

IMPROVING THE COMPREHENSION OF STUDENTS WITH SIGNIFICANT
DEVELOPMENTAL DISABILITIES: SYSTEMATIC INSTRUCTION ON THE
STEPS FOR COMPLETING AND USING A GRAPHIC ORGANIZER

by

Alexander P. Britt
A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
Doctor of Philosophy
Education

Committee:

_____ Chair

_____ Program Director

_____ Dean, College of Education
and Human Development

Date: _____ Fall Semester 2015
George Mason University
Fairfax, VA

Improving the Comprehension of Students with Significant Developmental Disabilities:
Systematic Instruction on the Steps for Completing and Using a Graphic Organizer

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

by

Alexander P. Britt
Master of Education
George Mason University, 2012
Bachelor of Business Administration
Belmont University, 2007

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

Fall Semester 2015
George Mason University
Fairfax, VA



THIS WORK IS LICENSED UNDER A [CREATIVE COMMONS
ATTRIBUTION-NONCOMMERCIAL 3.0 UNPORTED LICENSE](https://creativecommons.org/licenses/by-nc/3.0/).

Dedication

I dedicate this dissertation to my amazing family: To my brothers who have always been my number one fans, my parents who instilled in me an inclination to always pursue my life's dreams, and my grandparents who have always told me to trust my faith and believe anything is possible.

Acknowledgements

First, I would like to thank my committee members, Drs. Anna Evmenova, Maureen Schepis, and Michael Behrmann, for their guidance, patience, and insights as I completed my coursework and dissertation study. Their unwavering individual and collective supports were invaluable and allowed me to persevere throughout this entire process. I am grateful to have had such inspiring thinkers as role models.

Next, I would like to thank Dr. Tracie-Lynn Zakas for giving me permission to use the informational texts and instructional scripts from her doctoral study as part of the foundation of this dissertation study. Dr. Zakas' willingness to share materials from her study allowed me to conceptualize my project into a manageable dissertation study.

Last, I would like to thank the special education director, teacher, and students who participated in this study for their dedication. Their enthusiasm to be involved was an inspiration for me to continue to work to identify effective strategies to offer a full and high-quality education to students with significant developmental disabilities.

Table of Contents

	Page
List of Tables	ix
List of Figures	x
List of Abbreviations	xi
Abstract	xii
Chapter One	1
Background of the Problem.....	2
Statement of the Problem	8
Academic Instruction for Students with Significant Developmental Disabilities.....	9
Extending Previous Research.....	14
Significance of the Current Study	16
Purpose Statement and Research Questions.....	19
Definitions of Terms	20
Chapter Two.....	23
Evidence of Success in Reading Instruction for Students with Significant Developmental Disabilities	24
Summary of evidence.	29
Effective Components of Comprehension Instruction.....	30
Summary of effective components.	34
Systematic Instruction and Text-Based Comprehension	35
Literature search procedures.....	40
Direct instruction: Vocabulary and concept comprehension training.	43
System of least prompts: Passage comprehension training.	52
Summary of systematic instruction.	81
Use of Graphic Organizers to Support Academic Instruction.....	86
Evidence of success.	89
Summary of findings on graphic organizers.....	100

Summary of Literature	104
Chapter Three.....	110
Permission to Conduct Research.....	110
Institutional Review Board Approval	110
Participants	111
Jen.....	112
Mary.....	113
Cathy.....	115
Tony.....	116
Setting.....	117
Research Design.....	119
Single-subject design standards.....	120
Materials.....	121
Informational texts.....	121
Comprehension questions.....	125
Computer-based graphic organizer.....	126
Read: OutLoud 6.	127
Hardware.	127
Story-grammar concepts training materials.....	127
Generalization informational texts.	130
Dependent Variables	132
Task completion	132
Total independent story-statements.....	136
Total guided story-statements.....	142
Independent Variable	149
Direct instruction on the story-grammar concepts	149
Guided practice on the steps for completing the CBGO.	150
Guided practice on the steps for using the CBGO.....	151
Independent practice with feedback.	152
Data Collection Procedures.....	153
Introduction to the Read: OutLoud 6 software.....	154
Baseline phase.	155

Preintervention training and independent practice with feedback phase.	158
CBGO use phase.....	174
Generalization phase.....	175
Reliability, Fidelity, and Social Validity.....	175
Interobserver reliability.	176
Procedural reliability.	178
Social validity.	179
Data Analysis	181
Visual analysis.	182
Descriptive analyses.	185
Summary	185
Chapter Four	186
Task Completion	186
Jen.....	189
Mary.....	189
Cathy.....	190
Tony.....	191
Total Independent Story-Statements	191
Jen.....	195
Mary.....	195
Cathy.....	196
Tony.....	197
Total Guided Story-Statements	197
Jen.....	200
Mary.....	201
Cathy.....	203
Tony.....	205
Social Validity.....	222
Participant feedback.	222
Teacher feedback.....	223
Chapter Five.....	224
Summary of Findings	225

Discussion	226
Task completion.	226
Total independent story-statements.	231
Total guided story-statements.....	233
Social validity.	241
Recommendations and Implications for Practice.....	242
Limitations	247
Suggestions for Future Research.....	249
Summary	252
Appendix A.....	254
Appendix B	258
Appendix C	259
Appendix D.....	260
References.....	262

List of Tables

Table	Page
<i>Table 1.</i> Participant Demographic Information	112
<i>Table 2.</i> Story-Grammar Concepts and Definitions	123
<i>Table 3.</i> Comprehension Questions Used During Guided Comprehension Probes.....	126
<i>Table 4.</i> Participant Questionnaire.....	180
<i>Table 5.</i> Teacher Questionnaire	181
<i>Table 6.</i> Jen's Guided Story-Statements Accuracy.....	201
<i>Table 7.</i> Mary's Guided Story-Statements Accuracy	203
<i>Table 8.</i> Cathy's Guided Story-Statements Accuracy	205
<i>Table 9.</i> Tony's Guided Story-Statements Accuracy	208
<i>Table 10.</i> Jen's Guided Story-Statements with Materials Displayed Accuracy	213
<i>Table 11.</i> Mary's Guided Story-Statements with Materials Displayed Accuracy.....	215
<i>Table 12.</i> Cathy's Guided Story-Statements with Materials Displayed Accuracy	217
<i>Table 13.</i> Tony's Guided Story-Statements with Materials Displayed Accuracy	219

List of Figures

Figure	Page
<i>Figure 1.</i> Task completion.....	188
<i>Figure 2.</i> Total independent story-statements..	194
<i>Figure 3.</i> Total guided story-statements.....	199
<i>Figure 4.</i> Total guided story-statements with materials displayed.....	210
<i>Figure 5.</i> Total guided story-statements without and with materials displayed.....	221

List of Abbreviations

Alternate Assessments based on Alternate Achievement Standards	AA-AAS
Autism Spectrum Disorders.....	ASD
Computer-Based Graphic Organizer.....	CBGO
Intellectual Disabilities	ID
Significant Developmental Disabilities	SDD

Abstract

IMPROVING THE COMPREHENSION OF STUDENTS WITH SIGNIFICANT DEVELOPMENTAL DISABILITIES: SYSTEMATIC INSTRUCTION ON THE STEPS FOR COMPLETING AND USING A GRAPHIC ORGANIZER

Alexander P. Britt, Ph.D.

George Mason University, 2015

Dissertation Director: Dr. Anya Evmenova

A single-subject, multiple-baseline across participants design was used to examine the functional relation between systematic instruction and the ability to complete a graphic organizer and recall facts about informational texts by students with significant development disabilities. Four high school students enrolled in an adapted academic program for individuals with intellectual disabilities participated in this study. Systematic instruction procedures included four separate trainings: (a) direct instruction on seven story-grammar concepts for social studies content, (b) guided practice on the steps for completing the graphic organizer using a modified system of least prompts, (c) guided practice on the steps for using the graphic organizer to answer comprehension questions using verbal and verbal-gestural prompts, and (d) independent practice with feedback using verbal and verbal-gestural prompts. Data were collected on three dependent variables: (a) task completion; (b) total independent story-statements; and (c) total guided

story-statements, with and without materials displayed. The results of this study demonstrated strong evidence of a functional relation between systematic instruction and students' performances on the task completion and total guided story-statements, with and without materials displayed, measures. However, there was no evidence of a function relation between systematic instruction and total independent story-statements. Data collected in the generalization indicated all four students continued to perform at or near the improved level on the task completion and total guided story-statements measures after accessing texts that followed novel structures. Therefore, the findings of the current study suggest students with significant developmental disabilities were able to complete the graphic organizer in order to summarize an informational text. These results also indicate these same students were able to answer questions about texts with and without materials displayed after completing the graphic organizer. Study practical implications, limitations, and directions for future research are discussed.

Chapter One

Every student has the right to receive a high-quality and challenging education. School systems are required to include students in one of their respective states' accountability programs in order to demonstrate their students' progress in academic learning. *Students with significant developmental disabilities* are individuals who participate in states' accountability programs through alternate assessments based on alternate achievement standards (AA-AAS). These students qualify to participate in an AA-AAS because they receive services for a disability identified in the Individuals with Disabilities Education Act (IDEA, 2004) and demonstrate a cognitive impairment that prevents them from meeting grade-level achievement standards, even with accommodations and modifications (Kearns, Towles-Reeves, Kleinert, Kleinert, & Thomas, 2011). The term *significant developmental disability* is not synonymous with an intellectual disability. In fact, students assigned to AA-AAS are reported to include individuals who received special education services across IDEA categories; however, these students are typically reported to consist of individuals with a "moderate and severe intellectual disability..., as well as autism, multiple disabilities, and deaf-blindness but not all of any of these categories" (Kearns et al., 2010, p. 5). In a 2011 survey study, the majority of students participating in AA-AAS were described as symbolic language learners (Kearns et al.). These students used verbal or written words, Braille, signs, or

augmentative/alternative communication systems to participate in activities. A smaller percentage of students participating in AA-AAS were reported to use nonstandardized modes of communication, such as the use of body gestures. Additionally, the majority of these students were also described as having the ability to follow one- to two-step written directions with and without additional cues. In terms of these students' reading abilities, most were reported to demonstrate rudimentary literacy skills that were limited to reading sight words or bullets with little fluency and very basic understanding (Kearns et al., 2011).

Background of the Problem

The debate on what constitutes an appropriate education for students with significant developmental disabilities has existed for more than three decades. Initiated by the Education for All Handicapped Children Act (EAHCA) of 1975, the federal government determined a quality education was linked to physical access as all students with disabilities, for the first time, were given the right to receive a free and appropriate public education (FAPE). This mandate challenged many educators who firmly believed education for students with the most significant disabilities was a privilege rather than a right. It was estimated that just 20% of students with disabilities were receiving educational services in the early 1970s (Yell, Drasgow, Bradley, & Justesen, 2004). While this landmark legislation opened the door to millions of new students, it left the responsibility for defining what constitutes an appropriate education for students with disabilities to state and local school systems. In effect the implications of having access to programs for these students remained an empirical question (Yell et al., 2004).

Subsequent to the enactment of EAHCA (1975), educational programs were created for students with significant developmental disabilities throughout the country. Many of the earliest programs served these students in separate schools and self-contained classrooms within larger general education settings (Brown et al., 2004). The curricular focus of most of these early programs serving students with significant developmental disabilities followed a developmental model. Educators first assessed these students' mental ages and then designed programs that aligned with existing infant and early childhood curricula (Browder et al., 2003). While widely used at the time, growing criticism began to emerge questioning the relevance of a developmental-based program for older students with significant developmental disabilities. Perhaps most influential were those voiced by Lou Brown and colleagues who favored an approach they called "the criterion of ultimate functioning" (as cited in Browder & Spooner, 2006, p. 6).

Brown et al. (1979) proposed a functional curricular model that taught age-appropriate, daily life skills that were necessary to access current and future environments. The researchers' model emphasized instruction across four domains: (a) recreational, (b) vocational training, (c) domestic, and (d) community (as described in Browder & Spooner, 2006). A review of curricular trends from 1976 to 1995 by Nietupski, Hamre-Nietupski, Curtain, and Shrikanth (1997) revealed there was agreement and acceptance for the alternate curricular model in the literature. Most of the reviewed studies provided instruction on functional life skills ($n = 345$). Less than 10% of the reviewed articles in Nietupski et al. (1997) offered academic instruction ($n = 71$). A

review by Snell (1997) further validated the use of the functional model, identifying 123 empirical studies that demonstrated the successful acquisition of daily life skills with this student population. Therefore, the new conception of an appropriate education for students with significant developmental disabilities appeared to emphasize functional life skills instruction.

The mid-1980s and 1990s also brought to the forefront a greater inclination for educational programs to provide learning opportunities to students with significant developmental disabilities in inclusive environments (Browder et al., 2003). Such opportunities included socially interacting with their nondisabled peers, practicing functional skills, and developing the skills necessary to engage with others in natural environments (e.g., communication skills). While it is possible many students with significant developmental disabilities had increased exposure to academic content, it was rarely believed to be the primary purpose (Browder, Spooner, Wakeman, Trela, & Baker, 2006). The value of inclusion was seen in the relationships built between students with and without disabilities. Teachers agreed engagement in social activities at school contributed to the emotional development for all students (Carter, 2011; Jorgensen, Fischer-Mueller, & Prud'homme, 2014) and was key to learning how to be competent members in their communities (Browder et al., 2003; Jorgensen et al., 2014). Thus, there appeared to be a consensus that an appropriate education for students with significant developmental disabilities followed a functional curricular model with an additive social inclusion component.

