details, and the three explanations for each detail (i.e., 13 total). The connection arrows were black and labeled in black with the characteristic cue words (i.e., what, how/why). The letter-coded graphic organizer (see Appendix M), used by treatment group B, differed from the non-coded graphic organizer only in the bubble labeling. Each bubble was labeled according to the sentence type (i.e., topic, detail, explanation, conclusion) using a systematic labeling code (see Table 4). The remaining coloring and text was identical to the graphic organizer used by treatment group A.
### Table 4

**Group B Sentence Types and Characteristics**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topic Sentence</td>
<td></td>
</tr>
<tr>
<td>States main idea</td>
<td>Tp</td>
</tr>
<tr>
<td>Keeps the idea general/broad</td>
<td></td>
</tr>
<tr>
<td>Only 1 main idea</td>
<td></td>
</tr>
<tr>
<td>Detail Sentence</td>
<td>Dt</td>
</tr>
<tr>
<td>Gives specific information about the topic</td>
<td></td>
</tr>
<tr>
<td>Answers the “What” question</td>
<td></td>
</tr>
<tr>
<td>Explanation Sentence</td>
<td>Exp</td>
</tr>
<tr>
<td>Gives information about the detail</td>
<td></td>
</tr>
<tr>
<td>Answers the “Why” or “How” question</td>
<td></td>
</tr>
<tr>
<td>Conclusion Sentence</td>
<td>Ccl</td>
</tr>
<tr>
<td>General statement about the topic</td>
<td></td>
</tr>
<tr>
<td>Similar idea of topic sentence using different words</td>
<td></td>
</tr>
<tr>
<td>Wraps up the paragraph</td>
<td></td>
</tr>
<tr>
<td>Signals reader paragraph is ending (or transitioning</td>
<td></td>
</tr>
<tr>
<td>to new paragraph)</td>
<td></td>
</tr>
<tr>
<td>Typically the last sentence</td>
<td></td>
</tr>
<tr>
<td>May include the author’s general feeling/attitude</td>
<td></td>
</tr>
</tbody>
</table>

**Teacher’s Guide**

Three versions of the teacher’s guide were created, one for each of the groups (i.e., reverse model with non-coded graphic organizer, reverse model with letter-coded bubbles on the graphic organizer, and comparison). Each guide had an introduction, an overview of the contents of the guide, and an overview of the instruction (see Appendix N). The two intervention group teachers’ guides also had lesson plans for the 12 days of intervention (see Appendix O), lesson plans for the two maintenance probes, and samples of all documents used during the intervention. The guide for the comparison allowed for teachers to follow their submitted lesson plans.

Each lesson plan followed a similar structure. Each plan contained a lesson objective, a student friendly objective, detailed instructions for teachers to present the instruction in a
scaffolded gradual release method, and a closure (Fisher & Frey, 2008; Wood, Bruner, & Ross, 1976). The assessments on day 1, day 6, and day 12 were scripted to ensure all students received the same presentation and were administered by the researcher. The assessment days were called lessons for continuity so that teachers, who are versed in calling each day’s plan a lesson, could continue using typical classroom vocabulary when discussing the intervention. The lessons were aligned so that all three groups took the pre-, mid-, and post-intervention assessments at the same point within the three-week implementation period. The assessments were administered by the researcher on consecutive days, one per day at each of the schools.

The other nine treatment lessons were detailed, but not scripted, so that teachers could present the content based on the needs of the students in their classroom. There was also a list of materials needed for each day. For the treatment groups, the lessons were aligned so that the instruction was similar on each day except for the adjustments needed to provide the differences in using a non-label versus a label system.

**Procedures**

The intervention took place at three middle schools. The English language arts resource classroom teacher at each school was trained by the researcher to implement the intervention. Random assignment occurred at the school level; therefore, each teacher one of two treatment conditions or the comparison condition, but not both. Each day the same lesson was taught to all the teacher’s resource classrooms. This lesson was determined according to which group the site had been randomly assigned. For the treatment school with a modified block schedule, two lessons were taught on the days the class met for the extended 88-minute block. All students in the teachers’ resource classrooms received the instruction, with analysis data included only from students who meet the selection and participation criteria.
**Pretest Procedures**

All students completed two pre-intervention assessments: (a) the knowledge assessment and (b) the paragraph writing quality assessment. The 13-question multiple choice knowledge assessment was read aloud by the researcher. Each question was read aloud two times followed by reading the three answer choices one time. Students answered the question before the researcher read the subsequent question. If requested, the researcher re-read a question one time. Students were prompted by the researcher with, “If you don’t know the answer, circle your best guess.”

During the same class period, students completed the writing sample. The researcher read the prompt aloud twice. Students were given up to 30 minutes to write a paragraph in response to the prompt. Previous research allowed students with disabilities between 10 and 45 minutes to complete a writing prompt (see Benedek-Wood et al., 2014; Hebert, Graham, Rigby-Wills, & Ganson, 2014; Olinghouse & Santangelo, 2010). Thirty minutes was used for this intervention to allow time for completing the graphic organizer and drafting the paragraph. This 30-minute allowance was sufficient when the pilot study was performed (Ewoldt & Morgan, 2017). The prompt was written in the same format used in previous state-level writing achievement assessments and contained three sentences: (a) a general statement about a topic, (b) a specific question, and (c) a specific instruction telling the student how to answer the question (see Appendix G). No students took more than 12 minutes to complete the writing task during the pre-assessment. Most students completed the post-assessment paragraph before the 30-minute time limit, typically within 20 minutes. The two students who were still writing at 25 minutes were prompted with a 5-minutes remaining and 1-minute remaining oral reminder.
Across Study Conditions

After pretest assessments, each treatment group received nine instructional lessons, one per day over a period of three weeks. The only exception to this dosage was in the case of treatment group A which operated on a modified block schedule. One day per week the class meeting was extended and on this day, two lessons were implemented.

Previous studies have determined the length of the intervention based on the number of days required to teach the strategy under investigation, and have examined implementation effects after as few as four days (see Hebert et al., 2014; see Monroe & Troia, 2006; see Saddler & Assaro, 2007). Each lesson was designed to last approximately 30 minutes. The lesson plans were similar across groups, except for the treatment each group received. Treatment Group A received the reverse engineered instruction using a non-coded graphic organizer; treatment Group B received the reverse engineered instruction using a letter-coded graphic organizer; treatment Group C was the comparison group and did not receive any written expression instruction other than what was typically taught in the resource classroom, described by the teacher’s lesson plans (see Conditions section below). The treatment groups took take the mid-assessments after lesson five, and all groups took the post-assessments on consecutive days.

Data Collection

Records of student work consisted of the knowledge assessments, paragraph writing samples, and graphic organizers. All records were collected; records from students with proper consent and assent were used for data analysis. Student names were redacted from all assessment materials prior to the beginning of data analysis. A researcher-created student identification (ID) number was assigned to each participant, and that ID number was transcribed onto each artifact.
The identification number was created following a standardized format. The first letter represented the school (i.e., F, R, M), the second letter represented the pre, mid, or post assessment (i.e., none for the pre-assessment, M for the mid-assessment, C for the post assessment), the first number represented the class period (i.e., 1–6) and the last two digits represented the student (i.e., 0–16). For example, if the data were collected from City Middle School as the mid-assessment, from period 2, student number 6 the assigned ID would be CM206.

Treatment Procedures

The two treatment groups received 3 assessments and 9 instructional lessons implemented within three weeks. The first lesson measured student’s baseline knowledge and skills using the pre-intervention knowledge assessment and paragraph writing quality rubric. Lessons two and three were designed to teach students the four types of sentences required in an expository paragraph: (a) topic, (b) detail, (c) explanation, and (d) conclusion. In the following two lessons students learned to analyze and identify each sentence in the model paragraph (i.e., Paragraph A; see Appendix K) based on the sentence’s characteristics. Using a different model paragraph (i.e., Paragraph B; see Appendix K), students practiced analyzing each sentence to identify its type (i.e., topic, detail, explanation, conclusion). One treatment group (i.e., Treatment Group B) used a coding system to label each sentence in the model paragraph using a systematic letter-code; the other treatment group (i.e., Treatment Group A) did not use a coding system and did not label the sentences in the model paragraphs. In lessons 7 and 8, the students learned and practiced placing the main idea of each model sentence into a graphic organizer (GO). Treatment Group B had graphic organizers in the same letter-code scheme used to label the model
paragraph sentence type used during the analysis and identification. Treatment Group A used a graphic organizer without a letter code.

Students then transitioned from working with a model paragraph to creating their own paragraphs. In lesson 9 students brainstormed ideas and organized their ideas into a GO. The GO for each treatment group was the same as the GO the group used with the model paragraph: Treatment Group A used a GO without a letter label while Treatment Group B used the letter-coded GO. In lessons 10 and 11, students used their completed GO to draft their own expository paragraph. Following lesson 11, students completed post intervention assessments consisting of the same knowledge assessment used during pre-testing and mid-assessment, and a paragraph writing task. The writing task used a different prompt, but was scored using the same quality rubric and quantitative measures used in the pre-assessment.

The comparison group did not receive any paragraph writing instruction beyond the typical instruction for students in a resource room with specially designed written expression minutes as part of their IEP. The comparison group teacher’s lesson plans were examined and analyzed to determine which writing standards were being taught and how the instruction was delivered during the three-week intervention period.

At the end of the three-week period in which the two treatment groups received their intervention, the comparison group took the post-intervention assessments consisting of the same knowledge assessment used during pre-testing and the same paragraph writing task used as a post-assessment for the treatment groups. The writing task was scored using the same quality rubric and quantitative measures used in the pre-assessment.

**Language Supports.** To address the needs of the English learners in the classroom, the teachers were instructed in methods to incorporate language scaffolds during instruction. The
treatment groups were provided with a list of cues designed to assist students with identification of the phrases from the draft paragraph to be used on the graphic organizer during the reverse engineering process. This set of cues was printed on the reverse side of the sentence characteristics table. Teachers also encouraged students to answer questions in complete sentences when responding to questions.

Teachers were also instructed to use the academic language with the support of the definitions. During each lesson, students were reminded to refer to their copy of the sentence characteristics table. For treatment group B, the letter code was also included in sentence characteristics table. The sentence characteristics tables were printed on card stock to be more durable during its repetitive daily usage.

**Implementation Fidelity**

The researcher and two doctoral-level graduate assistants observed implementation of the intervention for the two treatment groups and documented fidelity using the researcher-created fidelity checklists (see Appendices E and F). Treatment group A was observed 88.8% of the time; treatment group B was observed 77.7% of the time. The researcher also observed 22.2% percent of the lessons to compare for inter-rater agreement, with minimum goal of 80% agreement.

**Comparison Group**

The comparison group was taught by two different English resource classroom teachers. The researcher met with these teachers prior to intervention and discussed lesson plans scheduled for teaching during the intervention period. Both teachers taught writing instruction in accordance with the state standards and district's published sequence and pacing schedule.