However, there was still a need for educators to go beyond efforts of promoting social interaction if students with significant developmental disabilities were to receive a full educational opportunity. Teachers needed to do more than simply place students with significant developmental disabilities in general settings. Instead, teachers needed to actively engage students with significant developmental disabilities in instructional activities. Such sentiments were expressed in a 1997 Senate Report, which concluded the intended promise of the EACHA (1975) had not been fulfilled for all students (as cited in Yell et al., 2004). It was acknowledged that while the legislation undoubtedly promoted access to educational programs, greater emphases on learning was needed in order to raise educational opportunity (Yell et al., 2004).

The 1997 amendment to the EAHCA act, which was renamed the IDEA, provided that necessary emphasis on educational learning (Wehmeyer, 2006). It was no longer a preference, but a presumption that all students, including those with disabilities, received a general curriculum-based education in inclusive settings. Students with significant developmental disabilities were also expected to be included in state- and district-wide assessments. Therefore, the 1997 reauthorization of IDEA unequivocally heightened the demands placed on education systems. No longer were states and local school districts expected to merely comply with access mandates. They were now held accountable for student learning (Hardman & Nagle, 2004). Educational systems were directed to develop AA-AAS for the students with the significant developmental disabilities who had been historically excluded from general assessments. Guidelines for creating and administering AA-AAS were later outlined in the No Child Left Behind Act (NCLB) of

2001 and the 2004 reauthorization of IDEA. The AA-AAS were to (a) be appropriate for only the estimated 1% of students with the most significant intellectual disabilities within a single state, (b) align with the state's general curriculum standards across content areas, (c) promote access to the grade-level general curriculum, and (d) uphold challenging academic expectations to greatest extent possible. Moreover, students' performances on AA-AAS had to be included in annual yearly progress reports (Browder, Spooner, et al., 2006).

The present conception of an appropriate education for students with significant developmental disabilities is defined by its procedures. Above all, these educational programs are individualized and designed by Individualized Education Plan teams with the distinct purpose of meeting the unique needs of the students. But educational programs must also include opportunities to access and learn the general curriculum to the greatest extent possible. A model for creating access for these students includes: (a) providing access to general settings, (b) offering challenging instruction in general curriculum content, and (c) demonstrating student learning in state AA-AAS.

The current demand for teachers of students with significant developmental disabilities to balance standards-based curricula with functional skills curricula has met two primary barriers. One persistent barrier is skepticism over the benefit of learning grade-level academic content (Ryndak et al., 2014). A second persistent barrier is a misperception that standards-based curricula and functional skills curricula are incompatible (Ryndak et al., 2014). For example, Ayres, Lowrey, Douglas, and Sievers (2011, 2012) argued students with significant developmental disabilities gain few, if any,

meaningful benefits from learning grade-level standards. The authors continued that the mandates require educators to abandon instruction on important functional skills that would positively affect these students' level of independence in their current and future environments. Others have countered such skepticisms by pointing out educational programs that offer standards-based instruction do not need to exclude instruction on important functional skills (e.g., Courtade, Spooner, Browder, & Jimenez, 2012; Creech-Galloway, Collins, Knight, & Bausch, 2013). Creech-Galloway et al. (2013) described two effective methods to offer academic instruction that is personally relevant to students with significant developmental disabilities. The first method is for teachers to identify functional applications related to the academic content. The second is for teachers to use academic content while providing instruction on functional skills.

The ability to read is an important academic and life skill. Access to academic learning opportunities for students with significant developmental disabilities is dependent on the ability to comprehend vocabulary and connected texts. Experts have argued the ability to comprehend information is one of the most important skills any student can learn (Mastropieri & Scruggs, 1997) and is vital to the overall learning process (Hudson & Browder, 2014). The need for students to be able to read and comprehend information is particularly necessary as they advance into secondary grade levels. Across content areas, the majority of instructional time in high school classrooms involves students reading textbooks (Berkeley & Riccomini, 2013). As students advance from elementary into high school grade levels, reading expectations shift from *learning to read* to *reading to learn* (Gajria, Jitendra, Sood, & Sacks, 2007). Additionally, the

ability to read promotes a student's quality of life. Downing (2005) explained the ability to read might increase one's self-esteem and open the door to a world full of opportunities. Learning to read may allow these students to have some control over their interactions with the environment. A student who is literate is able to commute around his or her community with greater independence. Students may find newly acquired reading skills allow them to engage in leisure materials and communicate with others more effectively. Thus, literacy skills are argued to increase students' with significant developmental disabilities abilities to complete daily living, vocational, leisure, and social skills with greater independence (Morgan, Cuskelly, & Moni; 2011; Shurr & Taber-Doughty, 2012). Perhaps most importantly, the ability to read will likely improve a students' with significant developmental disabilities postschool opportunities (Browder & Spooner, 2014). Whether initiated by legislation or changing social perspectives, students with significant developmental disabilities have access to a number of postsecondary educational and/or vocational options. However, students must be equipped with the necessary skills if they are to be successful. Instruction in academic and functional areas must teach students with significant developmental disabilities a strategy for retaining information. Students should also learn how to apply the newly acquired strategy to various contexts in environments in and outside of school.

Statement of the Problem

Despite its importance, students with significant developmental disabilities have historically been excluded from effective reading instruction. In their seminal work, Browder, Wakeman, Spooner, Ahlgrim-Dezell, and Algozzine (2006) conducted a

comprehensive review of reading research including students with significant cognitive disabilities. The researchers defined *students with significant cognitive disabilities* to encompass individuals with moderate, severe, or profound intellectual disabilities who may also have autism, or other developmental and/or physical disabilities. A total of 128 articles published between 1975 and 2003 were identified and then assigned to one of the National Reading Panel's (NRP) recommended areas of reading instruction (NRP, 2000). Findings from Browder, Wakeman, et al. (2006) indicated most research has focused on sight word instruction ($n = 117$). Of these studies, less than a third also measured comprehension ($n = 23$) within a functional (58% of 23) or academic (42% of 23) context. Although the overall number of studies is growing, subsequent reviews have also found a lack of quality intervention research focused on building the comprehension levels of students with significant cognitive disabilities (Roberts, Leko, & Wilkerson, 2013) and autism spectrum disorders (e.g., Chiang & Lin, 2007; Knight & Sartini, 2015). It is feared students with significant developmental disabilities may have little opportunity to learn to read when instruction is solely focused on the acquisition of sight words. Even more problematic, it is unlikely these students will receive the full educational opportunity promised in IDEA (2004) and the No Child Left Behind Act (NCLB) (2001) if instruction is limited to sight word instruction.

Academic Instruction for Students with Significant Developmental Disabilities

Providing grade-level academic instruction to students with significant developmental disabilities is challenging. Few of these students are described to be emergent readers who are able to derive meaning from texts (Kearns et al., 2011).

Additionally, the types of texts used in some academic content areas are arguably more difficult than others. For instance, experts contend expository texts are more difficult to understand than narrative texts (Saenz & Fuchs, 2002). Saenz and Fuchs identified four factors behind the challenges students face while reading expository texts: (a) students are often unfamiliar with its structure, (b) students often have difficulty managing the conceptual density of content, (c) students often have difficulty decoding the technical vocabulary used, and (d) students often have insufficient prior knowledge of the topics covered. Browder, Gibbs, et al. (2009) offered a conceptual framework that permits teachers to promote access to literature for the students with significant developmental disabilities through intensive, explicit listening comprehension instruction. Research has shown shared story readings are one effective strategy to increase access to literature for students with extensive support needs (Hudson & Test, 2011). This strategy consists of a reading partner (e.g., adult, peer) who reads a story aloud and provides various supports in order to give the listener(s) opportunities to engage in the activity and demonstrate understanding (Hudson & Test, 2011). Common characteristics of the shared reading include using (a) repeated storylines, (b) attention getters, (c) repeated readings, (d) picture symbols paired with words, and (e) summarized texts with controlled vocabulary (Hudson & Test, 2011). For example, two recent studies trained special education or general education teachers to follow a task analysis during a shared story reading with students with significant developmental disabilities (Browder, Trela, & Jimenez, 2007; Courtade, Lingo, & Whitney, 2013). Similar steps on the respective task analyses used in these studies included training students to point to vocabulary words and complete

repeated storylines. Both studies found teachers improved in the number of steps followed during the shared story reading after the intervention was introduced. The studies also found students' engagement increased after their respective teachers received training. Additionally, the use of technology is a method to increase access to literature for students with intellectual disabilities and autism spectrum disorders (e.g., Coyne, Pisha, Dalton, Zeph, & Smith, 2012; Knight, 2010; Wood, 2014). For instance, students with autism spectrum disorders and intellectual disabilities in Knight (2010) listened to electronic texts on a computer that the researcher created using a free online authoring tool called Book Builder (by the Center for Applied Special Technology, CAST). Similarly, students with a moderate intellectual disability who participated in Wood (2014) listened to electronic texts read aloud on the computer that were published on the Discovery Education website. Although more research is needed, one benefit of the use of technology is it may help increase the motivation levels of students with a moderate or severe intellectual disability to independently complete academic tasks (e.g., Miller, Krockover, & Doughty, 2013).

Once access is achieved, researchers must provide instruction to support the students' with significant developmental disabilities understanding of content. One effective strategy supported in the literature is systematic instruction, which is the process of breaking down a complex skill into individual behaviors (task analysis), then providing specific prompts, materials, and instructional strategies to gradually help students learn to independently perform each behavior of the complex skill (Collins, 2007). Two systematic instruction strategies prevalent in the literature are direct

instruction and system of least prompts. Botts, Losardo, Tillary, and Werts (2014) explained direct instruction offers explicit step-by-step training with error correction procedures. Training includes extensive practice opportunities for a learner to demonstrate his or her understanding by completing a given activity with progressively more independence. The described direct instruction continues until the learner independently completes a cumulative review with a certain level of mastery (Botts et al., 2014). Researchers have used model-lead-test procedures with examples and nonexamples as one specific direct instruction strategy to offer training on vocabulary and concepts (e.g. Knight, 2010; Zakas, 2011).

A system of least prompts provides a sequence of progressively more obtrusive supports within a hierarchy one by one until a learner provides the target response (Collins, 2007; Spooner, Knight, Browder, & Smith, 2012). While a system of least prompts has traditionally been used to teach daily living skills (Wolery, Ault, & Doyle, 1992), researchers have modified the hierarchy to provide a model for how to locate content necessary to answer questions. For example, Hudson, Browder, and Jimenez (2014) used a modified system of least prompts in which the first level prompt consisted of the interventionist rereading a portion of the text that contained the correct answer. The second level prompt, if needed, consisted of the interventionist rereading the sentence containing the correct answer. The third prompt, if needed, consisted of the interventionists pointing to and reading aloud the correct answer. Researchers have also modified a system of least prompts to provide instruction on how to answer questions. For example, Mims, Hudson, and Browder (2012) modified a system of least prompts to

include a first level prompt that consisted of the interventionists providing instruction on the rules for wh-questions. The second prompt, if needed, consisted of the interventionists (a) rereading the sentence containing the correct answer, (b) modeling the correct response, and (c) rereading the question and response option. The third prompt, if needed, consisted of the interventionists pointing to the correct answer on the response board while also reading it aloud. The findings from both identified studies established a functional relation between the systematic instruction and the number of comprehension questions answered by students with significant developmental disabilities.

While there is evidence demonstrating the aforementioned systematic instructional strategies can promote students' with significant development disabilities comprehension of texts, less is known regarding its efficacy for teaching an independent reading skill to this same student population. A small number of studies have investigated the effectiveness of systematic instruction to teach students with significant developmental disabilities to complete a graphic organizer (e.g., Douglas, Ayers, Langone, Bell, & Meade, 2009; Zakas, 2011). For example, Zakas (2011) trained students with autism spectrum disorders to complete a graphic organizer using a modified system of least prompts after reading a text. The modified system of prompts included a first level prompt that had participants state the definition of a story-grammar concept and identify examples and nonexamples. The second level prompt, if needed, consisted of the interventionists rereading a portion of the text that contained the correct answer. The third prompt, if needed, consisted of the interventionist stating the correct answer and instructing the participant to repeat it. The students with autism spectrum disorders in this

study demonstrated increases in the number of graphic organizers parts completed after the systematic instruction was provided. Moreover, a small number of studies have investigated the efficacy of teaching students with significant developmental disabilities to complete a graphic organizer and their abilities to recall important facts from an academic text. For example, Douglas et al. (2009) created electronic texts that offered explicit instruction, visual supports, and corrective feedback to train students with mild and moderate intellectual disabilities to complete a graphic organizer. These students then answer comprehension questions about the text after completing the graphic organizer. Douglas et al. (2009) reported the number of questions their respective participants with intellectual disabilities answered with the graphic organizer available increased after receiving systematic instruction. However, students in this study answered questions after completing graphic organizers with some level of support. The researchers also did not report data on the students' abilities to complete the graphic organizer. While the current literature base offers some evidence, more research is needed to evaluate whether students with significant disabilities can learn to complete a graphic organizer. Additionally, research is needed to examine the benefit of learning to complete a graphic organizer with this student population.

Extending Previous Research

The literature is rich with research supporting the use of systematic instruction to build the comprehension of students with significant developmental disabilities. Several of these studies have taught text comprehension by combining systematic instruction and shared story-reading strategies (e.g., Hudson et al., 2014; Mims, Hudson, et al., 2012).

However, only a small number of these studies used systematic instruction to teach an independent reading skill (e.g., Douglas et al., 2009; Zakas, 2011). Given the strong level of evidence supporting its use with students with learning disabilities (e.g., Ciullo & Reutebuch, 2013; Dexter & Hughes, 2011), the paucity of research investigating the effectiveness of graphic organizers instruction, including computer-based graphic organizers, with students with significant developmental disabilities is surprising.

The current study extended some of the procedures followed in Zakas (2011). First, the current study provided direct instruction on the definitions of seven story-grammar concepts for social studies content. Next, it used a modified system of least prompts to train participants to complete the graphic organizer. Like Zakas (2011), the current study investigated the effectiveness of the systematic instruction on the abilities of participants to complete the graphic organizer. All informational texts used in the current study followed the same structure introduced in Zakas (2011) with the exception of texts used in the generalization phase.

However, the current study extended the procedures followed in Zakas (2011) in seven noteworthy ways. First, the researcher taught participants to complete the graphic organizer on a computer using text-to-speech software (i.e., *Read: OutLoud 6*). Zakas (2011) had participants read the texts and then write in their responses on a paper-based version of the same graphic organizer. Second, the researcher offered additional training on the use of the graphic organizer to answer comprehension questions. Third, the researcher extended the comprehension measure. In addition to collecting data on the number of computer-based graphic organizer parts correctly completed, defined as task

completion, the current study measured the number of key facts that were independently recalled, defined as total independent story-statements, and independently provided in response to specific questions, defined as total guided story-statements. Fourth, the researcher measured the participants' abilities to independently complete the graphic organizer during the primary intervention condition, identified as computer-based graphic organizer use. Zakas (2011) had participants independently complete the graphic organizer in the generalization phase. Fifth, the researcher measured the generalized effectiveness of the systematic instruction using informational texts that did not follow the same structure of texts used in earlier conditions of the study. Sixth, the current study included participants with significant developmental disabilities in high school grade levels. Seventh, the current study included two participants with moderate intellectual disabilities. Therefore, the purpose of the current study was to examine the effectiveness of systematic instruction on the steps for completing and using a graphic organizer on the abilities of participants to recall important facts and answer comprehension questions.

Significance of the Current Study

The current study contributes to the existing literature in seven noteworthy ways. First, the current study contributes to the research base an intervention focused on teaching academic skill with students with significant developmental disabilities (e.g., Hudson et al., 2014; Mims, Hudson, et al., 2012; Zakas, 2011). Although growing, a recent review on the curricular focus of research including students with moderate and severe intellectual found less than 20% of studies conducted between 1996 and 2010 have taught cognitive academic skills (Shurr & Bouck, 2013). The current study adds to

the related literature that has provided academic instruction using expository texts (e.g., Hudson et al., 2014; Knight, 2010; Wood, 2014; Zakas, 2011). Second, the current study adds to the literature on the use of a direct instruction strategy to teach students with significant developmental disabilities the definitions of concepts or vocabulary (e.g., Zakas, 2011). Like Zakas (2011), the researcher used model-lead-test procedures with examples and nonexamples to teach participants the definitions of seven story-grammar concepts for social studies content in the preintervention training condition. The cumulative review measuring the participants' mastery of content was conducted in the independent practice with feedback condition. Third, the current study adds to the literature on the use of system of least prompts to support the comprehension of students with significant developmental disabilities (e.g., Hudson et al., 2014; Mims, Hudson, et al., 2012; Zakas, 2011). Similar to earlier research, the researcher used a modified system of least prompts that did not immediately disclose the target answer. The first level prompt provided a reminder of the definition of a story-grammar concept for social studies content and two examples. The second level prompt offered a reread of a focused section of a text containing the correct answer. The third level prompt provided a reread of the correct answer while also pointing to it in the text displayed on the computer.

Fourth, the current study adds to the literature on the use of systematic instruction, including a modified system of least prompts or explicit instruction with corrective feedback, to teach students with significant developmental disabilities how to use and complete a graphic organizer (e.g., Douglas et al., 2009; Zakas, 2011). As described in the section above, the current study used the same graphic organizer introduced in Zakas

(2011). However, the current study extended the related literature base by evaluating whether the students with significant developmental disabilities were able to generalize their abilities to complete the graphic organizer. The students who participated in the current study accessed texts at generalization that do not follow the same structure of the texts that were used in earlier conditions of the study. Fifth, the current study contributes to the literature on the use of graphic organizers to support the abilities of students with significant developmental disabilities to answer questions about a text (e.g., Douglas et al., 2009). Similar to earlier research, the current study measured the number of comprehension questions participants were able to answer with the graphic organizer displayed. However, the current study also measured the number of comprehension questions participants were able to answer without the graphic organizer available. Additionally, the current study measured the number of key facts described in a text the participants' were able to independently recall after completing the computer-based graphic organizer without any support from the researcher. Sixth, the current study adds to the literature on the use of technology to promote students' with significant developmental disabilities access to texts (e.g., Knight, 2010; Wood, 2014; Douglas et al., 2009). Similar to earlier research, participants in the current study listened to text read aloud on the computer. However, the current study extended the literature base by having participants complete the graphic organizer on the computer. In addition, the students in the current study completed the graphic organizer using the texts rather than researcher-prepared response cards. The seventh and final contribution is the feedback collected from stakeholders. The four students who participated in the current study and their

classroom teacher completed questionnaires on the social significance of this study's procedures, goal, and effectiveness.

Purpose Statement and Research Questions

Thus, the purpose of the current study was to examine the effectiveness of systematic instruction and the abilities of participants to complete a computer-based graphic organizer, recall important facts, and answer comprehension questions. The specific questions addressed were:

1. Is there a functional relation between systematic instruction on the use of a computer-based graphic organizer and task completion, defined as the number of computer-based graphic organizer parts independently completed after listening to information texts, for high school students with significant developmental disabilities?
2. Is there a functional relation between systematic instruction on the use of a computer-based graphic organizer and total independent story-statements, defined as the number of independent retells of facts related to story-grammar concepts described in a text during independent comprehension probes, for high school students with significant developmental disabilities?
3. Is there a functional relation between systematic instruction on the use of a computer-based graphic organizer and total guided story-statements, defined as the number of guided retells of facts related to story-grammar concepts described in a text during guided comprehension probes (with and without

materials displayed), for high school students with significant developmental disabilities?

Definitions of Terms

The following terminology is used with these specific meanings throughout this research.

Developmental Disabilities: These

are severe chronic disabilities that can be cognitive or physical or both. The disabilities appear before the age of 22 and are likely to be lifelong. Some developmental disabilities are largely physical issues, such as cerebral palsy or epilepsy. Some individuals may have a condition that includes a physical and intellectual disability, for example Down syndrome or fetal alcohol syndrome.

(American Association on Intellectual and Developmental Disabilities [AAIDD], n.d.)

Direct Instruction: A systematic approach to teaching that: (a) provides explicit step-by-step instruction, (b) establishes a mastery criterion for each step, (c) uses error correction procedures, (d) progressively moves from a teacher-directed to student-directed activity, (e) provides sufficient practice opportunities, and (e) includes a cumulative review (Botts et al., 2014; Gersten, Woodward, & Darch, 1986).

Intellectual Disability: An “intellectual disability is a disability characterized by significant limitations both in intellectual functioning [sic] (reasoning, learning, problem solving) and in adaptive behavior [sic], which covers a range of everyday social and practice skills. This disability originates before the age of 18” (AAIDD, n.d.).

- Mild Intellectual Disability: “IQ level of 50 to 55 to approximately 70” (Erickson, Hanser, Hatch, & Sanders, 2009, p. 3).
- Moderate Intellectual Disability: “IQ level of 35-40 to 50-55” (Erickson et al., 2009, p. 3).
- Severe Intellectual Disability: “IQ level of 20-25 to 35-40” (Erickson et al., , 2009, p. 3).

Comprehension: The ability to understand and interpret connected text whether independently read by an individual or heard.

Students with Significant Developmental Disabilities (Students with Significant Cognitive Disabilities): These terms encompass students who participate in a state’s education accountability system through alternate assessments based on alternate achievement standards (AA-AAS) due to a significant intellectual disability. Definitions of this student population vary across states (Courtade, Spooner, & Browder, 2007), but common learning characteristics include one who “(1) requires substantial modifications, adaptations, or supports to meaningfully access the grade-level content; (2) requires intensive individualized instruction in order to acquire and generalize knowledge; and (3) is working toward alternate achievement standards for grade-level content” (Browder & Spooner, 2006, p. xviii). Students who participated in the current study were found eligible to participate in the AA-AAS in the state in which it was conducted; therefore, they were considered students with significant with developmental disabilities.

Systematic Instruction: A behavior analytic approach to instruction that is highly structured, data driven, and makes use of prompt fading procedures to teach a socially significant skill (Browder & Spooner, 2014; Collins, 2007).

System of Least Prompts: A systematic instructional method that offers progressively more obtrusive prompts within a hierarchy to a student until he or she provides the target response. The goal is for the student to learn to provide the target response with the least amount of support (Brower & Spooner, 2014; Cooper, Heron, & Heward, 2007).

Chapter Two

This chapter reviews the reading research for students with significant developmental disabilities, also referred to as significant cognitive disabilities in the literature. As defined in Chapter 1, the term significant developmental disabilities (SDD) refers to students who participate in an AA-AAS. While the term is not synonymous with an intellectual disability, the majority of students participating in AA-AAS are typically reported to be individuals with “a moderate and severe intellectual disability..., as well as autism, multiple disabilities, and deaf-blindness but not all of any of these categories” (Kearns et al., 2010, p. 5). The first section offers an overview of the evidence supporting that students with significant developmental disabilities can benefit from comprehensive reading instruction focused on the five essential literacy areas identified by NRP (2000). The second section covers the components of effective reading instruction with this student population identified in prior reviews of literature. The third section provides a comprehensive review of two systematic instruction strategies used to support students’ with significant developmental disabilities comprehension of text. The two systematic instruction strategies, direct instruction and system of least prompts, were selected based on the findings of a recent review (Knight & Sartini, 2015). The fourth and final section describes the literature on the use of graphic organizers to support students’ with significant developmental disabilities comprehension during reading-based activities.

This literature review also included research on the use of graphic organizers to support instruction or to teach independent reading skills based on the recommendations of a recent review (Knight & Sartini, 2015).

Evidence of Success in Reading Instruction for Students with Significant Developmental Disabilities

Research has shown students with a significant developmental disability (SDD) can acquire various reading skills. Browder, Wakeman, et al. (2006) conducted one of the first comprehensive reviews of reading research including students with significant cognitive disabilities. As described in Chapter 1, the researchers defined significant cognitive disabilities to encompass individuals with moderate, severe, or profound intellectual disabilities (ID) who may also have autism, or other developmental and/or physical disabilities. First, the researchers assigned the 128 identified studies to one of the NRP's (2000) recommended areas of reading instruction: (a) phonemic awareness, (b) comprehension, (c) fluency, (d) vocabulary, and (e) phonics. Second, Browder, Wakeman, et al. (2006) calculated effect sizes for group studies and Percentage of Nonoverlapping Data (PND) for single-subject studies (Scruggs, Mastropieri, & Casto, 1987). Third, the researchers evaluated the quality of evidence offered by studies that met the design standards for single-subject (Horner et al., 2005) and group research (Gersten et al., 2005). The findings revealed the majority of studies focused on sight word instruction ($n = 117$). Of these studies, less than a third also measured comprehension ($n = 31$) within a functional (18 of the overall 31) or academic (13 of the overall 31) context. About one fourth of all the studies reviewed targeted fluency ($n = 36$).

Instruction focused on phonics ($n = 13$) or phonemic awareness ($n = 5$) skills was the least prevalent in the literature.

Of the single-subject studies, those that targeted phonics skills ($n = 3$) resulted in the highest overall average PND (93%). Studies providing sight word instruction ($n = 41$) had the second highest overall average PND (85%). Browder, Wakeman, et al. (2006) found the PND for most fluency-, picture vocabulary-, or sight word-related studies fell within the range of 81% to 90%. Although the skills received less attention than the others, the PND for studies focused on comprehension and phonics skills ranged from 90% to 100%. For the 3 of the 40 group studies that provided data necessary to calculate effect size, the median effect size was .25. Browder, Wakeman, et al. (2006) concluded the single-subject studies had a strong overall effect size on the reading skills for students with significant cognitive disabilities. However, the group studies had an overall weak effect. Browder, Wakeman, et al. (2006) reported research meeting design quality standards offers strong evidence for the use of systematic prompting in a massed trial format to provide sight word instruction. Systematic prompting was described as a strategy that includes specific prompt fading (e.g., constant time delay) procedures with feedback to repeatedly evoke a set of defined responses across time. However, there was insufficient evidence to support any one intervention to teach phonics, comprehension, phonemic awareness, or fluency. Browder, Wakeman, et al. (2006) called upon future researchers to investigate strategies for using the systematic prompting strategies to teach students with significant cognitive disabilities other reading skills.