One of the teachers utilized the school’s educational technology program daily and practiced narrative and/or composition writing at least two-times per week. Students used iPads
and desktop computers in the classroom to draft their writings. The focus of her instruction during the intervention was on conducting research and writing a research paper on a student-selected career.

The other teacher did not have access to the teacher’s section of the school’s educational technology program. Her students worked with pencil and paper daily. They were taught parts-of-speech during the three-week intervention period. Two days each week, students practiced narrative and expository paragraph composition generated from a teacher-provided prompt.

**Scoring Fidelity**

**Writing quality.** Three doctoral-level graduate assistants were trained to score the paragraph writing quality using the researcher-created traits rubric. The training consisted of definitions of the four types of sentences and the identification of these types of sentences within the written paragraph. During training, sample texts from the pilot study were used as practice materials. Scorers practiced until there was 100% agreement on the rubric scoring. The researcher randomly selected four paragraphs from each scorer and used the scoring rubric on these same paragraphs. Interrater reliability was above 80% for each scorer. Each discrepancy between the researcher and scorer rubric was discussed until 100% agreement. After all scoring was completed, the researcher randomly selected and scored 20% of the remaining paragraphs (i.e., those not compared during scoring). The consensus method using the following calculation: 

\[
\text{[(number of agreements/11)*100]} \quad \text{indicated interrater reliability was above 80% (Gast \\ Ledford, 2014).}
\]

**Total number of words.** The researcher counted the number of words in each paragraph. A doctoral-level graduate assistant also was trained to count the total number of words. Twenty percent of the paragraphs were randomly selected and scored by the graduate assistant. The
researcher and graduate assistant scores were compared to determine inter-rater reliability. Inter-rater reliability was above 80% (Gast & Ledford, 2014).

**Knowledge Assessment.** The researcher used a scoring key to grade the multiple-choice knowledge assessments. A graduate assistant randomly selected and scored 20% of the knowledge assessments using the same scoring key. Inter rater reliability was above 80% (Gast & Ledford, 2014).

**Maintenance Assessment Procedures**

Writing quality maintenance was assessed twice after the end of the intervention. Two-and four-weeks after the intervention, paragraph writing quality was assessed in the resource room. The classroom teacher displayed the researcher-provided prompt (see Appendix G) and read the prompt aloud twice, in a similar fashion as modelled by the researcher during the pre- and post-assessments. Students were provided a lined piece of paper and a graphic organizer, which was formatted in the same way as the graphic organizer used by their respective treatment group during the intervention. Scoring procedures for the maintenance assessments were the same as those performed for the pre- and post-intervention paragraph writing quality assessments.

**Experimental Design**

The intervention was implemented using a quasi-experimental design (Creswell, 2015). Threats to internal and external validity were addressed through the procedural implementation of the intervention. The design diagram (see Appendix P) includes the notation for non-randomly assigned group observations and treatments over time (Campbell & Stanley, 1963).
Conditions

The experiment consisted of three groups, two of which received a treatment and one comparison group. One treatment group reverse engineered a model paragraph into its component sentence types. The main idea of each sentence type was placed into a graphic organizer which was not labeled. The other treatment group reverse engineered a model paragraph into its component sentence types by identifying and labeling each sentence by type. The main idea of each sentence type was placed into a graphic organizer which used the same systematic labeling scheme used in the identifying and labeling process. The researcher interviewed the teachers assigned to the comparison group and examined their lesson plans to determine what comprised typical instruction. The control group took the pre-, and post-intervention assessments within one day of when the two treatment groups took their assessments.

Data Analyses

Data was examined to determine the effect of the intervention on writing knowledge and writing quality.

Question 1. Did reverse engineering the drafting step of the writing process improve expository paragraph writing quality compared to business as usual writing instruction in a typical resource classroom?

A 3 X 2 repeated-measure analysis of variance (ANOVA) test was run to show if a statistically significant difference existed between the writing quality for students in the two treatment groups compared to students in the comparison group. Subsequent independent t-tests compared scores between the groups. Each student’s pre-intervention and post-intervention scores were used.
2. Did adding a systematic letter coded graphic organizer to reverse engineering the drafting step of the writing process improve the writing quality of an expository paragraph?

A 3 X 2 repeated measure analysis of variance (ANOVA) test was run to show if a statistically significant difference existed between the writing quality for students in the Group A treatment group compared to students in the Group B treatment group. The pre-intervention, post-intervention, and two maintenance scores were used.

3: Did knowledge of four sentence types contained in an expository paragraph predict paragraph writing quality?

A simple linear analysis was run to determine there was a statistically significant relationship between knowledge of the four expository sentence types and the paragraph writing quality. The post-intervention knowledge assessment scores and writing quality scores were used.

4: For students with disabilities who are English learners, does using a graphic organizer, with or without a systematic letter code, improve writing quality and total number of words written?

Multiple regression analyses were performed. After completing necessary tests of assumptions (e.g. linear relationship, homoscedasticity, multicollinearity) and establishing dummy codes for categorical variables (i.e., gender, EL, disability, ethnicity), a model of fit test was run. Adding the independent variables (i.e., gender, EL, disability, ethnicity, group membership) to the model and examining the change of variability revealed the impact of the independent variable when other variables were controlled. Each categorical variable was examined to determine relationship of the category to the gain in quality scores.
Pattern Analysis

Individual students were further examined. In terms of growth in the quality of paragraph writing scores, the top and bottom three student’s growth performance was closely examined. Growth was measured comparing pre- and post-intervention paragraph quality writing scores. A visual analysis of components included or omitted, sentence structure, and content on the pre-and posttest were contrasted. These were also being contrasted and compared to the other two students in the subgroup to look for commonalities. The categorical data of each student was also considered to see if any patterns arose.

Summary

Written expression is a difficult task for students because of the multiple, simultaneous processes occurring, which is taxing to working memory. This is especially problematic for students who have working memory deficits or who are engaging in tasks that demand high cognitive load, such as students with learning disabilities and students learning English. Modeling is a procedure used during explicit instruction, which is known to be an effective instructional method for these populations. However, typical modelling is sequential. This study extends the literature by determining if a reverse engineering applied to instructional design as a teacher modeling method is effective for students with mild to moderate disabilities and English learners. Comparisons include reverse engineering using a graphic organizer with and without a systematic letter-label code.
CHAPTER FOUR

RESULTS

Writing is an important skill for school and beyond (Bangert-Drowns et al., 2004; Bazerman, 2013; College Board, 2004, 2005; Langer & Applebee, 2011). The recent adoption of rigorous academic content standards that require writing skills be embedded across all content areas, as well as the critical role writing plays in content acquisition and assessment of knowledge (Bangert-Drowns et al., 2004), has increased the call for addressing the integration of writing instruction in schools. When students have poor writing skills, their ability to convey understanding is limited and can have a negative effect on academic outcomes (Graham, 2006).

Beyond schooling, written communication connects people culturally and socially (Bazerman, 2013; Graham, 2006; MacArthur, Graham, & Fitzgerald, 2016) and also communicates important historical events to future generations (Bazerman, 2013; Schultz et al., 2016). Ideologies and social norms are passed down through written expression. For contemporaries, written expression connects people to one another through lists, notes, and letters (Graham & Perin, 2007a). As an employment skill, writing is used in most careers and is predictive of successful promotion (College Board, 2003; MacArthur et al., 2016). Recent technological developments have also influenced written communication and literacy (Kist, 2005; Leu, Slomp, Zaqlinski, & Corrigan, 2016).

Research on writing instruction has examined several critical aspects including development, execution, and process (Berninger & Swanson, 1994; Englert et al., 1988; Graham, 2006; Gillespie & Graham, 2014; Wong, 1997). For students with disabilities, self-regulated strategy development (SRSD) is the most widely researched framework for writing instruction.
Within the SRSD framework, teachers model effective writing. This modeling process is typically a think aloud of the forward sequence of the writing process.

Research has not examined articulating the idea development process required to move a prewriting idea forward from one or two words into an entire sentence that is organized into a cogent paragraph. The difficulty articulating this transition prohibits explicit instruction. However, examining the outcome of the process, followed by examining its origination, provides an explicit model of the results of successful sentence development.

The purpose of this study was to examine the effect of reversing the instructional sequence of writing an expository paragraph. It explicitly taught the types of sentences in a paragraph and used that knowledge to analyze a paragraph draft prior to engaging in a prewriting activity. Graphic organizers were used to support the cognitive load of the analysis. The study compared groups using a graphic organizer, a graphic organizer with an embedded systematic labeling code, and a comparison group.

Three urban middle schools in the southwestern United States were assigned randomly to one of three groups: (a) treatment group A, (b) treatment group B, or (c) business as usual comparison condition. The middle schools consisted of grades 6 through 8. Teachers and students gave consent and assent to participate. Four teachers and 42 students participated. One teacher and 21 students participated in group A. The instruction reverse engineered a draft paragraph with the support of a graphic organizer that did not have a systematic letter code. In group B, one teacher and 11 students participated. The instruction reverse engineered a draft paragraph with the support of a graphic organizer that contained systematic letter code. In group C, two teachers and 10 students participated. The instruction aligned to the state standards and included paragraph writing.
Implementation Fidelity

Three graduate assistants were trained to observe the treatment lessons for implementation fidelity. To collect the data, observers used the researcher developed fidelity checklist while monitoring classroom instruction. Data were entered into an internet-based survey via the Qualtrics app on a mobile device. The researcher performed simultaneous observations for 20% of the lessons to determine inter-rater reliability for teacher fidelity to the intervention.

Treatment Group A. One graduate assistant observed 88.8% of the lessons. The fidelity checklist consisted of nine observable behaviors each with a Likert scale of determinations (i.e., not observed, rarely, some of the time, most of the time). Criteria to meet implementation fidelity was reaching most of the time in 8 out of 9 of the behaviors. Of the lessons observed, the teacher met criteria 77.8% of the time. The steps most that were most-often below criteria were describing the terms by their characteristics more than one time. Lesson one and lesson five were not observed. The researcher also observed 2 of the 9 lessons to determine inter-rater reliability, which was calculated by taking each behavior individually and comparing observer to researcher selections of the Likert scale choices. Inter-rater reliability was 94.4%.

Treatment Group B. One graduate student observed 66.7% of the lessons, a second graduate student observed 11.1% of the lessons, and the researcher observed 11.1% of the lessons, for a total of 88.9% of the lessons observed for implementation fidelity. Lesson seven was not observed. The fidelity checklist consisted of 11 observable behaviors each with a Likert scale of determinations (i.e., not observed, rarely, some of the time, most of the time). Criteria to meet implementation fidelity was reaching most of the time in 8 out of 11 of the behaviors. Of
the lessons observed, the teacher met criteria 100% of the time. The researcher also observed 2 of the 9 lessons to determine inter-rater reliability, which was calculated by taking each behavior individually and comparing observer to researcher selections of the Likert scale choice. The formula used was \((\text{number of agreements/9}) \times 100\). Inter-rater reliability was 93.18%.

**Baseline Equivalency**

The study employed a quasi-experimental research design with three groups. One treatment group received reverse-engineered expository paragraph writing instruction with the use of a graphic organizer without labels, one treatment group received reverse-engineered expository paragraph writing instruction with the use of a graphic organizer with labels, and one group served as the comparison group. Pretest scores were analyzed using a one-way ANOVA in order to determine baseline equivalency across instructional groups for each of the three dependent variables: (a) writing quality, (b) total number of words written, and (c) sentence knowledge.

The mean pre-intervention scores were statistically equivalent on the writing quality, total number of words, and the sentence knowledge measure indicating the three groups were equivalent prior to the intervention. At the \(\alpha = .05\) level using a Bonferroni correction, the \(F\)-test for writing quality was not significant \((F_{2, 39} = .5, p = .611)\). The \(F\)-test for total number of words was not significant \((F_{2, 39} = .061, p = .941)\). The \(F\)-test for sentence knowledge was not significant \((F_{2, 39} = 1.24, p = .301)\).

**Analysis of Writing Quality**

To measure paragraph writing quality, students submitted paragraph writing samples during pre- and post-intervention assessments. The researcher or teacher read the prompt aloud and displayed it on the document camera. Students wrote for 30 minutes or less. To reduce
scoring bias, trained graduate assistants typed the student paragraphs and corrected for minor grammatical errors. The typed paragraphs were scored using a traits rubric with a possible score of 22 points. The total number of words written was calculated by counting the number of words the students composed.

The intervention groups also submitted paragraph writing samples during the 2- and 4-week maintenance probes. However, a relatively high number of data points were unavailable due to student absences and illegibility of student writings, which reduced the group sample sizes. As a result, these sample sizes were not large enough to conduct multiple regression analyses. Therefore, comparisons were performed on the pre- and post-intervention writing quality measures only; analysis did not include maintenance assessment measures.

Data from writing quality assessments were used to answer the following questions:

1. Does reverse engineering the drafting step of the writing process improve expository paragraph writing quality compared to business as usual writing instruction in a typical resource classroom?

2. Does adding a systematic letter coded graphic organizer to reverse engineering the drafting step of the writing process improve the writing quality of an expository paragraph?

The hypothesis for research question one was that students participating in the reverse engineered drafting step would score higher on an expository paragraph quality writing rubric and on the total number of words written than students who were not receiving the intervention. For research question two, the hypothesis was that students using the letter-coded graphic organizer would score higher on the expository paragraph quality rubric and on the total number
of words written than students who used a graphic organizer without the letter labels and higher than students who did not receive the intervention.

The researcher implemented a mixed design ANOVA to test for differences between the treatment groups. A visual inspection of the boxplots determined there were no outliers in the data. A Shapiro-Wilks test indicated the pre-intervention writing quality was normally distributed ($p > .05$) for group A and for group B, but not normally distributed for group C ($p = .42$). A further examination of normality indicated the group C skew $61 (SE = .68)$ and kurtosis -1.5 ($SE = 1.3$) were normally distributed ($p > .05$). Levene’s test indicated there was homogeneity of variance for the pre-intervention ($p = .374$) and post-intervention ($p = .699$). Using the Huynh-Feldt adjustment for sphericity, there was not a statistically significant interaction between the individual intervention groups and time on the writing quality scores, $F(2, 39) = .863, p = .43$, partial $\eta^2 = .042$, $\beta = 81.2\%$ (see Figure 1).

![Figure 1. Time and treatment interaction](image)

Estimated Marginal Means of Writing Quality

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Estimated Marginal Means of Writing Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A No Letters</td>
<td><img src="image" alt="Graph showing estimated marginal means for Group A No Letters" /></td>
</tr>
<tr>
<td>Group B With Letters</td>
<td><img src="image" alt="Graph showing estimated marginal means for Group B With Letters" /></td>
</tr>
<tr>
<td>Comparison</td>
<td><img src="image" alt="Graph showing estimated marginal means for Comparison" /></td>
</tr>
</tbody>
</table>

Figure 1. Time and treatment interaction
Although not statistically different, the comparison of gains on writing quality scores were higher in the group that did not use the letter-labeled graphic organizer than the group using the organizer that did not contain the letters. When looking at the three groups combined, there was a statistically significant difference ($\alpha = .001$; see Table 1) in the pre- and post-intervention scores $F(1, 84) = 11.170, p = .002, \eta^2 = .223$.

Table 5
Descriptive Statistics for Writing Quality Rubric Scores

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th></th>
<th>Post</th>
<th></th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Group A</td>
<td>21</td>
<td>7.53</td>
<td>4.97</td>
<td>12.67</td>
<td>4.61</td>
</tr>
<tr>
<td>Group B</td>
<td>11</td>
<td>5.91</td>
<td>3.51</td>
<td>9.5</td>
<td>4.92</td>
</tr>
<tr>
<td>Comparison</td>
<td>10</td>
<td>7.4</td>
<td>4.41</td>
<td>9.3</td>
<td>3.68</td>
</tr>
<tr>
<td>ELs</td>
<td>25</td>
<td>6.92</td>
<td>4.13</td>
<td>10.56</td>
<td>4.77</td>
</tr>
<tr>
<td>Group A</td>
<td>11</td>
<td>8.1</td>
<td>4.52</td>
<td>11.64</td>
<td>4.7</td>
</tr>
<tr>
<td>Group B</td>
<td>7</td>
<td>4.71</td>
<td>2.63</td>
<td>10.43</td>
<td>5.62</td>
</tr>
<tr>
<td>Comparison</td>
<td>7</td>
<td>7.29</td>
<td>4.35</td>
<td>9</td>
<td>4.2</td>
</tr>
<tr>
<td>Autism</td>
<td>2</td>
<td>8</td>
<td>5.66</td>
<td>10</td>
<td>7.08</td>
</tr>
<tr>
<td>Hearing Impaired</td>
<td>4</td>
<td>4.38</td>
<td>2.3</td>
<td>14.5</td>
<td>4.8</td>
</tr>
<tr>
<td>Learning Disability</td>
<td>36</td>
<td>7.32</td>
<td>4.57</td>
<td>10.71</td>
<td>4.56</td>
</tr>
</tbody>
</table>

*Note. SD = Standard Deviation; EL = English Learners.*

Comparison of Groups

A series of independent $t$-tests compared the post-writing quality scores between the groups. To compare group A to group B, a visual inspection of the boxplots indicated there were
no outliers. Shapiro-Wilk’s test indicated the post-intervention writing quality scores were normally distributed in Group A ($p = .98$) and in group B ($p = .866$). Levene’s test indicated there was homogeneity of variance between the groups ($p = .784$). The group A mean writing quality score was 3.17, 95% CI [-.42 to 6.8] higher than the group B writing quality score. There was not a statistically significant difference in the mean post-intervention writing quality scores between group A and group B, $t(30) = 1.8, p = .08, d = .66$.

Comparing group B to group C, a visual inspection of the boxplots indicated there were no outliers in either group. Shapiro-Wilk’s test indicted the post-intervention writing quality scores were normally distributed in group B ($p = .866$) and in group C ($p = .873$). Levene’s test indicated there was homogeneity of variance between the groups ($p = .391$). The group B mean writing quality score was .2, 95% CI [-3.8 to 4.2] higher than the comparison group writing quality score. There was not a statistically significant difference in the mean post-intervention writing quality scores between group B and the comparison $t(19) = .1, p = .92, d = .05$.

Comparing group A to group C, Levene’s test indicated there was homogeneity of variance between the groups ($p = .51$). The group A mean writing quality score was 3.7, 95% CI [-.04 to 6.8] higher than the group C writing quality score. There was not a statistically significant difference in the mean post-intervention writing quality scores between group A and group B $t(29) = 2.0, p = .05, d = .8$.

**Analysis of English Learners**

The student participants received instruction in the resource classroom because of the specially designed instruction included in their individualized education plans. All students in the study were identified as having a disability. Sixty percent of the students also were identified as
English learners (see Table 1). The English learners’ data was disaggregated from the student participant data to answer the following question:

4: For students with disabilities who are English learners, does using a graphic organizer, with or without a systematic letter code, improve writing quality and total number of words written?

The hypothesis for research question four was that students identified as English learners with disabilities would score higher on the writing quality and total number of words written when using the letter-labeled graphic organizer than students who used the graphic organizer without the letter labels. The writing quality scores for English learners increased from pre- to post-intervention (see Table 1).

The researcher analyzed a mixed design ANOVA to test for differences in English learner’s writing quality between the treatment groups. A boxplots inspection indicated there was an outlier in the group B pre-intervention scores. This was transformed using the Winsorization method (Fields, 2013). Writing quality was normally distributed as indicated by Shapiro-Wilk’s test ($p > .05$). Levene’s test indicated homogeneity of variances ($p > .05$). There was not a statistically significant interaction between the intervention and time on writing quality for English learners $F(2,22) = .934, p = .408$, partial $\eta^2 = .08, \beta = 80.9\%$. The mean score for group B ($M = 10.43, SD = 5.62$) was lower than the score for group A ($M = 11.64, SD = 4.7$). However, for the students using the letter-labeled graphic organizer (i.e., group B) gains were higher than for students not using the letter-labeled graphic organizer (see Table 1).

To examine the number of words written by English learners, the researcher analyzed a mixed design ANOVA to test for differences between the treatment groups. A boxplots inspection indicated there was an outlier in the group A pre-intervention scores. This was
transformed using the Winsorization method (Fields, 2013). Writing quality was normally
distributed as indicated by Shapiro-Wilk’s test \( (p > .05) \). Levene’s test indicated homogeneity of
variances \( (p > .05) \). There was not a statistically significant interaction between the intervention
and time on number of words for English learners \( F(2, 22) = .959, p = .399, \) partial \( \eta^2 = .08, \beta =
80.5\% \). The mean score for group A \( (M = 62, SD = 19.59) \), which did not use the letter-coded
graphic organizer, was higher than group B \( (M = 44.71, SD = 26.27) \).

*Table 6*

Total Number of Words

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Group A</td>
<td>45.58</td>
<td>29.15</td>
</tr>
<tr>
<td>Group B</td>
<td>43</td>
<td>40.48</td>
</tr>
<tr>
<td>Comparison</td>
<td>47.7</td>
<td>20.8</td>
</tr>
<tr>
<td>Els</td>
<td>43.39</td>
<td>24.17</td>
</tr>
<tr>
<td>Group A</td>
<td>50</td>
<td>25.1</td>
</tr>
<tr>
<td>Group B</td>
<td>29.71</td>
<td>15.78</td>
</tr>
<tr>
<td>Comparison</td>
<td>48.57</td>
<td>22.95</td>
</tr>
<tr>
<td>Autism</td>
<td>36</td>
<td>31.91</td>
</tr>
</tbody>
</table>

*Note.* SD = Standard Deviation; EL = English Learners.
**Analysis of Writing Knowledge**

Writing knowledge was measured using a 13-question multiple choice knowledge assessment. The knowledge assessment was administered during the pre- and post-intervention assessments, and midway through the intervention (i.e., after lesson 5). In two cases, students were out of the classroom for a portion of the class period during pre-assessment testing so pre-intervention knowledge scores were not available. For these two cases, the sample mean pre-test score was used to impute data.