Since the seminal review by Browder, Wakeman, et al. (2006), research has evaluated the effects of comprehensive reading instruction that offers systematic instruction on all five essential reading skills identified in the NRP (2000) report (Allor, Mathes, Roberts, Jones, & Champlin, 2010; Browder, Ahlgrim-Delzell, Courtade, Gibbs, & Flowers, 2008; Browder, Ahlgrim-Delzell, Flowers, & Baker, 2012). In one study, Browder, Ahlgrim-Delzell, et al. (2008) used a randomized group design to investigate the effects of the Early Literacy Skills Builder (ELSB) curriculum on the language and early literacy skills of participants with SDD. Participants were 23 primary-grade (K–Grade 4) students with a mean age of 8.75 and estimated mean intelligent quotients (IQs) of 41 (ranged from 20 to 54) who read below the first-grade level. The study lasted one academic year with participants in the treatment and contrast groups receiving an average of 52.91 and 56.23 minutes of literacy instruction per day. Prior to the start of the study, students were randomly assigned to a treatment or contrast group within classrooms. The researchers then trained seven special education teachers to deliver the intervention, the ELSB curriculum, to participants assigned to experimental group. The ELSB curriculum was described as a scripted reading program that applied various systematic prompting strategies to offer direct instruction on early language and literacy skills. The curriculum contained five levels of instruction focused on rudimentary reading skills, such as concepts of print, phonemic awareness, vocabulary, comprehension, and phonics. Thirteen learning goals were established for each level that progressively became more difficult as reading skills were mastered. In contrast, students assigned to the contrast group received sight word instruction using the Edmark Reading Program. However,

participants in both groups received story-based lessons intended to engage them in reading and comprehending grade-level adapted books. Participants' reading levels were measured using the following assessments: (a) Nonverbal Literacy Assessment (NVLA), (b) Early Literacy Skills Assessment (ELSA), Peabody Picture Vocabulary Test-III (PPVT-III), and (c) Woodcock Language Proficiency Battery (WLPB). The NVLA and ELSA were both created by members of the research team and validated by experts prior to the beginning the study. Analysis of pretest/posttest data revealed participants who received the ELSB curriculum outperformed those in the contrast group on posttest for all dependent variables. The intervention was found to have a large effect size (range of 1.15 to 1.57) across all dependent variables for participants in the treatment group.

In a later study, Browder et al. (2012) used a random assignment group design to further evaluate the effects of the ELSB program for students with severe developmental disabilities (IQs of 55 or below). This was a longitudinal investigation that included three cohorts of participants, although only one cohort participated in a single year. In all, 93 students in Grades 3-5 who read below the first-grade level participated and were randomly assigned to a treatment or contrast group. The researchers noted the mean time spent engaged in literacy instruction per day was about one to one and one-half hours across all three cohorts. Most of the procedures mirrored those followed in Browder, Ahlgrim-Dezell, et al. (2008) with the exception of two noteworthy changes. Unlike the earlier study, the researchers provided training on the use of the Edmark Reading Program prior to the start of the study. The researchers also conducted regular observations of instructional sessions to ensure teachers in the contrast group were using

the reading program as planned. The early literacy levels of participants from both groups were assessed before and after the intervention using the NVLA and PPVT-III. Results indicated participants in the treatment group had higher posttest scores on all dependent variables. The aggregate effect sizes across all treatment groups were moderate for phonemic awareness (.44) and listening comprehension subtests (.49) of the NVLA dependent variable, but small on the PPVT-III (.30).

In another study, Allor et al. (2010) used a pretest/posttest group design to measure the effect of a comprehensive reading program with a moderate ID (IQs ranged from 40 to 55). Participants included 28 students in Grades 1-4 with a mean age of approximately 9 years old. The primary reading program used in this group study was the Early Interventions in Reading. However, additional lessons, called the Foundation Level, were created because some participants did not demonstrate the necessary prerequisite skills to benefit from the Early Intervention in Reading curriculum. Prior to starting the intervention, participants from 10 separate schools were randomly assigned to either a treatment or a contrast group. The researchers then trained six special education teachers to deliver the intervention. Participants in the treatment condition received instruction using the aforementioned reading program on the following skills: (a) concepts of print, (b) phonological and phonemic awareness, (c) oral language, (d) letter knowledge, (e) word recognition, (f) vocabulary, (g) fluency, and (e) comprehension. Participants also participated in storybook read alouds during which they made predictions, checked to confirm or reject predictions, summarized main ideas, and sequenced events. Text-specific comprehension strategies were also reviewed. For

example, participants learned to identify story-grammar elements while reading narrative texts. They also began and finished read alouds with expository texts by stating what they knew about the content and then identifying what they learned. Participants in the contrast group continued to receive what was defined as standard special education instruction for this student population (e.g., sight word instruction). Participants received instruction for approximately 40 to 50 minutes in small groups (1 to 4 students) for a mean of 42.8 weeks. Measures used to monitor participants' progress at pretest/posttest were (a) PPVT-III, (b) The Expressive Vocabulary Test (EVT), (c) The Woodcock Language Proficiency Battery-Revised (WLPB-R), (d) The Comprehensive Test of Phonological Processing (CTOPP), and (e) Test of Word Reading Efficacy (TOWRE). However, the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) was used to continuously assess progress throughout the intervention. Allor et al. (2010) found participants in the treatment group outperformed those in the contrast group on posttests across all measures. The aggregate difference between groups was significantly different on measures of phonemic awareness, phonics, word recognition, vocabulary, and comprehension.

Summary of evidence. Research supports the efficacy of comprehensive reading programs for students with SDD (Allor et al., 2010; Browder, Ahlgrim-Dezell, et al., 2008; Browder et al., 2012). The findings from the aforementioned studies indicated students with SDD who received comprehensive reading instruction outperformed others who received traditional instruction (e.g., sight words) on multiple measures of literacy. While the systematic and explicit instructional strategies across studies were effective, it

is unknown whether comparable findings would be had with secondary-aged students with SDD. All three studies included students with SDD in primary (Browder, Ahlgrim-Dezell, et al., 2008) and/or elementary grade levels (Allor et al., 2010; Browder, Ahlgrim-Dezell, et al., 2008; Browder et al., 2012).

In addition, it is unknown which components of the comprehensive program resulted in these students' improved listening and reading comprehension levels. While learning broad literacy skills is indeed important, students with SDD must also learn specific strategies to improve their comprehension of connected text. Researchers agree the ability to comprehend information from a text is one of the most important skills a student can learn (Mastropieri & Scruggs, 1997) and is vital to the overall learning process (Hudson & Browder, 2014). This skill is particularly important for secondary-aged students who will likely be required to understand information from textbooks or complex novels if they are to achieve in an adapted academic curriculum aligned with the general education standards. For these reasons, there is a need for research to identify effective strategies for promoting the independent reading skills of students with SDD.

Effective Components of Comprehension Instruction

Since the seminal analysis by Browder, Wakeman, et al. (2006), there have been four reviews of literature conducted on reading research including students with autism spectrum disorders (ASD; Chiang & Lin, 2007; Knight & Sartini, 2015), significant cognitive disabilities (Roberts et al., 2013), and extensive support needs (Hudson & Test, 2011). One analyzed the literature on reading comprehension instruction (Chiang & Lin, 2007). One focused on literacy skills (Hudson & Test, 2011). One synthesized the

research on reading instruction (Roberts et al., 2013). Finally, one focused on comprehension instruction across core content areas (Knight & Sartini, 2015).

In the first review, Chiang and Lin (2007) identified 11 studies that provided reading comprehension instruction to students with ASD. The majority of the reviewed studies included participants with ASD and an ID. A few studies included participants with average or above average IQ scores. None had participants with Asperger syndrome. Seven of the 11 reviewed studies focused on sight word comprehension, while 4 focused on text comprehension. Five of the 11 reviewed reading comprehension studies used academic content. The remaining 6 studies used functional content (e.g., product warnings, grocery items). Strategies used in the seven sight word comprehension studies were: (a) progressive time delay, (b) discrete trial training, (c) incidental teaching, (d) multimedia instruction, (e) computer-based video instruction, (f) computer-based instruction, (g) stimulus class technology, and (h) book-based instruction. Strategies used in the four text comprehension studies were: (a) peer tutoring, (b) cooperative learning groups, and (c) procedure facilitation. The findings from Chiang and Lin (2007) offered support that students with ASD could benefit from reading comprehension instruction. However, the researchers noted more research was needed before specific strategies could be identified as effective.

In the second review, Hudson and Test (2011) identified 13 studies that used a shared story-read strategy to provide literacy skills instruction to students with extensive support needs. Participants represented in the reviewed studies included students with ID, autism, or multiple disabilities. The researchers defined the shared story-reading strategy

as one that includes a reading partner (e.g., adult, peer) who reads a story aloud and provides various supports to allow a listener or listeners to have opportunities to engage in the activity and demonstrate understanding. *Literacy* was defined to include vocabulary and text comprehension skills as well as emergent skills that represent access to literature. In addition, the researchers reviewed the quality of the evidence for the use of the shared story-reading strategy against the quality indicators recommended by Horner et al. (2005). The researchers reported all 13 of the identified studies used fictional texts. The results of this analysis established a moderate level of evidence for the use of the shared story-reading strategy to promote the literacy skills of students with extensive support needs. However, the researchers noted a limitation of this review was all of the reviewed studies combined shared story-reading procedures with other strategies. More specifically, the reviewed studies included the use of task analytic instruction, systematic instruction, and adapted texts within shared story-reading procedures. Therefore, the extent any one strategy contributed to the participants' improved literacy skills, if at all, was not known. The researchers concluded more research was needed on the individual strategies, or on the use of the same strategies, with students with extensive support needs.

In the third review, Roberts et al. (2013) identified 19 studies that provided reading instruction to adolescents with significant cognitive disabilities. The researchers defined *adolescents with significant cognitive disability* as middle and high school students with a moderate to severe ID who might also have ASD or a physical disability. While all studies included participants with a moderate or severe ID, five studies also

included at least one participant with a mild ID. Twelve of the 19 reviewed studies focused on sight word comprehension. Three studies focused on sight word and text comprehension. One focused on text comprehension. Additionally, 13 of the 19 reviewed studies used functional content (e.g., content related to daily living skills). Four used academic content derived from the core curriculum. Findings from Roberts et al. (2013) suggested secondary students with a significant cognitive disability may benefit from vocabulary instruction using time-delay procedures. The one study that focused on the participants' comprehension of text used a shared story-reading strategy with systematic instruction (i.e., time delay, system of least prompts; Browder et al., 2007).

In the fourth review, Knight and Sartini (2015) identified 13 studies that provided comprehension instruction in a core content area to students with ASD. Unique to this review, the researchers only included studies that focused on text-based comprehension skills. The researchers defined *text-based comprehension* as listening, vocabulary, and language comprehension skills that required students “to answer comprehension questions, provide definitions, or apply content to novel situations derived from texts” (p. 1217). The researchers excluded studies that focused solely on vocabulary identification or coin counting. Using the indicators recommended in Reichow (2011), the researchers evaluated the design quality of reviewed studies and then the level of evidence of specific strategies to identify potential evidence-based practices. Nine of the 13 reviewed studies included participants with ASD and an ID. Seven studies included participants with ASD and average to above average IQ scores. Most of the 13 reviewed studies used stories ($n = 5$) or science content ($n = 4$). Two of the reviewed studies used math content or a

reasoning and language skills program. The results of this analysis identified the use of response-prompting strategies, also referred to as systematic instruction in the literature, and visual supports as evidence-based practices to teach comprehension skills to students with ASD. Eleven of the 13 reviewed studies used response-prompting strategies. Of these 11 studies, the three most widely used specific response-prompting strategies were model-lead-test procedures ($n = 5$), system of least prompts ($n = 4$), and tasks analysis ($n = 4$). In addition to the use of response-prompting procedures, 8 studies included visual supports. However, the researchers noted a limitation of the review was the small number of studies that used a specific response-prompting strategy or visual support. Therefore, no one response-prompting strategy (e.g., model-lead-test) or visual support (e.g., graphic organizer) could be identified as promising or established.

Summary of effective components. Two insights were offered from the four literature reviews. First, all four reviews reported students with SDD can benefit from instruction focused on vocabulary and text comprehension. Although paucity in the number of quality studies available was acknowledged, students in this population were learning functional and academic content. There is a need for future research to now expand upon the literature to investigate effective strategies to support students' with SDD comprehension of functional and academic content.

Second, two reviews of literature offered support for broad instructional approaches to teaching reading and emergent literacy skills to students with SDD. Hudson and Test (2011) established a moderate evidence base for shared story-reading procedures to promote literacy skills to students with extensive support needs. The

researchers noted the strategy was used to teach a variety of emergent literacy skills (e.g., orient book, identify title and author, complete repeated storyline) as well as to support comprehension of text. However, the researchers also recognized a number of other strategies were also included in the overall shared story-reading procedures (i.e., system of least prompts, task analysis instruction). Similarly, Knight and Sartini (2015) identified response-prompting strategies, also referred to as systematic instruction, and visual supports as evidence-based practices for supporting the comprehension levels of students with ASD. The researchers noted that many studies used a model-lead-test procedure or a system of least prompts to provide instruction. In addition, more than half of the studies included a visual support. However, the reviewed studies used a number of different systematic instruction strategies and visual supports. Therefore, there is a need for research to investigate the effectiveness of specific strategies and visual supports in order to identify which can build the comprehension skills for students with SDD.

Given the focus of the current study to teach an independent reading skill, the rest of the literature will review research on the use of systematic instruction and graphic organizers to support the text-based comprehension of students with SDD.