Data from the knowledge assessment was used to answer the following questions:

3: Does knowledge of four sentence types contained in an expository paragraph predict paragraph writing quality?

The hypothesis was that students who knew the four sentence types contained in an expository paragraph would score higher on the writing quality and total number of words measurements and that the level of knowledge would be correlated to the writing quality and total number of words.

The overall sentence knowledge scores increased by 2.29 points (see Table 3). The individual group sample sizes were not large enough to run a multiple regression analyses. Therefore, analysis was limited to a simple linear regression between the post-intervention sentence knowledge and writing quality scores. A visual inspection of this scatterplot indicated a linear relationship. The Durbin-Watson statistic of 1.868 indicated there was independence of residuals. A visual inspection of a plot of standardized residuals versus standardized predicted values indicated equal error variances (i.e., homoscedasticity). The sentence knowledge accounted for 5.4% of the variance in writing quality with an adjusted $R^2 = 3.1\%$. Sentence knowledge did not statistically predict the writing quality scores, $F(1, 40) = 2.30, p = .137$.
Table 7

Sentence Knowledge

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre</th>
<th>Mean</th>
<th>SD</th>
<th>Post</th>
<th>Mean</th>
<th>SD</th>
<th>Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>21</td>
<td>5.42</td>
<td>1.84</td>
<td>7.05</td>
<td>3.03</td>
<td>+1.63</td>
<td></td>
</tr>
<tr>
<td>Group B</td>
<td>11</td>
<td>6.5</td>
<td>1.84</td>
<td>7.6</td>
<td>2.33</td>
<td>+1.1</td>
<td></td>
</tr>
<tr>
<td>Comparison</td>
<td>10</td>
<td>6</td>
<td>1.63</td>
<td>5.56</td>
<td>1.71</td>
<td>-0.44</td>
<td></td>
</tr>
<tr>
<td>Els</td>
<td>25</td>
<td>5.82</td>
<td>1.94</td>
<td>6.74</td>
<td>2.5</td>
<td>+0.92</td>
<td></td>
</tr>
<tr>
<td>Autism</td>
<td>2</td>
<td>7.5</td>
<td>.71</td>
<td>8</td>
<td>0</td>
<td>+0.5</td>
<td></td>
</tr>
<tr>
<td>Hearing Impaired</td>
<td>4</td>
<td>5.33</td>
<td>.577</td>
<td>6</td>
<td>.82</td>
<td>+0.67</td>
<td></td>
</tr>
<tr>
<td>Learning Disability</td>
<td>36</td>
<td>5.79</td>
<td>1.87</td>
<td>6.87</td>
<td>2.83</td>
<td>+1.08</td>
<td></td>
</tr>
</tbody>
</table>

Note. SD = Standard Deviation; EL = English Learners.

The sentence knowledge accounted for 5.4% of the variance in writing quality with an adjusted $R^2 = 3.1%$. Sentence knowledge did not statistically predict the writing quality scores, $F(1, 40) = 2.30, p = .137$.

The researcher analyzed a mixed design ANOVA to test for differences in sentence knowledge between the treatment groups. An inspection of the boxplots indicated there were not outliers in the data. Shapiro-Wilk’s test indicated sentence knowledge was normally distributed for all groups ($\alpha = .05$) except group B pre-assessment score ($p = .038$). Levene’s test indicated homogeneity of variance ($p > .05$). There was not statistically significant interaction between the individual intervention groups and time on the writing quality scores, $F(2, 39) = 1.72, p = .192$, partial $\eta^2 = .081, \beta = 66%$. 
Analysis of Maintenance

At 2- and 4-weeks post intervention, student writing quality was re-assessed for both
treatment groups. The teachers read the prompt aloud and displayed it on the document camera.
The teacher gave each student a copy of the same graphic organizer (i.e., with or without letter
labels) used during the intervention. Students had up to 30 minutes to write their response
paragraph. There was a large number of students absent on the maintenance assessment days.
Additionally, seven paragraphs were not legible enough to be typed. These factors reduced the
number of cases that contained all four data points (i.e., pre, post, 2-weeks, 4-weeks) to \( n = 14 \) in
treatment group A and \( n = 5 \) in treatment group B. The 2-weeks post intervention writing quality
scores decreased from the post-intervention scores and rebounded slightly on the 4-week post
intervention measure (see Table 4).

Table 8

<table>
<thead>
<tr>
<th>Writing Quality Maintenance Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Group A</td>
</tr>
<tr>
<td>2-Weeks Post</td>
</tr>
<tr>
<td>4-Weeks Post</td>
</tr>
<tr>
<td>Group B</td>
</tr>
<tr>
<td>2-Weeks Post</td>
</tr>
<tr>
<td>4-Weeks Post</td>
</tr>
</tbody>
</table>

Note. SD = Standard Deviation

The distal maintenance scores were lower than the proximal post-intervention scores, but they
did not return to the pre-intervention levels (see Figure 2).
Analysis of Social Validity

Teachers

The two intervention teachers participated in a structured interview and completed a survey. The interview consisted of five open-ended questions. The researcher interviewed each teacher and, if needed, extended the line of inquiry based on the teacher’s response. The survey consisted of eight statements with Likert-scale responses of agree, neutral, or disagree. The strengths of the intervention were the reverse engineering sequence and the highly-structured lessons. Teachers indicated their students benefited from, “Seeing the big picture first.” The weakness identified by both teachers was the quick pace. Both teachers would have liked an additional class period for lessons 9, 10, and 11, wherein students practice using the graphic organizer to produce text. Teachers felt more practice time was needed.

To improve the intervention, one teacher suggested using a color code. The other teacher suggested changing the content of the prompt used during lesson 9 for increased clarity; her
students were unsure if the response should have been in a friendly letter format. Teachers both reported the intervention will change how they teach expository paragraph writing. One will use the reverse engineering process with subsequent classes. The other will use the framework and adapt it to reverse engineer narrative- and persuasive-paragraph writing instruction.

**Students**

Students completed a six-statement survey with Likert-scale responses of *yes, kind of, or no* (see Table 5). Surveys were completed anonymously on the same day as the post-intervention assessments. Twenty-two students completed the survey for a response rate of 69%. One survey contained a statement with more than one response selected; one survey contained a statement with no response. These statements were omitted from analysis, but the remainder of the students’ responses were included.

**Table 9**

Frequency of Student Survey Responses

<table>
<thead>
<tr>
<th>Statement</th>
<th>Yes</th>
<th>Kind of</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>I liked learning to write paragraphs.</td>
<td>51.7%</td>
<td>44.8%</td>
<td>3.4%</td>
</tr>
<tr>
<td>My paragraphs are different now that I have learned the types of sentences and the graphic organizer.</td>
<td>44.8%</td>
<td>44.8%</td>
<td>6.9%</td>
</tr>
<tr>
<td>I know the different types of sentences in a paragraph.</td>
<td>58.6%</td>
<td>34.5%</td>
<td>6.9%</td>
</tr>
<tr>
<td>I understand how to use the graphic organizer.</td>
<td>64.3%</td>
<td>25.0%</td>
<td>10.7%</td>
</tr>
<tr>
<td>I have used this graphic organizer for other paragraphs.</td>
<td>48.3%</td>
<td>24.1%</td>
<td>27.6%</td>
</tr>
<tr>
<td>I will use this graphic organizer for other paragraphs.</td>
<td>69.0%</td>
<td>17.2%</td>
<td>13.8%</td>
</tr>
</tbody>
</table>
Measurement Fidelity

Three tools measured any changes in student writing. The 22-point traits rubric measured changes in writing quality. A count of the total number of words a student wrote measured the change in student writing quantity. The 13-point multiple-choice tool measured the change in student’s knowledge about the types of sentences in an expository paragraph.

Writing Quality

The researcher created a writing quality rubric and a total number of words checklist. Interrater reliability was evaluated on both measures. For writing quality, the researcher conducted interrater reliability. For the number of words written, a trained doctoral-level graduate assistant performed interrater reliability.

The researcher created a 22-point writing quality rubric. The rubric analyzed the traits of the four sentence types contained in an expository paragraph: (a) topic sentence, (b) detail sentences, (c) explanation sentences, and (d) conclusion sentences. Each of the sentence types was evaluated on two or three traits (e.g., three detail sentences relate to the main idea, each detail sentence has at least one explanation sentence). For each of the traits, a corresponding point value was associated. Point values ranged from 0 to 2. There were 11 traits evaluated for a total possible score of 22 points.

The researcher trained three doctoral students to use the writing quality rubric. The training consisted of learning the sentence types and qualities of each type, then applying that scoring process to example paragraphs that had been written by students during the pilot study. The training continued until each scorer’s rubric matched the researcher’s quality score on 11 out of 11 traits. During the scoring, the researcher randomly selected and scored four paragraphs.
from each scorer. All disagreements were discussed until there was 100% agreement between the
scorers and the researchers.

After scoring was complete, the researcher randomly selected an additional 20% of the
scored paragraphs for interrater reliability. The calculation was [(number of agreements/11) X
100]. The interrater reliability of trait agreements was 84.1%.

**Total Number of Words**

Two or more contiguous letters were considered a word, regardless of proper
capitalization or spelling. There were three single letters also counted as one word each (i.e., a, I,
u). The researcher created a list of characteristics that qualified a letter or contiguous set of letters
and symbols to determine the total word count (Benson & Campbell, 2009; see Table 6).

*Table 10*

<table>
<thead>
<tr>
<th>Student Writing</th>
<th>Inferred Meaning</th>
<th>Number of Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>a</td>
<td>1</td>
</tr>
<tr>
<td>i</td>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td>u</td>
<td>you</td>
<td>1</td>
</tr>
<tr>
<td>$20</td>
<td>Twenty dollars</td>
<td>2</td>
</tr>
<tr>
<td>PS4</td>
<td>Play Station Four&lt;sup&gt;a&lt;/sup&gt;</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note.*<sup>a</sup>Each word in the unabbreviated form of an acronym is counted as one
word.

The researcher performed word count analysis from the student’s original writing.

Twenty percent were randomly selected to check interrater reliability. The researcher trained a
doctoral-level graduate assistant to perform the word count using the table. There was 100% agreement on the total number of words.

**Knowledge Assessment**

A 13-question multiple choice tool measured students’ knowledge of the types of sentences used in an expository paragraph. The researcher created a scoring key of the correct answers. The researcher scored the knowledge assessments using the scoring key.

The researcher also trained a doctoral-level graduate assistant to score the knowledge assessments using the scoring key. Training consisted of using exemplar materials from the pilot study. Twenty percent of the knowledge assessments were randomly selected to check interrater reliability. There was 88% interrater agreement on each item, but due to addition errors, the overall scores agreed 88% of the time. The researcher re-calculated the total scores for all knowledge assessments. No additional errors were found.
Students with high incidence disabilities and English learners have difficulty with written expression (Graham, 2006; Ellis, 2006; MacArthur & Graham, 2016). These difficulties can have negative impacts on their academics and on their life beyond secondary education. Academic consequences can include limitations in using writing as a learning tool, difficulties in accessing assessment tools that use writing as a measure of content knowledge, lower course grades in secondary content areas, and decreased graduation rates (Bangert-Drowns et al., 2004; Connelley & Dockrell, 2016; Langer & Applebee, 2011;). Beyond high school, most careers use writing skills and deficits in writing can be barriers to career promotion and progression (Bazerman, 2013; College Board, 2003; Graham, 2006). With less than 6% of students with disabilities and English learners currently able to write proficiently there is a dire need to find instructional methods, sequences, strategies, and supports that will improve writing quality (U.S. Department of Education, Institute of Education Sciences, 2012).

Successful instruction for students with high incidence disabilities and English learners include scaffolds and strategies that help explicitly identify important concepts (Echevaria, & Graves, 2015; Graham et al., 2016; Graham et al., 2013; Graham & Perin, 2007a, 2007b; Swanson, 2001). The scaffolds help to free up the cognitive load of the task to free working memory resources to manage the multiple and simultaneous tasks required during writing (Graham, 2006; Sweller, 1994; Sweller et al., 1998). Teacher modeling explicit steps provide students with strategies to employ when working on their own writing tasks (Olson et al., 2017). Reversing the steps in the writing process helps students observe sentence and paragraph connections.

This study applied the concepts of reverse engineering to writing instructional design.
Instead of moving through a forward progression of the early writing process steps, which typifies current writing instruction implemented in schools, participants in this study began at the end and worked backwards. This reversal was designed to bridge the gap between prewriting simple ideas into well-developed complete sentences within an organized expository paragraph. Graphic organizers with and without a systematic labeling code were used as scaffolding supports to decrease the cognitive load required as students observed a teacher model the process. Students subsequently used these systematically-coded graphic organizers as a prewrite tool for expository paragraph composition.

A quasi-experimental research design, with random assignment at the school level, examined the application of reverse engineering to paragraph writing instruction. Participating students received writing instruction in one of three different formats: (1) group A, where the implemented instruction reverse engineered a draft paragraph and used a graphic organizer without a labeling code, (2) group B, where the implemented instruction reverse engineered a draft paragraph and used a letter-labeled graphic organizer, and (3) group C, where implemented instruction was the typical resource classroom writing instruction. Pre- and post-intervention tools measured the changes in writing quality and sentence knowledge.

Student writing quality and number of words written increased, but the increase was not statistically different than the comparison group. The differences in effect of the two types of graphic organizers was not significant. For English learners, the gains were higher when using the letter-labeled graphic organizer

**Impact of Reverse Engineered Writing Intervention on Student Writing Quality**

Student writing samples were scored using a researcher-created rubric to measure writing quality. The samples were an expository paragraph written in response to researcher-created
prompts. Writing samples were taken four times for the treatments groups: (a) pre-intervention, (b) post-intervention, (c) two-weeks post intervention, (d) four-weeks post intervention. Maintenance of learned writing skills was measured using a two- and four-week post-intervention assessment; this measure was not collected from participants in the comparison group.

Writing quality mean scores of the three instruction groups improved by 4 points on a 22-point scale (i.e., 18%) between the pre- and post-measures. This statistically significant difference ($p < .001$) had a large effect size ($d = .87$) in a three-week period. Although the present study did not indicate differences between groups, there was a medium and large effect size in a brief amount of time on the pre- and post-measure for the two intervention groups (i.e., group A $d = .08$; group B $d = .05$). Hough et al. (2012) found writing quality improvements in an intervention of similar length. The ratio of effect size to treatment length shows promise, and this effect size may be more likely to endure on distal measures similar to Fien et al. (2015).

Additionally, Antmann, Abbot, and Berninger (2008) noted that twice as much instructional time was needed for struggling students to reach proficiency. For this intervention to reach high effect size in a brief amount of time with a population that typically takes twice as long to learn indicates that a replication of this study may find significant impact on student outcomes. Further research could compare effect size to treatment length, as well as how effects obtained in a brief intervention endure over time.

**Comparing the Impact of the Graphic Organizer with Letter Codes to without Letter Codes**

There was not a statistically significant interaction based on group membership, but the high possibility of a type II error (i.e., 81.2%) warranted further investigation. Group
comparisons showed an unexpected difference between the treatment groups and the comparison group. The hypothesis was students using a systemically coded graphic organizer (i.e., group B) would improve writing quality more than students using a graphic organizer without a letter code (i.e., group A). The results of the study indicate students using a graphic organizer without labels outperformed students who used a graphic organizer with labels. The addition of the letter code may not be necessary when using a graphic organizer. Additionally, although teacher fidelity was measured, student behavior was not. Group B fidelity observers reoccurring noted off-task behaviors during the instruction. Future research could examine student engagement with the material as an additional independent variable.

One of the group A lessons not observed for fidelity was lesson 5. In that lesson, the teacher modeled placing a main idea from the draft sentence into the graphic organizer. The lesson plans for group A did not include a labelling system. However, the teacher naturally added labels as an instructional scaffold when her students struggled with the process. This became evident during the examination of the student work samples. Therefore, some confounding of the interventions occurred as the teacher implemented a similar coding schema used by group B. It is not possible to ascertain the impact of using different graphic organizer types from the reverse engineering process on the reported outcomes. However, the combination of using the graphic organizer with reverse engineering supports the conclusion of Monroe and Troia (2006) that combining multiple instructional strategies may accelerate closing the achievement gap for students with disabilities. Future research should focus on specifically analyzing the components of a writing graphic organizer that support the development of an expository paragraph.

Although there was not a statistically significant difference, there was a large effect for
reverse engineering without the letter labeling system, a medium effect for reverse engineering with the lettering system, and no effect for typical instruction. The lack of statistical significance may be explained by the small number of participants \((n = 42)\). However, the effect sizes and increase in number of words written displays promise of the impact of an explicit instruction expository writing intervention that incorporates principles of reverse engineering.

Moreover, the medium and large effects of embedding reverse engineering principles into expository writing instruction suggest this may be a viable instructional method for students with high incidence disabilities and English learners. Showing students a completed model, and modeling its deconstruction to understand each component’s role within the completed whole, may help students to understand how expert task-performers develop their behaviors to successful goal achievement. Future research could examine the reverse engineering instructional framework to other writing genres and other content areas (e.g. math).

**Explicit Instruction**

This study employed direct and explicit writing instruction for students with disabilities and English learners. Analysis of the writing quality scores indicated the use of explicit instruction with graphic organizers improves writing quality. This is in line with previous research that direct and explicit instruction is effective for students with disabilities and English learners (Antmann, Abbot, & Berninger, 2008; Ciullo, Falcomata, & Vaughn, 2015; Fien et al., 2015; Garza et al., 2017). A major difference was the focus of this study on expository paragraph writing. Future research should continue to explore explicit instruction with graphic organizers on expository paragraph writing instruction.

This research also extends Miller and Lignugaris-Kraft (2002). Their study focused on explicit instruction of expository paragraph component sentences and found similar positive
impacts on student writing quality. However, their small sample size was much smaller (n = 3) which limited their pre- and post-intervention analyses to descriptive statistics. This project had a larger number of participants and used null-hypothesis significance testing to determine a large effect size when comparing pre- to post-intervention writing quality measures.

**Graphic Organizers**

This project supports the findings of Evmenova et al. (2016) and Flanagan and Bouck (2015). Evmenova et al. (2016) found technology-based graphic organizers effective for improving expository paragraph writing. Flanagan and Bouck (2015) found that using graphic organizers improves writing skills regardless of the medium (i.e., pencil and paper or technology-based).

Bulgren et al. (2009) also found using graphic organizers can lead to improved expository writing quality. Their measures examined expository writing at the essay level, whereas this research narrowed the focus to the paragraph level. Relatively little writing intervention research addresses expository paragraph skills. Most studies either address narrative writing or expository writing at the sentence level or multi-paragraph level. Only three of the intervention studies found for this literature review targeted expository paragraph writing. Future research should focus on paragraph writing skills.

**Assessing Writing Quality**

The writing quality measurement tools were researcher-developed. The scoring process and interrater reliability checks exposed a need to improve the measurement tools for expository paragraph writing quality. The amount of scoring time was not measured, but scorers anecdotally reported spending between 2 and 10 minutes per paragraph. When considering the impact on teachers, the cumulative amount of time required to examine specific traits and characteristics of
each sentence type for an entire class may become a limiting factor.

Graham, Heber, Sandbank, and Harris (2016) found that to identify a valid and reliable measure of writing quality for a struggling writer, evaluators need to examine 11 writing samples from the student. The number required for validity, combined with the amount of time to grade each writing sample, is a time-consuming task for special education teachers. Future research should examine application of automated writing tools to provide qualitative analyses at the expository paragraph level.

**Impact of the Reverse Engineered Writing Intervention on Writing Quality of English Learners**

The quality and number of words written increased for English learners, but there was not a statistically significant difference between the intervention groups. There was a low effect size, but more than 80% probability of type II error. A larger sample size may find statistical significance.

Embedded academic vocabulary, by teaching students the definitions of sentence types included in an expository paragraph, in this intervention did not statistically improve achievement as Lara-Alecio et al. (2012) and Garza et al. (2017) have found. The writing quality scores of English learners did not exceed the quality scores of the intervention groups. However, the English learners had higher gains than their intervention group. This finding of higher gains for English learners compared to other members of the study is similar to the findings of Lara-Alecio et al. (2012) and Olson et al. (2015).

The greatest gains in quality scores for English learners occurred in the group that used the letter-labeled graphic organizer. The present study incorporated scaffolded, explicit instruction which have shown to increase English learner achievement (Garza et al., 2017; Lara-Alecio et
Olson et al. (2012; Olson et al., 2015) also concluded explicit instruction of writing strategies used by proficient students helps to close the achievement gap for English learners. The present study explicitly modeled the origin of effective writer’s sentence development. Using the letter-coded graphic organizer may explain the greater gains for English learners. Future research could further examine reverse engineering, with and without systematic labeling, applied to other tasks as an explicit modeling approach for English learners.

Total Number of Words

English learner’s total number of words written increased from pre- to post-intervention. For this subgroup, the largest gains in total number of words written occurred in group B, as predicted. This group used the graphic organizer with the letter labels. This supports the finding of Olson et al. (2015) that explicit, scaffolded instruction let to greater gains for English learners compared to students with English proficiency.

Relationship between Knowledge of Sentence Types and Writing Quality

Student understanding of the sentence types required in an expository paragraph increased, but there was not a statistically significant difference. This supports Sadler and Graham (2007) findings that sentence knowledge is predictive of writing quality for typical peers, but not for students with learning disabilities. Additionally, Sadler and Graham (2007) found students with high incidence disabilities required a greater number of instructional lessons to learn the writing knowledge content compared to typical peers. The two lessons in this intervention may not have been enough time for students to learn the sentence types. Extending the time of the study lends support to the teacher-identified weakness of the quick pace of this study. Future research could examine the appropriate dosage of knowledge instruction required for students with high incidence disabilities.
Limitations

1. There was a low rate of returned parental consent forms, which decreased the sample size. A larger sample size may have reached statistical significance.