Systematic Instruction and Text-Based Comprehension

Systematic instruction is a behavior-analytic approach to teaching students with and without disabilities. Examples of systematic instruction procedures commonly used to teach academics to students with SDD include: (a) time delay, (b) direct instruction, and (c) system of least prompts (Browder & Spooner, 2014). Systematic instruction is highly structured and consists of five components (Collins, 2007; Spooner et al., 2012).

First, an educator must identify and define a skill, or behavior, that is observable and measurable. The skill may be a discrete one-step behavior or a chained behavior that encompasses multiple steps. Second, an educator must decide whether the skill will be taught in an individual or small-group format using massed or distributed trials. A massed trial refers to a model of instruction that offers repeated training on a target skill within a relatively short time frame. In contrast, a distributed trial refers to a model of instruction that offers training on a target skill across an extended time frame. Third, an educator must select the prompts for evoking the behaviors and delivering the consequence following correct and incorrect response. Fourth, an educator must determine a system for collecting data reliably and consistently. And fifth, an educator must establish a plan for helping the student maintain and generalize the learned skill.

Evidence supporting the efficacy of using systematic instruction to teach literacy skills to students with SDD is beginning to unfold. Three reviews of research have identified time delay prompting as an evidence-based practice for teaching picture and sight word recognition to students with severe developmental disabilities (Browder, Ahlgrim-DeLzell, et al., 2009; Browder, Wakeman, et al., 2006; Spooner et al., 2012). One of the most common variations of time delay prompting prevalent in the reading literature including this student population is constant time delay (CTD), which provides the controlling prompt intended to evoke a target behavior at predetermined time intervals (Cooper et al., 2007). During initial instructional sessions, the controlling prompt and the task direction are presented simultaneously. The presentation of the

controlling prompt is then delayed until after the task direction is delivered for a number of seconds that is considered acceptable for fluency (e.g., 3-s, 5-s; Cooper et al., 2007).

Examples offered in the current literature base include Browder, Hudson, and Wood (2013), who used CTD to offer instruction on wh-question words to middle school students, aged 11 to 13, with a moderate ID (IQs ranged from 45 to 51). Using a multiple probe across participants design, students first learned to match six wh-definition word cards as they were individually presented with their associated wh-word card (i.e., who, what, when, where, how, what). The definition word cards were grouped together and placed near a graphic organizer. The controlling prompt (i.e., modeled matching the wh-word with its definition) was provided at the same time as the task directive during the first session. The delivery of the controlling prompt was then delayed until 4-s after the task directive was presented for the remaining sessions for all participants, except one who received it at 8-s. If participants did not respond or matched a wh-word with an incorrect definition, the interventionist provided the same controlling prompt. Once all six were correctly matched, participants were then required to identify the appropriate example card for each wh-definition word card. For these probes, the researcher affixed a set of wh-definition word cards on the graphic organizer. The graphic organizer was displayed on an 8 x 11 piece of paper and included three columns titled “WH word,” (b) “definition word,” and (c) “examples.” The researcher then read three examples associated with a specific wh-definition word card and subsequently presented three example cards (one correct, two foils). Participants were instructed to affix the correct example card on the graphic organizer. This process was repeated until the correct

example card was identified for each wh-definition word card. Participants were required to match wh-word cards with their wh-definition word cards three times within a single session, but were only required to match wh-definition word cards with their example once. Although procedures were repeated three times within a single session, data were only recorded from the first trial of a session. Data established a functional relation between CTD training and the participants' abilities to correctly match wh-word cards with the correct definition word and example cards.

In addition, Knight, Spooner, Browder, Smith, and Wood (2013) used CTD to teach three middle school students with ASD and an ID (IQs ranged from 40 to 55) to identify set of vocabulary words related to the science concept of convection and then match them with their definitions. The interventionist first presented a randomly selected vocabulary word card in addition to three other incorrect answer options. The interventionist then provided the task directive plus controlling prompt at 0-s. (i.e., said "I'll point to the word _____," and then modeled pointing to correct card). Next, the interventionist prompted the participant to point to the correct answer and delivered the same controlling prompt at 0-s. The same procedures were repeated to review the rest of the vocabulary words. The interventionist continued to offer training at 0-s time delay until participants correctly identified all vocabulary words and definitions across two consecutive sessions. After this mastery criterion was met, the interventionist provided additional training using the same procedures described with the exception that students were given up to 5-s to identify the correct answer before the controlling prompt was

presented. Training continued using 5-s time delay until participants matched vocabulary words with their definitions with 100% accuracy across for two consecutive sessions.

Although a valuable early literacy skill, most experts agree the ability to correctly identify and match vocabulary words with their definitions is not a particularly strong measure of comprehension (e.g., Alberto, Waugh Fredrick, & Davis, 2013; Knight & Sartini, 2015; Spooner et al., 2012). The researcher in the two studies described above provided CTD to offer training on vocabulary that was introduced in a reading activity (Browder et al., 2013) or science lesson (Knight et al., 2013). Therefore, students with SDD in these studies learned vocabulary needed to complete meaningful academic activities. Knight and Sartini (2015) explained examples of meaningful academic and functional activities that demonstrate a text-based understanding of content include having students answer questions and complete novel tasks derived from text (e.g., completing a graphic organizer).

Activities that require one to apply his or her understanding of sight words while completing an academic or functional activity will likely be particularly challenging for students with SDD. It is well documented these students experience noteworthy challenges attempting to perform a skill learned in one context to another context (Knight et al., 2013; Wood, Browder, & Mraz, 2014). Therefore, students with SDD must learn how to generalize their understanding of vocabulary words before they can be expected to independently complete activities. Two systematic instructional strategies that have been used to support generalization and effectively engage students with SDD in activities intended to promote their overall understanding of content are direct instruction

and a system of least prompts (Browder & Spooner, 2014). The current study used direct instruction to teach participants the definition of story-grammar concepts that were described in informational texts. A modified system of least prompts was also to teach participants how to complete and use a computer-based graphic organizer.

Literature search procedures. The following procedures were conducted to identify reading research that used direct instruction and/or a system of least prompts with students with SDD. First, the researcher searched Education Research Complete, ProQuest, and PsycINFO databases using a combination of the following keywords: reading instruction, comprehension, listening comprehension, literacy skills, shared story, systematic instruction, graphic organizer, severe disabilities, intellectual disability, moderate intellectual disability, severe intellectual disabilities, autism, developmental disabilities, severe developmental disabilities, significant cognitive disability, significant developmental disability. Second, the researcher used the same databases to review the table of contents of the following journals that most often publish research including students with SDD: *Education and Training in Autism and Developmental Disabilities*, *Research and Practice for Persons with Severe Disabilities*, *Exceptional Children*, *Focus on Autism and Other Developmental Disabilities*, and *Remedial and Special Education*. Third, the researcher conducted a descendent search looking for publications by the following prominent scholars in this research topic: Diane Browder and Fred Spooner. Finally, the researcher conducted an ancestry search by reviewing the reference lists of selected publications. In addition to using the noted databases, the following websites for relevant organizations, agencies, or centers were reviewed: National Alternate

Assessment Center; Collaboration for Effective Educator Development, Accountability, and Reform (CEEDAR) Center; and National Center on Educational Outcomes.

All studies retrieved using the aforementioned search procedures that met the four inclusion criteria described below were included in this literature review. First, only empirical studies were included. The majority of empirical studies identified were published in peer-reviewed journals. However, a few dissertation studies that met the following inclusion criteria were also included (e.g., Knight, 2010; Mims, 2009; Wood, 2014). An article derived from a dissertation study that was later published in a peer-reviewed journal was excluded in order to eliminate the duplication in reviewed studies (e.g., Knight, Wood, Spooner, Browder, O'Brien, 2015). Second, an empirical study had to include at least one student with a moderate ID (IQs between 40 and 55). Studies that only included students with a severe or profound ID (IQs below 40) were excluded (e.g., Browder, Lee, & Mims, 2011; Browder, Mims, Spooner, Ahlgrim-Dezell, & Lee, 2008). Studies that only included students with a mild ID (IQs between 55 and 70) and/or ASD were excluded if the authors did not specifically report the students were eligible for an AA-AAS (e.g., Bethune & Wood, 2013; Flores & Ganz, 2007, 2009). Third, an empirical study had to include students with SDD who were in primary, elementary, or secondary grades (K-12). Studies that only included students with ID or ASD in preschool or postsecondary grades were excluded because it is unknown whether these individuals qualified to participate in a state's accountability program (e.g., Celik & Vuran, 2014; Hua et al., 2012). Fourth, an empirical study had to use a direct instruction strategy on vocabulary or concepts to build the text-based comprehension levels of students with

SDD. Similarly, an empirical study had to use a system of least prompts while accessing texts for the purposes of building the text-based comprehension levels of students with SDD. Empirical studies that used both or only one of the strategies were included. *Text-based comprehension* was defined as listening and reading comprehension skills that required students to “answer comprehension questions, provide definitions, or apply content to novel situations derived from text” (Knight & Sartini, 2015, p. 1217).

Empirical studies were judged to not focus on text-based comprehension skills if students were only required to match or identify vocabulary. Additionally, empirical studies that used science curricula that included graphic organizers and experiments to support the text-based comprehension of students with SDD were identified, but not discussed in great detail due to concerns with identifying which strategy contributed to students’ improvements (e.g., Jimenez, Browder, & Courtade, 2009).

The researcher focused on the use of the aforementioned strategies because they were used in the current study. Direct instruction and a system of least prompts were also two of the three most commonly used systematic instruction strategies identified in the most recent review of comprehension research including students with ASD (Knight & Sartini, 2015). However, an exception to the noted inclusion criteria was made for three empirical studies that did not include a measure that met the definition of text-based comprehension, but were some of the first scientific investigations that used systematic instruction to build the text-based comprehension levels of students with SDD (i.e., Browder et al., 2007; Knight, Smith, Spooner, & Browder, 2012; Spooner, Rivera, Browder, Baker, & Salas, 2009).

Direct instruction: Vocabulary and concept comprehension training. Direct instruction is a systematic approach to teaching academics that includes six critical features: (a) explicit step-by-step instruction, (b) a mastery criterion for each step, (c) error correction procedures, (d) extensive practice opportunities, (e) strategic plans to progressively transfer responsibility for completing the activity from the teacher to the student, and (f) a cumulative review (Botts et al., 2014; Gersten et al., 1986). Most research including students with SDD has used the following specific direct instruction strategy to teach new vocabulary and concepts: model-lead-test with examples and nonexamples. The most common version of this strategy begins with an educator providing a model to the student by stating the definition of a vocabulary word or concept. Next, an educator and the student identify the definition together (e.g., verbally state, point to definition on a piece of paper). Last, an educator instructs the student to provide the correct answer independently. After the definition is reviewed, an educator then instructs the students to identify examples and nonexamples from an array of samples.

In a doctoral study, Knight (2010) used a multiple probe across students design to evaluate the effectiveness of supported electronic texts on the vocabulary acquisition and comprehension of middle school participants with developmental disabilities. Participants included four students, aged 11 to 14 years, with a mild to moderate ID (IQs ranged from 53 to 67) and ASD. Electronic texts were created using a free online authoring tool called Book Builder (CAST). All texts met the grade-level science standards outlined in *Read to Achieve: Comprehending Content Area Text*, (published in 2009). Originally, the

electronic texts were designed to only include the following CAST-recommended supports: (a) hyperlinks to definitions of key vocabulary; (b) text-to-speech; (c) drawings, sounds, and examples of key concepts; (d) concept maps and lists of key ideas; and (e) background information. The texts also had embedded coaches that offered scaffolded support as the participants completed specific comprehension strategies (i.e., predicting, questioning, and summarizing). After participants received individual training on the procedures for using the program, the intervention was introduced. Participants read a supported electronic text two times and then completed a seven-item multiple-choice quiz on the computer. The researcher created the quizzes using an online program (i.e., Woodshare QuizCreator). Each quiz presented three vocabulary, three comprehension, and one application question.

After the intervention was originally introduced, Knight (2010) modified the electronic texts at two separate points of the study due to participants' lack of progress on the comprehension measures. At both phase changes, the electronic texts were modified so the aforementioned embedded coaches offered more extensive supports using model-lead-test procedures with examples and nonexamples. For the first phase change, the electronic texts were modified to provide explicit instruction on key vocabulary and concepts using model-lead-test procedures with examples and nonexamples. First, the embedded coach modeled the correct response. Second, an embedded coach and the participant said the correct response together. Third, an embedded coach prompted the participant to independently provide the correct response. After the definitions were reviewed, an embedded coach reviewed four samples and had the participant identify

which were examples and nonexamples of the vocabulary and concepts. Of the four samples reviewed, three were examples and one was a nonexample of the noted concept. For the second phase, the electronic texts were further modified to offer explanations for why the presented sample was or was not representative of the targeted concepts during. First, an embedded coach modeled the correct response and provided a rationale by referring to the definition of the noted vocabulary word or concept. Second, an embedded coach and the participant said the correct response with the rationale together. Last, an embedded coach prompted the participant to independently provide the correct response and the rationale. Afterward, an embedded coach had the participant identify one example and one nonexample. The number of samples reviewed was also lowered due to concerns on the duration of sessions. A graduate research assistant was trained to administer all sessions across conditions. Findings from Knight (2010) indicated three of the four participants demonstrated mean increases in correct responding to vocabulary, comprehension, and application questions after training was provided using the modified versions of supported electronic texts. Maintenance data were collected for two of the four participants and suggested their improved responding was retained when assessed one to three weeks following the date of the last intervention session.