2. Student engagement was not measured and anecdotally was low for group B. A behavior management mechanism may have changed the results.

3. The teacher in group A added a letter-labeling system to the non-labeled graphic organizer, which may have decreased the distinction between the treatment groups.

4. The intervention groups had an unequal number of class sessions each week due to the partial-block scheduling of treatment group A.

5. The teachers in the comparison group were licensed long-term guest teachers, not licensed special educators.

6. A large number of maintenance samples were not collected. Only 50% of participants had writing samples at all four collection points (i.e., pre, post, 2-weeks post, 4-weeks post).

Conclusions

This study took place in resource middle school English language arts classrooms in a large southwestern urban school district. Participants were middle school students with high incidence disabilities. The conclusions from this study are based on quantitative and anecdotal data from this population. Generalizations to other contexts should consider the limitations of this study.

1. While the writing quality of all students increased across time, the writing quality of students who used the graphic organizer without the letter code showed the greatest gains. Statistical analysis of these gains approached statistical significance, and post-intervention scores indicated a high effect size for the groups using the graphic organizers.
2. Although not statistically significant, the practical significance between the groups in this intervention indicate using a graphic organizer during the reverse engineering process is effective in increasing writing quality.

3. Due to threats to internal validity, it is difficult to conclude if the reverse engineering process or the graphic organizer contributed more to the improved writing quality.

4. Results of adding a letter code to the graphic organizer are inconclusive. English learners who used the letter code made greater gains than ELs who did not use the letter code. But the treatment group that did not use the letter code had the highest quality score.

5. Student scores on the writing knowledge assessment improved for the treatment groups, but decreased for the comparison groups. The differences between the groups were not statistically significant, but it appears that directly teaching sentence types does have an impact on learner knowledge of the components of an expository paragraph.

6. Results of the present study did not identify a relationship between knowledge of sentence types and student scores on a measure of writing quality.

7. The data indicate teachers see value in reverse engineering as an instructional sequence. It allows students to see a completed project and work backwards. Teachers believe the intervention is beneficial to their students.

8. Student perceptions of using the graphic organizer are mixed. Less than half believe their paragraphs are different because of the intervention, but nearly 70% state they will use this graphic organizer when writing paragraphs in the future.

9. Implementation fidelity did not reach 80% for group A. This teacher also added a component that mirrored the independent variable in group B.
Recommendations for Future Research

This study used reverse engineering with a graphic organizer to provide and explicit model of effective writing for students with high incidence disabilities and English learners. The following research could extend this line of inquiry:

1. A replication of the present study with a larger number of participants.
2. The present study should be replicated, with an increase of the number of lessons from 9 to 12 in order to allow for more student practice opportunities with the composition of a paragraph portion of the intervention.
3. Future studies should be implemented in inclusive classrooms, and include both students with and without disabilities. Results from typical peers could be compared to students with high incidence disabilities.
4. Future studies should embed reverse engineering as the modeling approach within a SRSD design and compare to an SRSD Model it step without reverse engineering.
5. Alternative forms of the labelling system could be expanded to include color highlighting or shapes other than bubbles (e.g. rectangles and triangles) that systematically align the sentences to the location on the graphic organizer. Researchers should compare using shapes, highlight colors, and letter codes on the effect of efficiency of reverse engineering instruction.
6. Reverse engineering should be applied to other paragraph types such as narrative or persuasive.
7. Teacher modeling could be studied as the independent variable in paragraph writing instruction where one group receives typical forward sequencing and another group receives reverse engineering.
Future research should compare reverse engineering without the use of a graphic organizer to reverse engineering with a graphic organizer.

Summary

Quality writing instruction is important for academic and employment outcomes, yet continues to be an area of low achievement (Bangert-Drowns et al., 2004; Bazerman, 2013; College Board, 2003; Connelley & Dockrell, 2016; Graham, 2006; Langer & Applebee, 2011). Students with high incidence disabilities and English learners, who require additional supports to gain content understanding, offer unique challenges to practitioners in search of strategies for improving written expression skills (Echevaria, & Graves, 2015; Graham et al., 2016; Graham, Harris, & McKeown, 2013; Graham & Perin, 2007a, 2007b).

Part of the instructional process includes providing direct and explicit models for students to observe (Archer & Hughes, 2011; Echevaria, & Graves, 2015). However, some processes are more difficult to articulate than others. In the case of writing, it is difficult to model how to develop a single-word idea into a complete sentence. By reversing this process, students can observe the outcome of the process. Adding working memory scaffolds, such as coded graphic organizers, may lay the groundwork of larger future studies.

This study contributes to the literature base by applying reverse engineering techniques to a novel situation. It appears to be the first study that applies reverse engineering to paragraph writing instruction. Although a statistical significance was not found between the intervention groups, there is practical significance. There was a large effect size in a relatively brief amount of time. Students with high incidence disabilities and English learners improved expository paragraph writing skills.

This study also adds to the literature regarding the time length of interventions. A large
effect was found in a brief amount of time for a population that typically takes twice as long as typical peers to achieve. Making large effect gains in a three-week intervention shows promise to the practice of reverse engineering with a graphic organizer. Further exploration is needed to make definitive conclusions. Moreover, this method provides teachers with an additional teaching tool to incorporate into their instructional practice.
Department of Educational and Clinical Studies, Special Education Program

TITLE OF STUDY: Backward & Forward Chaining Pre-Writing and Drafting Steps of the Writing Process for Students with Mild to Moderate Disabilities

INVESTIGATOR(S): Dr. Joseph Morgan and Ms. Kathy Ewoldt, M.Ed.
CONTACT PHONE NUMBER: 702-895-3329

Purpose of the Study
Your child is invited to participate in a research study. The purpose of this study is to examine a process for teaching students how to prewrite and draft a paragraph using a writing graphic organizer. This is a pilot study that will be used to develop a future, more comprehensive study of writing interventions.

Participants
Your child is being asked to participate in the study because he/she is an elementary student receiving special education services in a resource room at Crestwood Elementary School. If you and your child agree to participate, and if your child scores below the cut-off scores on the pre-tests, his/her data will be collected and analyzed as part of this study. If you or your child choose not to participate, he/she will still receive the instruction, but none of the assessments, data, and writing samples will be collected.

Procedures
If you allow your child to volunteer to participate in this study, the researchers will collect writing samples and writing quizzes your child will have completed as part of his/her writing instruction. Your student will also be asked to complete a 7-item survey about how he/she liked the writing intervention. We will also collect demographic information about your student (i.e., age, race, gender, disability category). All information, writing samples, and writing quizzes will be coded using a coded identification number. Your student’s results may be discussed with the resource room teacher. This discussion may benefit your child’s individualized education. Upon request, we will discuss your child’s results with you.

Benefits of Participation
There may not be direct benefits to your child as a participant in this study, although we anticipate that your child’s writing skills will improve as a result of this study. Additionally, we hope to learn the most strategic ways to implement high quality writing interventions to students with disabilities. Our ultimate goal is to improve their writing skills.
**Risks of Participation**

There are risks involved in all research studies. This study may include only minimal risks. The primary risk would be that their identity could be determined as a participant in this study. To protect against that, your child’s information will be coded using a secret ID number and all materials will be locked in an office at UNLV. Only the principal and student investigators will have access to individual data.

**Cost /Compensation**  
There will not be financial cost to you to participate in this study. The study will take approximately 15 minutes of your child’s time to complete the survey. It should be noted that all of this time will occur within the resource classroom at your child’s school during normal school days; no outside time commitment is required. Your child will not be compensated for their time.

**Contact Information**  
If you or your child have any questions or concerns about the study, you may contact Dr. Joseph Morgan, the principal investigator, at 702-895-3329. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office of Research Integrity – Human Subjects at 702-895-2794, toll free at 877-895-2794, or via email at IRB@unlv.edu.

**Voluntary Participation**  
Your child’s participation in this study is voluntary. Your child may refuse to participate in this study or in any part of this study. Your child may withdraw at any time without prejudice to your relations with the university. You or your child is encouraged to ask questions about this study at the beginning or any time during the research study.

**Confidentiality**  
All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link your child to this study. All records will be stored in a locked facility at UNLV for five years after completion of the study. After the storage time the information gathered will be shredded (for paper copies) or securely deleted (for digital copies).

**Participant Consent:**  
I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

---

Signature of Parent  
Child’s Name (Please print)

Parent Name (Please Print)  
Date
1. My name is Kathy Ewoldt.

2. We are asking you to take part in a research study because we are trying to learn more about how to teach writing to elementary students.

3. Your teacher will teach you about using a graphic organizer when you write a paragraph. The teacher will ask you to take a short test and to write a paragraph. The teacher will teach you the lessons for six weeks during the school day. At the end of the six weeks, you will take another short test and write another paragraph. If you agree to participate in the study, you will then be asked to fill out a 7-question survey about how you liked the lessons.

4. A possible risk of being in the study is that people outside the study could get your study information. We are going to lock your information in an office and on a computer that has a password to prevent that from happening. We also will assign each of you a secret ID so no one can tell the work you turn in is yours.

5. Being in the study will help the researchers learn about how students like you learn to write and learn to improve their writing skills.

6. Please talk this over with your parents before you decide whether or not to participate. We will also ask your parents to give their permission for you to take part in this study. But even if your parents say “yes” you can still decide not to do this.

7. If you don’t want to be in this study, you don’t have to participate. Remember, being in this study is up to you and no one will be upset if you don’t want to participate or even if you change your mind later and want to stop.

8. You can ask any questions that you have about the study. If you have a question later that you didn’t think of now, you can call me at 702-895-1075 or ask me next time. If I have not answered your questions or you do not feel comfortable talking to me about your question, you or your parent can call the UNLV Office of Research Integrity – Human Subjects at 702-895-2794 or toll free at 877-895-2794.

9. Signing your name at the bottom means that you agree to be in this study. You and your parents will be given a copy of this form after you have signed it.

_____________________________  _________________________
Print your name                                      Date
Circle one answer for each question.

1. How many sentence types should be included in a paragraph?
   a) Two: the topic sentence and the explanation sentence
   b) Four: The topic, detail, explanation, and conclusion sentences
   c) Five: The topic, detail, explanation, general, and conclusion sentences

2. Which of the following describes explanation sentences?
   a) Explanation sentences give information about the detail sentence.
   b) Explanation sentences are general sentences that do not include details.
   c) Explanation sentences wrap up the paragraph.

3. Which of the following describes the main idea of a paragraph?
   a) The main idea should be included in the topic sentence.
   b) The main idea can have more than one idea.
   c) The main idea should include details.

4. What is the purpose of a conclusion sentence?
   a) The conclusion sentence gives information about the detail sentence.
   b) The conclusion sentence tells the “What” information about the main idea.
   c) The conclusion sentence wraps up the paragraph.

5. Which of the following describes a detail sentence?
   a) A detail sentence should be included in the topic sentence.
   b) A detail sentence tells the “What” information about the main idea.
   c) A detail sentence wraps up the paragraph.

6. Which of the following describes a topic sentence?
   a) A topic sentence should include more than one idea.
   b) A topic sentence answers the “How” or “Why” of a detail sentence.
   c) A topic sentence lets the reader know what the paragraph will be about.
7. Which type of sentence explains the “What” of a main idea?
   a) Topic sentence  
   b) Conclusion sentence  
   c) Detail sentence

8. Which type of sentence is similar to the topic sentence?
   a) Topic sentence  
   b) Conclusion sentence  
   c) Detail sentence

9. Which two sentence types are broad and do not include specific information?
   a) Detail and topic sentences  
   b) Explanation and conclusion sentences  
   c) Topic and conclusion sentences
Use the sentences in the following paragraph to answer questions 10 – 13.

Dr. Martin Luther King, Jr. is an American hero. He was a good family man. He was married for 15 years and had four kids. He was brave. When black people were being treated badly, he stood up for them. He wasn’t worried that he might get hurt. He was also a smart man. He went to school and college for a long time. He also learned to become a church reverend. Dr. King will be remembered for a lot of years.

10. Which of the following is a detail sentence?
   a) He was married for 15 years and had four kids.
   b) He was also a smart man.
   c) Dr. King will be remembered for a lot of years.

11. Which of the following is the topic sentence?
   a) He was married for 15 years and had four kids.
   b) He was also a smart man.
   c) Dr. Martin Luther King, Jr. is an American hero.

12. Which of the following is an explanation sentence?
   a) He was married for 15 years and had four kids.
   b) He was also a smart man.
   c) Dr. King will be remembered for a lot of years.

13. Which of the following is the conclusion sentence?
   a) He was married for 15 years and had four kids.
   b) Dr. Martin Luther King, Jr. is an American hero.
   c) Dr. King will be remembered for a lot of years.
Answer Key:

1. B
2. A
3. A
4. C
5. B
6. C
7. C
8. B
9. C
10. B
11. C
12. A
13. C
APPENDIX D

PARAGRAPH QUALITY RUBRIC
<table>
<thead>
<tr>
<th>Topic Sentence</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contains one main idea.</td>
<td>Contains more than one idea.</td>
<td>Main idea is clear.</td>
<td></td>
</tr>
<tr>
<td>Main idea is somewhat clear.</td>
<td>Main idea is unclear.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main idea is somewhat broad.</td>
<td>Main idea is not broad.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paragraph contains three or more detail sentences.</td>
<td>Paragraph contains fewer than two detail sentences.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three detail sentences relate to the main idea.</td>
<td>Paragraph contains details unrelated to the main idea.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Each detail sentence has at least one explanation sentence.</td>
<td>Fewer than two detail sentences have at least one explanation sentence.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Each detail sentence has two or more explanation sentences</td>
<td>Some detail sentences have two or more explanation sentences.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Each explanation sentence relates to its detail sentence.</td>
<td>Few explanation sentences relate to their detail sentences.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conclusion is clear.</td>
<td>Conclusion is somewhat clear.</td>
<td>Conclusion is missing or is unclear.</td>
<td></td>
</tr>
<tr>
<td>Conclusion is somewhat broad.</td>
<td>Conclusion is not broad.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conclusion restates ideas of topic sentence.</td>
<td>Conclusion does not restate ideas of the topic sentence.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL SCORE: 22**
APPENDIX E

GROUP A FIDELITY CHECKLIST
<table>
<thead>
<tr>
<th>Description</th>
<th>Most of the time/Yes (3 Points)</th>
<th>Some of the time (2 Points)</th>
<th>Rarely (1 Point)</th>
<th>Not observed/No (0 Points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher follows correct order of lesson plans (e.g. teacher uses and analyzes sentences in model paragraph before students complete a graphic organizer).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses correct terminology when naming sentence types (i.e. topic, detail, explanation, conclusion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses term topic sentence more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses term detail sentence more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses term explanation sentence more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher describes topic sentence by its characteristics more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher describes detail sentence by its characteristics more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher describes explanation sentence by its characteristics more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher describes conclusion sentence by its characteristics more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL SCORE:**
<table>
<thead>
<tr>
<th>Description</th>
<th>Most of the time/Yes (3 Points)</th>
<th>Some of the time (2 Points)</th>
<th>Rarely (1 Point)</th>
<th>Not observed/No (0 Points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher follows correct order of lesson plans (e.g. teacher uses and analyzes model paragraph before students complete a graphic organizer).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses correct terminology when naming sentence types (i.e. topic, detail, explanation, conclusion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses term topic sentence more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses term detail sentence more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses term explanation sentence more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher describes topic sentence by its characteristic more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher describes detail sentence by its characteristic more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher describes explanation sentence by its characteristic more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher describes conclusion sentence by its characteristic more than one time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses the coding system on the model paragraph (e.g. letters)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher uses the same coding system on the model paragraph and graphic organizer (e.g. none, colors, letters)*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL SCORE:**

*If graphic organizers are not used, please write n/a and compute score out of 30.
APPENDIX G

WRITING PROMPTS
<table>
<thead>
<tr>
<th>Purpose</th>
<th>When</th>
<th>Prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-intervention assessment</td>
<td>Lesson 1</td>
<td>When you go home, you have many activities you can do. What is your favorite activity outside of school? Write a paragraph telling why this activity is your favorite (6.0).</td>
</tr>
<tr>
<td>You-do practice paragraph</td>
<td>Lesson 8 &amp;</td>
<td>Each classroom in a school has different ways of doing things. If a new student came into your classroom today, what would be important for this new student to know? Write a paragraph telling the new student important things to know about your classroom (6.2).</td>
</tr>
<tr>
<td></td>
<td>Lesson 9</td>
<td></td>
</tr>
<tr>
<td>Post-intervention assessment</td>
<td>Lesson 12</td>
<td>We have all had great teachers who have impacted our lives in a special way. Who is your favorite teacher? Write a paragraph explaining why this teacher is so special (5.2).</td>
</tr>
<tr>
<td>2-week maintenance probe</td>
<td>2-weeks post-</td>
<td>Listening to music can make people happy. What is your favorite kind of music? Write a paragraph describing why this kind of music is your favorite (5.9).</td>
</tr>
</tbody>
</table>
Social media are used by students every day, but many adults do not understand how it works. What type of social media do you use most often? Write a paragraph describing your chosen social media (8.4).

Note. *Flesch-Kincaid grade level.*
**TEACHER SURVEY**

<table>
<thead>
<tr>
<th>Statement</th>
<th>Agree (2)</th>
<th>Neutral (1)</th>
<th>Disagree (0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>My student’s paragraph writing skills improved as a result of this intervention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This intervention is useful in my classroom.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This intervention is effective for my students.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will use this intervention again.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The lesson plans for this intervention are clear.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation is easy in my classroom.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This intervention is appropriate for my students.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will recommend this intervention to my colleagues</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional comments:**
APPENDIX I TEACHER INTERVIEW
Teacher Interview

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>What were the strengths of this intervention?</td>
<td></td>
</tr>
<tr>
<td>What were the weaknesses of this intervention?</td>
<td></td>
</tr>
<tr>
<td>If you could have changed anything about the intervention, what would you change and why?</td>
<td></td>
</tr>
<tr>
<td>If you could have changed anything about instruction of the intervention, what would you change and why?</td>
<td></td>
</tr>
<tr>
<td>How has teaching the intervention affected your writing instruction? Has teaching the intervention affected your instruction of any other content? If so, what have been the effects?</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX J

STUDENT SURVEY
<table>
<thead>
<tr>
<th>Statement</th>
<th>Yes (2)</th>
<th>Kind of (1)</th>
<th>No (0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I liked learning to write paragraphs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My paragraphs are different now that I have learned the types of sentences and the graphic organizer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know the different types of sentences in a paragraph.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I understand how to use the graphic organizer.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have used this graphic organizer for other paragraphs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I will use this graphic organizer for other paragraphs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there anything you want the researchers to know?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX K

MODEL PARAGRAPHS
Paragraph A

The features of a road bike are designed for speed. Road bikes have thin tires. The thin tires cause less friction with the road. Thin tires help rider to get more speed than they could with thick tires. The handle bars on road bikes are called drop bars. They have a C-shape where the rider can place his hands. With hands in this “drop” position of the handle bar, the rider is faster. The frame of a road bike narrow and light-weight. This type of frame causes less friction with the wind so the bike can travel quicker. Road bikes are made to move quickly.

Paragraph B

Mountain bikes are made to ride on rugged trails. They have fat, knobby tires. These tires make more contact with the trail. The rider has more stability on the fat tires. The handle bars are straight and level. The rider sits upright because his hands are on a straight handlebar. The rider doesn’t wobble as much when using a straight handlebar. The frame of a mountain bike is made to help the rider. The frame is sturdy so it won’t break in the rocks. It is built so the rider is sitting straighter and doesn’t fall. Mountain bikes are designed for off-road rides.
APPENDIX L

NON-LABELED GRAPHIC ORANIZER
Diagram with text:
- What
- How/Why

Diagram structure:
- Top level: What
- First level: How/Why
- Second level: How/Why
- Third level: How/Why
- Fourth level: How/Why
APPENDIX M

LETTER-LABELED GRAPHIC ORANIZER
<table>
<thead>
<tr>
<th>Lesson Number</th>
<th>Overview</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre assessments:</td>
</tr>
<tr>
<td></td>
<td>• Knowledge (Multiple Choice)</td>
</tr>
<tr>
<td></td>
<td>• Writing Sample</td>
</tr>
<tr>
<td>2</td>
<td>Two-Column notes to learn 4 sentence types by characteristics</td>
</tr>
<tr>
<td>3</td>
<td>Make flashcards to practice 4 sentence types by characteristics</td>
</tr>
<tr>
<td>4</td>
<td>Teacher models identifying each sentence in paragraph A according to its characteristics and models reverse draft to prewrite sequence by writing main idea of each sentence into associated bubble on graphic organizer (part 1).</td>
</tr>
<tr>
<td>5</td>
<td>Teacher models identifying each sentence in paragraph A according to its characteristics and models reverse draft to prewrite sequence by writing main idea of each sentence into associated bubble on graphic organizer (part 2).</td>
</tr>
<tr>
<td>6</td>
<td>Mid-intervention knowledge assessment (Multiple Choice)</td>
</tr>
<tr>
<td>7</td>
<td>Students practice identifying each sentence in paragraph B according to its characteristics and reverses draft to prewrite sequence by writing main idea of each sentence into associated bubble on graphic organizer (part 1)</td>
</tr>
<tr>
<td>8</td>
<td>Students practice identifying each sentence in paragraph B according to its characteristics reverse draft to prewrite sequence by writing main idea of each sentence into associated bubble on graphic organizer (part 2)</td>
</tr>
<tr>
<td>9</td>
<td>Using practice writing prompt, students brainstorm ideas, and organize ideas into bubbles on graphic organizer</td>
</tr>
<tr>
<td>10</td>
<td>Students draft paragraph from graphic organizer (part 1)</td>
</tr>
<tr>
<td>11</td>
<td>Students complete draft paragraph from graphic organizer (part 2)</td>
</tr>
<tr>
<td>12</td>
<td>Post intervention assessments:</td>
</tr>
<tr>
<td></td>
<td>• Knowledge (Multiple Choice)</td>
</tr>
<tr>
<td></td>
<td>• Writing sample</td>
</tr>
</tbody>
</table>
APPENDIX O