In a later study, which was also a doctoral research project, Zakas (2011) trained a special education teacher to offer direct instruction on seven story-grammar concepts for social studies content in a group setting before introducing the primary intervention. The concepts were: (a) event, (b) people, (c) location, (d) time, (e) detail, (f) sequence, and (g) outcome. Participants included three middle school students with ASD between the ages

of 11 and 14. Two participants also were diagnosed with a borderline/mild or a mild ID (IQ ranged from 61-69). All participants were assigned to an AA-AAS in at least one content area. The special education teacher followed model-lead-test procedures with examples and nonexamples to offer the direct instruction. First, the special education teacher modeled the correct response by stating the definition for the concept. Second, the special education teacher and the participant stated the definition for the concept together. Third, the special education teacher instructed participants to state the definition independently. Last, the special education teacher presented a number of samples and instructed participants to identify which were examples and nonexamples of the concept. After training was completed, participants completed a vocabulary map by matching the story-grammar concepts with their respective definitions and examples. The aforementioned training continued until participants were able to complete the concept map with at least 87% accuracy.

Knight and colleagues (2012; 2013) conducted two multiple probe across behaviors design studies to examine the effectiveness of direct instruction on the participants' comprehension levels of science concepts. In Knight et al. (2012), the researchers used the model-lead-test procedures with examples and nonexamples to provided training on 15 science descriptors. Participants were three elementary-aged students with ASD and an ID who were between the ages of 5 to 7 years. Two participants were reported to have IQs of 53 or 62, respectively. All three participated in their state's AA-AAS. During the intervention phase, the researchers placed five objects in front of the participant for each of the five descriptors reviewed in a single session.

Three of the objects were examples of the said descriptor, while two were nonexamples. First, the researchers modeled the correct response by explicitly stating and pointing to objects that were examples and nonexamples. Second, the participant identified the examples and nonexamples of the descriptor at the same time as the researchers. Participants were permitted to either verbally repeat what was said by the researchers while also pointing to each object, or the participant could point to the objects at the same time as the researcher. Third, the researchers placed the same items in a new order and then instructed the participant to independently identify which were examples and nonexamples. Data established a functional relation between the direct instruction and the participants' comprehension levels of science descriptors. In addition, data revealed participants were able to generalize their understanding of science descriptors to novel items during subsequent science inquiry lessons.

In a later study, Knight et al. (2013) used systematic instruction and a graphic organizer to teach the science concept of convection to three middle school students, aged 13 to 14 years, with ASD and a ID (IQs ranged from 40 to 55). The systematic instruction package included CTD, direct instruction, and explicit instruction. As described above, the researchers first used CTD to provide instructions on the definitions for a set of vocabulary words related to the concept of convection. Vocabulary words training continued until participants were able to identify each with 100% accuracy for two consecutive sessions. Once vocabulary words were mastered, the researchers provided direct instruction on the concepts related to convection using model-lead-test procedures with examples and nonexamples. A T-chart was also used during training to help the

researcher and/or participant sort examples and nonexamples of a selected concept. The T-chart was a table with two columns that were titled “Yes” and “No ” on the left- and right hand side, respectively. First, the researchers displayed a sample picture of a concept and provided explicit instruction on why it was an example or nonexample. The researchers then placed the picture on the appropriate side of the T-chart, depending on whether it was an example or nonexample of the targeted concept. Second, the researchers displayed a new sample picture of the same concept and had the participant point to specific features of the picture as they were specifically described and identified by the researchers. The researchers and participant then placed the second reviewed concept on the appropriate side on the T-chart, depending on whether it was an example or nonexample of the targeted concept. Last, the researchers presented a new sample picture of the same concept and instructed the participant to identify whether it was an example or nonexample. The participant was also requested to provide a rationale for his or her answer. After all samples for given concept were reviewed, the researchers had the participant independently and correctly sort the samples on the T-chart. Next, the researchers provided explicit instruction on where to place the concept word cards on a weather-cycle graphic organizer in order to demonstrate her or his understanding of the concept of convection. The researchers used three different graphic organizers during this training to promote generalization. Each graphic organizer presented the weather cycle with a different background (e.g., beach scene, mountain scene). The researchers began with an explicit instruction and a model of where to place specific concept cards. The researchers then provided guided practice opportunities for the participants to identify

concepts word cards and place them on the graphic organizer. The researchers then prompted the participant to identify where to place the word card on the graphic organizer. Once all the concept word cards were placed on the weather-cycle graphic organizer, the researchers used CTD to teach the participants where to place the different arrows. The arrows were used to represent the cyclical nature of the concept convection. Data from Knight et al. (2013) established a functional relation between the systematic instruction intervention and the participants' comprehension levels of the convection concept.

Spooner, Kemp-Inman, Ahlgrim-Delzell, Wood, and Davis (2015) evaluated the effectiveness of systematic instruction with elementary-aged participants with severe disabilities (IQ of 55 or below). Participants were five students with an ID between the ages of 7 to 11 years. Two participants were reported to have IQs between 47 and 50. The systematic instruction included direct instruction, CTD, and a system of least prompts. One of the members of the research team conducted all sessions with individual participants in a resource room. The purpose of the training was to teach a variety of literacy skills participants were expected to later generalize during a shared story-reading activity in the intervention condition. This generalization training was offered on an iPad2 immediately after a session was held in the primary intervention condition. The iPad2 pages were programed to provide direct instruction on a variety of emergent literacy skills and vocabulary words using model-lead-test procedures with examples and nonexamples. Each iPad2 page presented the examples and nonexamples in a grid of nine. Emergent literacy skills reviewed included book awareness skills (e.g., identifying

the title and its author). The vocabulary words reviewed in the generalization training sessions were introduced during the shared story-reading activity in the primary intervention condition held the next day. However, the content used to provide instruction on the noted book awareness skills was not related to the books read in the intervention condition. After direct instruction was provided, participants listened to a short story on the iPad2. CTD was used to teach participants to turn pages and point to text. The short stories were three to four sentences in length. After the short story was read, a comprehension question was presented on the iPad2. If the participant did not provide the correct answer within 4-s of the question being asked, the researcher implemented a system of least prompts to help the participant select the help picture symbol on the iPad2. Each level was provided in the order of the least obtrusive prompt until the noted picture symbol was selected (verbal, then gestural, then physical). Findings from Spooner et al. (2015) established a functional relation between the systematic instruction and participants' generalization of skills during the shared story-reading activities.

Researchers have also found a shortened version of the model-lead-test procedures to be effective with students with SDD when, for instance, provided direct instruction. In a recent study, Hudson and Browder (2014) provided training on five wh-question words using model-test procedures with examples and nonexamples. Participants were three elementary-aged students with a moderate ID (IQ of 55 or below) who were between the ages of 9 to 11 years. The IQs of two participants were reported as 51. Training was provided before starting the study to prepare participants for the activity they would be expected to complete after listening to a text (i.e., answer questions). The

five wh-question words included (a) who, (b) when, (c) where, (d) what, and (e) why. First, the researcher individually displayed and reviewed five samples. Three of the five samples were examples of the wh-question word, while the remaining two were nonexamples. Second, the researcher removed the previously reviewed five samples and presented four additional samples. The researcher then instructed the participant to point to correct examples of the noted wh-question word. If the participant correctly identified an example, the researcher offered descriptive verbal feedback. In contrast, the researcher provided a model and verbal feedback if the student incorrectly identified a nonexample as an example (e.g., pointed to example and said “this is [noted wh-question word]”). The described direct instruction continued until participants were able to independently identify examples of each wh-question word with 80% accuracy across two consecutive sessions.

In addition to the aforementioned studies, researchers have used the model-lead-test procedures while providing instruction on reading and language concepts using published programs designed upon the principles of direct instruction. For example, Flores et al. (2013) examined the effects of a published reading program and a language program with elementary-aged participants. Participants were 18 male students, aged 7 to 9 years, with ASD and mild to moderate ID. Based on the preintervention placements test performance, 11 of the participants were received training on the reading program *Corrective Reading Comprehension: A Thinking Basis*. The 7 remaining participants received training on the language program *Language for Learning*. The researchers trained special education teachers to administer all sessions in a university-sponsored

summer program. Sessions were held with 2 to 4 participants in both groups. During the intervention phase, the special education teachers delivered training using the prescribed scripts for the respective published programs. If participants made errors at any time, the special education teachers used model-lead-test procedures to provide corrective feedback. First, the special education teacher modeled the correct answer. Second, the special education teacher and the participant selected the correct answer together. Third, the special education teacher requested the participant to identify the correct answer independently. The results of this study indicated both direct instruction programs had a strong effect on the participants' language and reading skills.

System of least prompts: Passage comprehension training. A system of least prompts is an errorless teaching model that follows a distinct hierarchy made up of progressively more intrusive prompts. First, a student is given an opportunity to independently provide the correct response to a task directive within a predetermined time interval. Next, if the correct response is not given within the predetermined time interval, the teacher provides the first level prompt of the hierarchy before, during, or after repeating the instruction. If needed, the teacher continues to provide the subsequent level prompts of the hierarchy one by one in the order of the least obtrusive until the student provides the correct response (Thompson, Bethune, Wood, & Pugalee, 2014). While a system of least prompts has traditionally been used to teach daily living skills (Wolery et al., 1992), a growing number of researchers have used it to support students with SDD during shared story-reading activities. During the shared story-reading activities, researchers have typically focused on promoting these students' engagement

and comprehension of texts. For example, students with SDD learned to orient a book properly, identify the title and author, repeat vocabulary words, turn pages, and answer prediction and listening comprehension questions (Spooner, Ahlgrim-Dezell, Kemp-Inman, & Wood, 2014). Comprehension skills focused on shared story-reading activities have primarily included answering prediction questions and making factual recalls. Others, however, have used a system of least prompts to support students in this same population while completing a reading-based activity before or after accessing a text. Reading-based activities have included completing graphic organizers (e.g., Zakas, 2011) and answering comprehension questions, (e.g., Browder et al., 2013).

During shared story reading. One way researchers have used a system of least prompts is to support students' with SDD engagement and comprehension during shared story-reading activities. In one study, Browder et al. (2007) examined the effectiveness of training special education teachers to use systematic instruction strategies during a shared story-reading activity. Each special education teacher was initially expected to deliver the intervention with two students with a moderate ID (IQs ranged from 42 to 50) who were nonreaders of connected text, but could read up to 20 sight words. However, the teachers who participated in the study asked and were permitted to include other students in their classes who were not participating in the study. The teachers typically included approximately 4 students in the shared story-reading activity with an occasional session including the entire class (8 to 10 students).

Using a multiple probe across participants design, the three special education teachers delivered the intervention in a special education classroom. Texts used in this

study included eight adapted versions of grade-level novels. Each text provided brief summaries of a chapter and was written at the second- to third-grade level. The researchers also added the definitions of new words and picture symbols for key vocabulary in the texts. Data were collected on the number of steps correctly followed by teachers during the shared story-reading activity. Data were also collected on the students' engagement and comprehension during the shared story-reading activity. The systematic instruction strategies employed by the teachers included time delay procedures and a system of least prompts. Data from Browder et al. (2007) indicated the number of steps correctly completed by teachers increased after training was provided. Outcome data also suggested students' engagement and comprehension improved after the teachers were trained.

In a second study, Mims, Browder, Baker, Lee, and Spooner (2009) examined the effectiveness of a system of least prompts on the engagement and comprehension levels of two elementary-aged participants. Participants were two students, aged 6 to 9 years, with an ID (IQ below 55) and a visual impairment. The researchers used three adapted versions of elementary-level books. Books provided brief summaries of the original text in addition to repeated storylines. They also included five concrete objects that represented selected nouns described in text. The five objects were presented two times in each book. Ten factual recall questions were created for each chapter (e.g., what, who questions).

Using a multiple probe across materials, a member of the research team delivered the intervention to individual participants in a resource room or a special education

classroom. The researcher read the selected book aloud to the participant and then stopped at certain points to ask a question. The participant responded by selecting the object representative of the correct answer from a field of two (one correct answer, one foil). If the participant did not respond within 5-s of the question being asked, the researcher implemented the system of least prompts. The first level prompt consisted of the researcher saying, “Find the one that is like this” and then placing the participant’s hand on to the page that presented the correct answer. The second level prompt consisted of the researcher repeating the first level prompt and then placing the participant’s hand on top of the object representative of the correct answer. The third level prompt consisted of the researcher repeating the second level prompt and then saying “this is__ (name of object).” The researchers collected data on the number of questions correctly answered. Findings from this study established a functional relation between the system of least prompts and participants’ engagement and comprehension during the shared story-reading activity. The researchers also reported one participant continued to answer questions at the improved level when assessed at maintenance and generalization.

In a third study, Spooner et al. (2009) extended the research by training a paraprofessional to implement a system of least prompts during a shared story-reading activity. The paraprofessional delivered the intervention to an elementary student, aged 6 years, with a moderate ID (IQ of 54). The family of the student participant reported the primarily language spoken at home was Spanish. The texts used in the study were three adapted books that were related to the student participant’s native culture (i.e., Spanish). Four literacy skills were taught in three distinct skill sets. The skills targeted ranged from

book awareness (i.e., pointing to title, orienting book) to answering comprehension questions (i.e., answer prediction question, factual recall). Training was provided on one skill set at a time. The participant answered comprehension questions using response boards.