SAMPLE LESSON PLAN
# Lesson 3

**Objective:** Students will make flashcards and practice sentence types and characteristics

**Student-Friendly Objective:** I can make flashcards to learn sentence types.

<table>
<thead>
<tr>
<th>Materials</th>
<th>Teacher Action</th>
<th>Student Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 X 5 index cards (4/student)</td>
<td>Introduce lesson: Tell student they will use the information from the Sentence Characteristics table to make flashcards. Tell students these terms will be used often in the upcoming lessons.</td>
<td></td>
</tr>
<tr>
<td>Copy of Sentence Characteristics Table (1/student)</td>
<td>Model making a flashcard with the words <em>topic sentence</em> on one side, and the characteristics of a topic sentence on the opposite side of the flashcard. (Students should copy characteristics word for word onto their flashcards).</td>
<td>Make topic sentence flashcard</td>
</tr>
<tr>
<td></td>
<td>Model making a flashcard with the words <em>detail sentence</em> on one side, and the characteristics of a detail sentence on the opposite side of the flashcard.</td>
<td>Make detail sentence flashcard</td>
</tr>
<tr>
<td></td>
<td>Model making a flashcard with the words <em>explanation sentence</em> on one side, and the characteristics of an explanation sentence on the opposite side of the flashcard.</td>
<td>Make explanation sentence flashcard</td>
</tr>
<tr>
<td>characteristics of an explanation sentence on the opposite side of the flashcard.</td>
<td>Make conclusion sentence flashcard</td>
<td></td>
</tr>
<tr>
<td>Model making a flashcard with the words <em>conclusion sentence</em> on one side, and the characteristics of a conclusion sentence on the opposite side of the flashcard.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instruct students to practice reading word on one side and characteristics on the other side.</td>
<td>Students practice with flashcards</td>
<td></td>
</tr>
<tr>
<td>Closure: How many sentences are in an expository paragraph? What are the four kinds of sentences?</td>
<td>4 Topic, detail, explanation, and conclusion</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>Time</td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Pretest-posttest</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Non-equivalent groups</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Quasi-experiment</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td></td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES


Berkeley, S., Mastropieri, M.A., & Scruggs, T. E., (2011). Reading comprehension strategy instruction and attribution retraining for secondary students with learning and other mild


National Commission on Writing: For America’s Families, Schools, and Colleges.

Retrieved from


Ennis, R. P. & Jolivette, K. (2014). Using self-regulated strategy development for persuasive writing to increase the writing and self-efficacy skills of students with emotional and


Next generation science standards: For states, by states. Retrieved from
http://www.nextgenscience.org/next-generation-science-standards

and its relation to outcomes in K-12 curriculum intervention research. Review of
Educational Research, 78, 33–84.

on Exceptional Children, 43(4), 1–27.

achievement gaps in academic writing for Latinos and English learners in grades 7–12.
Journal of Educational Psychology, 109, 1–21.

R.E. Mayer (Ed.), The Cambridge handbook of multimedia learning (pp. 27–42).

In C. A. MacArthur, S. Graham & J. Fitzgerald (Eds.), Handbook of writing research (pp.

Pearson-Student-Mobile-Device-Survey-Grades-4-12.pdf

Prawat, R. S. (1989). Promoting access to knowledge, strategy, and disposition in students: A

Rijlaarsdam, G., Van den Bergh, H., Couzijn, M., Janssen, T., Braaksma, M., Tillema, M., &
Raedts, M. (2012). Writing. In K. Harris, S. Graham, & T. Urdan (Eds.), APA educational


188
Retrieved from https://www2.census.gov/geo/pdfs/reference/fedreg/fedregv76n164.pdf

assessment of educational progress at grades 8 and 12 (NCEE 2012-470). Retrieved 

Without Random Assignment. Retrieved from https://education.ufl.edu/educational-
research/files/2015/04/qed_presentation_slides_030315.pdf

U.S. Department of Education, Office of Elementary and Secondary Education. (2016). Non-
regulatory guidance: English learners and title III of the Elementary and Secondary 
Education Act (ESEA), as amended by the Every Student Succeeds Act (ESSA). 
Retrieved from 

U.S. Department of Education, National Center for Education Statistics. (2017). Table 240.40: 
Children 3 to 21 years old served under Individuals with Disabilities Education Act 
Department of Education, National Center for Education Statistics (Ed.), Digest of 
d17/tables/dt17_204.40.asp?current=yes

Vanderberg, R., & Swanson, H. L. (2007). Which components of working memory are important 
in the writing process? Reading & Writing, 20, 721–752. doi: 10.1007/s11145-006-9046-
6


CURRICULUM VITAE

KATHY BURNS EWOLDT
University of Nevada Las Vegas (UNLV)
Department of Educational and Clinical Studies
ewoldtk@gmail.com

GRADUATE EDUCATION
Doctor of Philosophy, Special Education, University of Nevada Las Vegas, (projected) 2018
Master of Education, Special Education, University of Nevada Las Vegas, 2011

UNDERGRADUATE EDUCATION
Bachelor of Science, Human Resources/Management, Park University, 2001
Associate of General Studies, Pikes Peak Community College, 1993
Associate of Applied Science in Avionics Technology, Community College of the Air Force (42 Credits)

PROFESSIONAL EXPERIENCE
Intervention in School & Clinic (2017-Present)
   Editorial Assistant

University of Nevada Las Vegas (2015-Present)
   Graduate Assistant (Teaching & Research)

Office of Special Education Program Leadership Scholar, College and University Leaders
   Trained to Understand and Respond to Exceptionalities and Diversity. Project CULTURED (H325D140035) 325D OSEP Leadership Grant (2015-Present)

   Special Education Teacher & Department Chair
   English Resource & Co-Teach

Canarelli Middle School (2010-2013)
   Special Education Teacher
   Intensive Interventions (Resource room): English Language Arts 6, Math 6
   Co-Teach: English 6-8, Reading 6, Math 6-7, US History 7, Science 7
   Resource: English 8

Durango High School (2007-2009)
   AVID Tutor

PUBLICATIONS


MANUSCRIPTS UNDER REVIEW


Ewoldt, K. B. Four Ways to Foster Your Academic Writing Skills. The Luminary.


GRANTS FUNDED

UNLV Graduate & Professional Student Association: Student Travel Funding. Las Vegas, NV (2017, Summer $500).

Student Academic Affairs: Registered Student Organization. UNLV Department of Equity & Diversity. Las Vegas, NV. (2016, Fall $500).

GRANTS WRITTEN

Increasing academic achievement for middle school students with mild to moderate disabilities: Project SMART (Stress Management & Reduction Team). Las Vegas, NV: The University of Nevada, Las Vegas. (2016, Fall).

REFEREED CONFERENCE PRESENTATIONS


**INVITED PRESENTATIONS AND CONFERENCES**


**RESEARCH**

A Multi-Site Randomized Controlled Trial to Assess the Efficacy of the NumberShire Level 1 Gaming Intervention for Improving Math Outcomes for Students with or At-Risk for Math Learning Disabilities: Data collection team (2017, Spring). Clark County School District, Las Vegas, NV.


Blended English Language Learner Project, Teacher Perceptions of Planning for Blended Learning: Survey development team (2015, Fall). UNLV Las Vegas, NV.

**ONLINE TEACHING**
University of Nevada, Las Vegas
ESP 730 *Parent Involvement in Special and General Education* (Summer 2016)

University of Nevada, Las Vegas
ESP 701 *Introduction to Special Education and Legal Issues* (Spring 2015)

University of Nevada, Las Vegas
EDSP 432 *Serving Individuals with Disabilities and Their Families* (Fall 2015, Spring 2017)

**FACE-TO-FACE TEACHING**
University of Nevada, Las Vegas
EDSP 423 *Collaboration and Consultation in Special Education*
(Fall 2017)
University of Nevada, Las Vegas
EDSP 461 Oral and Written Language Instruction for Students with Disabilities (Fall 2017)

University of Nevada, Las Vegas
EDSP 451 Assessment of Diverse Learners with Disabilities in Inclusive Settings (Spring 2016, Spring 2017, Spring 2018)

University of Nevada, Las Vegas
ESP 719 Advanced Oral and Written Language for Students with Disabilities (Spring 2015, Spring 2016)

University of Nevada, Las Vegas
ESP 709 Diagnostic and Prescriptive Assessment for Diverse Learners (Summer, Fall 2015)

TRAINING/PROFESSIONAL DEVELOPMENT


AWARDS
Council for Exceptional Children Division of Research Doctoral Student Scholars (2017-2018)
Association of Teacher Educators Clinical Practice Fellow (2018)
UNLV Graduate & Professional Student Association travel grant (2017)
Education & Clinical Studies travel grant (2016)
Airman of the Year (1990)
Maintenance Professional of the Year (1989)

PROFESSIONAL AFFILIATIONS
Council for Exceptional Children
Council for Children with Learning Disabilities
Phi Kappa Phi Honor Society
Textbook & Academic Authors Association

SERVICE
Fostering Hope Las Vegas (2017)
UNLV AskMe! Volunteer (2017)
American Association of Colleges for Teacher Education Conference proposal reviewer (2017)
Journal of Special Education and Technology Guest reviewer (2017)
Dissertation reliability rater (2017)
UNLV Student Academic Authors Founder & Past-President (2015-Present)
UNLV Nevada Education Summit 2016
Department of Educational & Clinical Studies Doctoral Development Committee (2016-2017)
Department of Educational & Clinical Studies Doctoral Recruitment Committee (2015-2016)
UNLV Graduate College Recruitment (2016)
Intervention in School & Clinic Guest reviewer (2016)
Council for Learning Disabilities Conference Local Arrangements Committee (2015)
LD Forum Guest reviewer (2015)
Crestwood Elementary School School Improvement Committee 2016-2017
Desert Oasis High School School Improvement Committee 2012-2014
Guide Dogs for the Blind Puppy Sitter 2016-Present

CERTIFICATIONS
IES Group Designs Standards
Online Teaching
Teacher Leadership Advanced Studies
Nevada Special Education K-12 Generalist license #87215
Highly Qualified 6-8 Special Education Math
Advancement Via Individual Determination (AVID) Certified Tutor

AREAS OF RESEARCH AND PROFESSIONAL INTEREST
Improving writing skills for students with high-incidence disabilities
Culturally and linguistically diverse students with disabilities in urban environments
Online education and instructional technology for K-12 students with high-incidence disabilities
Special education teacher development and retention.