Using a multiple probe across skill sets design, the paraprofessional implemented the intervention to the participant in a special education classroom. The paraprofessional initially provided the instruction in Spanish, but progressively increased the amount spoken in English throughout the study. The paraprofessional stopped at various points in the book and provided an instruction. As necessary, the paraprofessional implemented the different levels of a system of least prompts to support the student participant. Findings from Spooner et al. (2009) indicated the student participant's engagement and comprehension increased after the intervention was introduced.

In a fourth study, Mucchetti (2013) compared the effectiveness of a system of least prompts during shared story reading in three instructional formats: (a) nonadapted book, (b) Adapted Book 1 plus supplemental objects, and (c) Adapted Book 2 plus supplemental objects. The two adapted books were simplified versions of grade-appropriate fictional texts. Adapted books also contained pictorial supports of content and tactile representations of objects in the book. The reading levels of books ranged from a 1.6 to 1.9 grade equivalent level. Participants were four elementary students with autism and a moderate ID (IQ below 55) who were between the ages of 6 and 8 years. The researchers created six wh-questions for each book; however, the number of specific what, who, or where questions varied across the three books. Participants were permitted

to respond to questions either vocally or by selecting the correct answer on the appropriate response board. Each response board provided four answer options that were presented using text, picture symbols, and objects. Three of the four answer options were taken from the text, while the fourth was not.

Using a multiple-baseline across participants design with an embedded alternating treatments design, teachers were trained to introduce the intervention to individual participants in a special education classroom. During the shared reading activity, the teacher stopped at various points to ask the participant to engage with the book or to present a comprehension question. If the participant did not respond or provided an incorrect answer, the teacher implemented the individual levels of a system of least prompts in the order of the least obtrusive. The two levels of the system were: (a) model the correct response and repeated question and (b) provide physical support to help the participant identify the correct answer. Data were collected on participants' task engagement and listening comprehension. Mucchetti (2013) reported participants' performance on both dependent measures increased after the intervention was introduced. Interestingly enough, data also indicated the participants' correct responding was highest while listening to nonadapted texts.

In order to build upon the literature base, researchers have also investigated the effectiveness of a modified system of least prompts that includes text-dependent prompts. Rather than having students with SDD provide correct answers by simply repeating or imitating a model provided by an interventionist, several researchers have trained these students to focus on progressively narrower sections of text in order to answer questions.

In a dissertation study, Mims (2009) examined the effectiveness of a modified system of least prompts that included rereading progressively more focused sections of a text on the comprehension levels of participants. Participants were four elementary students between the ages of 10 and 11 years with a significant ID (IQs ranged from 30 to 44). The researcher created three adapted versions of grade-level novels for the study. Texts were brief summaries of the original texts and included pictorial supports. Pictures were representative of important vocabulary and main ideas. Individual texts were used in sessions until participants answered 8 of 10 comprehension questions across 3 consecutive sessions. Ten wh-questions were created for each book. Questions included one prediction question, two knowledge questions, two synthesis questions, and one analysis question. Participants answered comprehension using picture symbols (one correct, two foils).

Using a multiple probe across materials design, a trained classroom teacher or paraprofessional delivered the intervention in a special education classroom. The person who conducted individual sessions was the participants' regularly assigned teacher or paraprofessional. During the shared story reading, the interventionist stopped at predetermined places in the book to ask 1 of the 10 questions. If the participant did not respond within 3-s of the receiving the question, the interventionist implemented the modified system of least prompts. The interventionist continued to deliver the individual levels of the modified system of least prompts in the order of the least obtrusive until the participant provided the correct answer. The first level prompt was a reread of the sentence in the story containing the correct answer. If needed, the second level prompt

was a reread of a more focused section of the text containing the correct answer and then a model of pointing to the correct picture symbol. If needed, the third level prompt was a physical prompt that helped the participant place his or her hand over the correct picture symbol. Data were collected on the number of comprehension questions correctly answered by participants. The findings from Mims (2009) indicated participants made mean increases in the number of comprehension questions correctly answered after the intervention was introduced. Data also showed participants continued to respond at the high level when assessed in the maintenance condition.

In a similar study, Mims, Lee, Browder, Zakas, and Flynn (2012) used a modified system of least prompts as part of an English Language Arts (ELA) curriculum with 15 middle school participants with a moderate developmental disability (IQs ranged from 40 to 65). The first unit of the ELA curriculum consisted of eight lessons that covered the following literacy skills: (a) vocabulary, (b) read aloud and comprehension of text, (c) story elements, (d) writing, (e) poetry passage comprehension, and (d) research. Materials included fiction and nonfiction texts that were adapted using controlled texts. However, materials used during the poetry and research lessons were not adapted. The researchers trained five special education teachers to deliver the ELA curriculum. Participants answered questions by responding verbally or using the appropriate response card.

Using a nonrandomized pretest/posttest design, the special education teachers introduced the first unit of the ELA curriculum to individual participants in a self-contained classroom. First, the teacher provided instruction on 5 to 15 vocabulary words using CTD. Second, the teacher implemented a modified system of least prompts to

support participants during a shared story-reading activity. If a participant made an error or did not respond within 4-s of a question being asked, the teacher implemented the individual levels of the prompting system in order of the least obtrusive until the participant provided the correct answer. The first level was a reread of the key script. If needed, the second level was a reread and model (point to correct answer) of the correct answer. If needed, the third level was a physical prompt to help the student select the correct response card. Third, the teacher offered additional instruction on story elements after reading a text. The teacher had participants identify main characters in the story from an array of response options. Corrective feedback was provided to help participants identify the correct answers. Fourth, the teacher introduced the writing activity. Fifth, the teacher read poetry to participants and asked participants to identify the main idea, the mood, a simile, and the author's purpose. They also answered factual recall questions. Similar to the shared story-reading lessons described before, the teacher used a modified system of least prompts to support participant's errors. The first level prompt was a reread of a section of the poem containing the correct answer. If needed, the second level prompt was a reread of the line containing the correct answer. If needed, the third level was a model of the correct answer. Sixth, the teacher delivered the research lessons. The teacher read a short nonfiction text and then had participants identify main topic. Similar to the story elements lesson, the participants identified the main topic from an array of response options. The participants then completed a KWHL graphic organizer to list the following: what they knew (K), what they want to know (W), how they will learn (H), and what they learned (L). The teacher provided a model before participants completed

each section of the graphic organizer. Response options were provided to help participants fill out the graphic organizer. Findings of Mims et al. (2012) indicated participants made moderate gains on comprehension measures.

Hudson et al. (2014) used a multiple probe across participants design to investigate the effectiveness of two different types of modified system of least prompts on the comprehension levels of students with a moderate ID (IQ of 55 or below). Unique to this study, peer tutors were trained to deliver the intervention package to three elementary students in a general education classroom. Participants were also trained to self-monitor their performance by tracking the number of independent correct responses provided during the shared story-reading activity before the start of the study. Texts used in this study were seven grade-level lessons adapted from a science textbook used in the general education classroom. Each summarized the main idea about the selected topic, provided definitions of important vocabulary words, and was written at the second- or third-grade reading level. In the intervention condition, a randomly selected text was used in three consecutive sessions before the next one was introduced. Six wh-questions were created for each text using the same template. A template was created to promote the reliability of questions created for all sessions. Four were factual recall questions and two were inferential questions. A response board was created for each of the six questions. These boards displayed seven response options. The top presented a titled picture symbol (written text plus picture symbol representative of the text) participants could use to ask peer tutors for help. Directly underneath, six titled picture symbols were displayed that participants could use to answer questions.

During the shared story-reading activity, the peer tutors were trained to stop at certain places in the book to ask one of the six questions. If the participant did not provide the correct answer within 4-s of the question being asked, or pointed to the help picture symbol on the answer board, the peer tutor implemented a modified system of least prompts. The peer tutor continued to deliver the individual levels of the prompting system in the order of the least obtrusive until the participant selected the correct answer on the response board. For factual questions, the individual levels of the modified system of least prompts were: (a) reread the paragraph containing the correct answer, (b) reread the sentence containing the correct answer, (c) say the correct answer, and (d) say and point to the correct answer. For inferential questions, the modified system of least prompts included a think-aloud model at the second and third levels for inferential questions. More specifically, the individual levels of the prompting hierarchy were: (a) reread the paragraph containing the correct answer, (b) ask participant to think about his or her personal experience in the described situation, (c) model how a peer related to the described situation, and (d) say and point to the correct answer. All correct responses, independent and prompted, to comprehension questions were recorded and scored on a scale based on the amount of help needed. In other words, performance scores decreased as greater assistance was provided. Total scores were then calculated by summing the points earned per question at the end of a session. Data from Hudson et al. (2014) showed all participants' responses to comprehensions improved after introducing the intervention; however, participants' prompted correct responding increased to a larger extent than independent correct responding. Data from this study also indicated

participants' improved responding to comprehension questions was not retained during the intermittent generalization probes conducted before texts were used in the treatment condition.

Spooner et al. (2014) examined the effectiveness of two systematic instruction strategies on the comprehension levels and engagement of elementary-aged participants. Participants were four students, aged 8 to 12 years, with autism and an ID (IQs ranged from 49 to 61). All participants were eligible to participate in the AA-AAS in the state in which the study was conducted. The two systematic strategies were CTD and a modified system of least prompts. Like Hudson et al. (2014), the first two levels of the modified system of least prompts used in this study included rereads of progressively more focused sections of a text. Texts were adapted elementary-level books selected from a published research-based curriculum, *Building with Stories*. In the baseline and maintenance phase, the researcher read a new story in each session. In the intervention phase, the researcher read the same book across five consecutive sessions. The researcher randomly selected one of six wh-questions to use in each session across all phases of the study. Three were factual recall questions and three were inferential questions. Each question was written on a response page with four response options. The four response options were presented as titled picture symbols. The response boards were presented on an iPad2.

Using a multiple probe across participants, a researcher implemented the intervention to individual participants in a special education session. The researcher used CTD to support participant's engagement during the shared story-reading activity. After the story was read, the researcher asked the one randomly selected comprehension

question. If the participant did not provide the correct answer within 4-s of the question being asked, the researcher implemented a modified system of least prompts. The researcher delivered the individual levels of the prompting system in the order of the least obtrusive until the participant provided the correct answer. The first level prompt was (a) reread a section of the text that included the correct answer and (b) repeat the question. If needed, the second level prompt was (a) reread a more focused section of the text that included the correct answer and then (b) repeat the question. If needed, the third level prompt was (a) state the correct answer and then (b) say, “Your turn.” If needed, the fourth level prompt was a physical support to help the participant select the correct answer option on the iPad2. Data on participants’ engagement and responses to comprehension questions were reported on separate graphs. The findings of Spooner et al. (2014) indicated participants’ engagement in the shared story-reading activity increased after the intervention was introduced. A functional relation was also established between the modified system of least prompts and participants’ responses to comprehension questions. Data also indicated participants’ engagement and comprehension levels remained high when assessed in the maintenance phase.

Mims, Hudson, et al. (2012) further extended the literature base by using a modified system of least prompts that offered rereads of progressively more focused sections of texts as well as explicit instruction on the rules for answering comprehension questions. Participants were four middle school students (ages 12-14) with a moderate or severe developmental disability. One participant’s IQ was reported as 42. Texts were five biographies adapted from two sixth-grade textbooks. Each was a brief summary of the

original text and also included pictorial representations of important vocabulary. In the intervention condition, a randomly selected text was read a total of three times before the next one was introduced. Eleven questions were created for each text. Eight of these were all wh-word questions (e.g., who, what, where). The remaining three questions required participants to sequence main events (i.e., what came first, next, last). All participants responded to wh-comprehension questions by selecting one of four answer options that were displayed on titled picture symbols. An additional graphic organizer (three large blank squares aligned horizontally and titled “first,” “next,” and “last”) was used to help participants organize their responses while sequencing main events.

Using a multiple probe across participants design, a researcher implemented the intervention to individual participants in a resource room. If the participant did not respond within 4-s of the receiving the question, the researcher implemented the system of least prompts. The interventionist continued to deliver the individual levels of the prompting system in the order of the least obtrusive until the participant provided the correct answer. The first level prompt was an explicit instruction on the rule for how to answer the presented wh-question. This instruction was delivered with the support of a T-chart graphic organizer that displayed the relationship between the wh-question type and its rule (i.e., this is a [wh-question]; when you hear [wh-question], listen for [key word]). All together, the first level prompt was (a) state the type of wh-question being asked, (b) describe its rule, (c) reread the paragraph containing the answer, and then (d) repeat the question and response options. If needed, the second level prompt was (a) reread the sentence containing the correct answer, (b) model the correct response, and (c) reread the

question and response option. If needed, the third level prompt was (a) point to correct answer on response board, (b) read the correct answer, and (c) instruct participant to repeat the correct answer. Outcome data indicated all participants showed increases in the number of correct unprompted responses made to comprehension questions after receiving the intervention. The participants' improved listening comprehension levels were retained when assessed during maintenance probes. However, only three of the four participants showed improved comprehension during the intermittent generalization probes conducted before texts were used in the treatment condition.

In a similar study, Hudson and Browder (2014) used a multiple probe across participants design to further examine the effectiveness of a modified system of least prompts that included rereads of focused sections of the texts and explicit instruction prompts. Participants were three elementary students, aged 9 to 11 years, with a moderate ID. Two participants were reported to have an IQ of 51. The researchers trained peer tutors to deliver the intervention in a general education classroom. As described in the Direct Instruction section above, the researchers provided direct instruction on five wh-question words prior to starting the study. Training was provided using explicit instruction on examples and nonexamples and covered the rules for answering each wh-question word. The researcher also taught participants how to ask the peer mentors for help using a response and how to use a self-monitoring sheet. The researchers created an adapted chapter book derived from a grade-level novel for this study. Each chapter summarized the main events of the original texts, provided definitions for important vocabulary words, and was written at the second or third-grade reading level. Although

each chapter of the adapted novel was read three consecutive times before moving to the next one, the comprehension questions were never repeated across sessions. Like Hudson et al. (2014), researchers in this study used a template to create questions. Researchers created three sets of six inferential and factual recall wh-questions for each session (one who, where, when, and what question, and two why questions). Participants used a response board to answer questions during the comprehension probes. One response board was created for each wh-question for each chapter. The response board presented a help-prompt, the wh-question rule, and nine answer options. While only one of the nine answers was the correct response for a single question, the foils were plausible options because they were the correct answers to one of the other questions asked during one of the earlier sessions using the same chapter. In other words, the target answer for the same wh-question type (e.g., who, what) asked varied across the three sessions although the same chapter was used. This may have allowed the researchers to strengthen the validity for the multiple-choice template of each response board. It may have also helped strengthen the internal validity of the intervention despite the fact the same materials were used across consecutive sessions.

After preintervention training was completed, the trained peer tutors led the shared story-reading activity with individual participants. The peer tutors stopped at various points in the text to ask one of the six questions. If the participant did not respond within 4-s of the receiving the question, the peer tutors implemented the system of least prompts. The peer tutor continued to deliver the individual levels of the prompting system in the order of the least obtrusive until the participant selected the correct answer

on the response board. The first level prompt was (a) state the wh-question type present and its associated rules (i.e., this is a [wh-question]; when you hear [wh-question], listen for [key word]) and (b) reread the paragraph containing the correct answer. If needed, the second level prompt was a reread of the sentence containing the correct answer. If needed, the third level prompt was a model of the correct answer (i.e., say the correct answer). If needed, the fourth prompt was (a) model the correct answer and (b) point to it on the response board. Similar to Hudson et al. (2014), the researchers in Hudson and Browder (2014) collected data on independent and prompted correct responses. The researchers scored participants' overall performance during a single session based on the amount of help needed across questions. Total scores decreased as greater support was provided. Findings from Hudson and Browder (2014) indicated participants' prompted responding to comprehension questions increased after the intervention. However, independent correct responding only increased for one participant. Data from generalization sessions showed participants' improved responding to comprehension questions while listening to untrained chapters of the text was retained.

The collective findings of research using a modified system of least prompts during a shared story-reading activity provide evidence this systematic instruction strategy can help improve the comprehension levels of students with SDD (Hudson & Browder, 2014; Hudson et al., 2014; Mims, 2009; Mims et al., 2012; Spooner et al., 2014). However, there is a need to strengthen this line of research by limiting the repeated use of the same materials across sessions. There is also a need to limit the extent students with SDD respond to the same comprehension questions for a text across

consecutive sessions. It is acknowledged that repeated reading of texts is one of the foundations of the shared story-reading strategy. It is also understood the learning characteristics of students with SDD may not allow them to quickly acquire and retain information reviewed in a single session. However, research should strengthen the evidence supporting the use of shared story-readings by keeping the repeated exposure to a minimum. If not, it is uncertain whether these participants' improvements were independently due to a greater understanding of the texts or from the repeated exposure to the same content. Hudson and Browder (2014) strengthened the effectiveness for the use of a modified system of least prompts during a shared story-reading activity by asking different sets of questions to ask during each reread of a text. Similarly, Spooner et al. (2014) randomly selected one from a set of comprehension questions to ask during each reading of a story.

Before or after reading story. Researchers have also used a system of least prompts to help students with SDD complete an activity and/or answer comprehensions before or after accessing a text. In one study, Browder et al. (2013) used a multiple probe across participants design to examine the effectiveness of two systematic instruction strategies: CTD and modified system of least prompts. Participants were three middle school students, aged 11 to 13, with a moderate ID (IQs ranged from 45 to 51). Texts were four adapted grade-level novels written at the first- or third-grade reading level. Each text consisted of 10 chapters and was adapted following recommendations provided in the related literature base; however, texts did not include pictorial supports. Individual chapters of a randomly selected text were read sequentially. The selected chapters were

read across five consecutive sessions before the next one was introduced. One of the researchers conducted all sessions of this study in a resource room. Each session began with the researcher providing training on wh-question words. As described in greater detail above, the researcher used CTD to teach the definitions for each wh-question word (i.e., who, what, when, where, how, and what) using a graphic organizer.

Next, the researcher had the participant read aloud a chapter of an adapted novel two times. During the first reading of the chapter, the researcher provided support (i.e., read the word) for words the participants did not know or mispronounced. After the chapter was read twice, the researcher asked six wh-questions. Participants were instructed to respond verbally or by pointing to the correct answer in the text. If the participant did not provide the correct answer within 30-s of the wh-question being asked, the researcher delivered the modified system of least supports. Each level of the prompting system was individually introduced in the order of the least obtrusive until the participant provided the correct answer. This first, second, and third levels of the prompting system were: (a) restate the wh-question and say its definition; (b) restate the wh-question, say its definition, and reread the portion of the text containing the correct answer; and (c) restate the wh-question, say its definition, reread the portion of the text containing the correct answer, and state the correct answer. Data were collected on the number of independent correct responses to wh-word definition questions and to comprehension questions. Data from this study established a functional relation between CTD and the participants' abilities to correctly identify the definition word associated with each wh-question word. In addition, the researchers found the participants' correct

responding to comprehension questions improved after the intervention was introduced. Participants' responding to comprehension questions remained high during the intermittent generalization probes conducted before chapters were used in the treatment condition. Last, participants' increased correct and independent responding to wh-questions after reading adapted chapters at maintenance. Therefore, the researchers concluded a functional relation was established between the systematic instruction and participants' independent and correct responding from baseline to intervention, generalization, and maintenance conditions.

In a second study, which was a doctoral research project, Zakas (2011) used a multiple probe across participants design to examine the effectiveness of systematic instruction on the use of a graphic organizer. The systematic instruction intervention used in this study included direct instruction and a modified system of least prompts. Participants were three middle school students with ASD who were assigned to an AA-AAS for at least one content area. Two participants also were diagnosed with a borderline/mild or a mild ID (IQ ranged from 61-69). The reading materials were created by the researchers using grade-level content, but written at the third-grade reading level. Each text summarized topics on United States history and included picture symbols that represented main ideas and key vocabulary. The researcher did not explicitly state the number of times individual texts were read. The graphic organizer contained nine parts, each listing a story-grammar concept for social studies content. The story-grammar concepts were: (a) event, (b) people, (c) location, (d) time, (e) first detail, (f) second

detail, (g) third detail, and (h) outcome. Participants wrote their responses in the graphic organizer.

The researchers trained a special education teacher to conduct all sessions of this study in a classroom. Before starting the study, the special education teacher taught participants in a whole group setting the definitions of seven story-grammar concepts for social studies content (i.e., event, people, location, time, detail, sequence, outcome). As described in the Direct Instruction section, training followed model-lead-text procedures with examples and nonexamples. After baseline was completed, the teacher taught individual participants how to complete a paper-based graphic organizer to summarize an informational text. The participant first read the text and then completed the graphic organizer under the direction of the teacher. In other words, the teacher asked the participant to identify the fact from the text that was related to the story-grammar concept presented as the title of a specific graphic organizer part. A vocabulary guide that listed each social studies concept and its definition was also displayed during sessions. All participants were expected to respond verbally. If the participant answered incorrectly, the teacher implemented a modified system of least prompts to offer assistance. First, the teacher asked the participant to state the definition for the story-grammar concept. The teacher then presented samples individually and requested the participant to identify which were examples and nonexamples. The participant then reread the expository text. Second, if the participant answered incorrectly again, the teacher reread the portion of the text containing the answer and then repeated the question. Third, if the participant required greater assistance, the teacher stated the correct answer and instructed the

participant to repeat it. After the participant provided the correct response, he or she was instructed to write it in the graphic organizer. The aforementioned procedures were followed until all parts of the graphic organizer were completed.

Participants who independently completed the graphic organizer with at least 78% accuracy (seven of nine parts) across three consecutive trials were then placed in the generalization phase. During generalization phase, the participant filled out the graphic organizer using untrained passages. No instruction was provided as the participant completed the graphic organizer. After the participant indicated he or she was finished, the teacher reviewed and scored the completed graphic organizer. The teacher then provided error correction feedback to the participant if he or she did not provide the correct answer in any graphic organizer parts. Depending on which occurred first, the generalization sessions continued until the participant completed the graphic organizer with 78% accuracy across for three consecutive trials, or read four to five texts. The participants were then placed into the maintenance phase one to six days after the date of the last session conducted in the generalization phase. In the maintenance phase, the participant read the text and then independently filled out the graphic organizer. After the participant completed the graphic organizer, the teacher reviewed and scored each graphic organizer part. The teacher then provided error correction feedback if a participant made any errors. Data were collected on the number of graphic organizer parts the participants independently completed. The findings from Zakas (2011) established a functional relation between the systematic instruction and the participants' abilities to independently fill out the graphic organizer after reading social student texts. Data also

indicated participants retained their improved understanding of social studies texts, measured as the ability to independently complete the graphic organizer, in the generalization and maintenance phases.

In a third study, which was a dissertation research project, Wood (2014) used a multiple probe across participants design to evaluate the effectiveness of systematic instruction on the listening comprehension for students with a moderate ID (IQs of 55 or below). Participants were three elementary students between the ages of 8 and 11 years. Approximately 50 electronic texts published on the Discovery Education website and written at the Kindergarten to second-grade reading level were used. All texts covered topics related to elementary science standards. Two texts were randomly selected for each session, but were only read one time. The researcher did not explicitly state whether materials were used across sessions. The researcher trained two special education teachers to deliver the intervention in a special education classroom. The systematic instruction intervention used in this study included CTD and a modified system of least prompts. The special education teachers first used CTD to teach participants to generate questions using a template on an iPad2. Next, the special education teachers instructed participants to listen the electronic text. Last, the special education teachers asked participants five factual recall questions. The researcher created four of these beforehand, while the participant generated one before listening to the text. Participants were required to respond to questions verbally. If the participant did not initiate a response within 5-s, or did not provide the correct answer within 30-s of the question being asked, the special education teacher implemented a modified system of least prompts. The first level

prompt had the teacher (a) offer a think-aloud (i.e., interventionist said, “I heard the answer, I’m going to use the question topic words, find them in the text, and replay that part of the story”), (b) provide a model of looking at the topic words on the iPad then identifying the words in the text, and (c) highlight and replay the section of the text containing the answer. If needed, the second level prompt repeated the three supports of the aforementioned first level prompt, but the final support of the second level required the teacher to only highlight and replay the sentence containing the answer rather than the entire section of the text. If needed, the third level prompt had the teacher (a) state he or she heard the answer, (b) instruct participants to listen again, (c) highlight and replay the correct answer, (d) repeat the correct answer, and (3) instruct the participant to repeat the correct answer. Immediately after the five comprehension questions were answered, participants were asked to generate one more question without the support of the template. In addition to the intervention phase, the researcher collected four data points for each participant in a generalization condition. A general education teacher conducted these generalization sessions with individual participants in a general education classroom. Data from this study established a functional relation between the use of systematic prompting (i.e., constant time delay, system of least prompts) and increased abilities to generate questions using a template on an iPad2 and answer comprehension questions. The findings from Wood (2014) also indicated the number of questions generated and answered about texts by participants remained high and above baseline when assessed in the generalization phase.

In a fourth study, Wood, Browder, and Flynn (2015) used a multiple probe across participants design to evaluate the effectiveness of systematic instruction on the abilities of participants to generate and answer questions. The systematic instruction used in this study included two modified systems of least prompts. Participants were three middle school students, aged 10 to 11, with a moderate ID (IQs ranged between 48 and 51). Each participant had a listening comprehension level between the first- to second-grade equivalency. Texts used were selected sections of chapters from a fifth-grade social studies textbook. Unique to this study, the researchers did not adapt selected sections for the purposes of the investigation. Instead, the researchers divided chapters into multiple sections that included approximately 150 to 250 words. Two sections were randomly selected from a pool designated for use in specific phases of the study. While texts could be randomly selected more than once, none were used in consecutive sessions. The researchers trained a special education teacher and general education to deliver the intervention in the intervention condition or generalization condition, respectively.

During a session in the intervention condition, the special education teacher introduced the intervention in four steps to individual participants in a special education classroom. The two randomly selected sections were read three times each within a single session. All four steps described below were followed for the first readings of a section within a session. For the second reading of a section, the teacher generated the question (step two) and then followed third and fourth steps described below. The questions generated by the teacher were selected from a pool created by the researcher before the start of the study. For the third reading of a section, the teacher followed the second,

third, and fourth steps described below. For the first step of the activity, the special education teacher completed a brief prereading activity that included reading a summary section that provided background information on the target section and then presenting and reviewing a picture related to the summary section. The teacher then read the heading of the target section and presented and reviewed pictures related to the target section. The teacher finished the prereading activity by reading the question words listed on the top of the graphic organizer and then stated their meanings. For the second step of the activity, the special education teacher instructed the participant to generate a question. If the participant did not generate a question within 5-s of the directive, the teacher implemented the first modified system of least prompts. The first level consisted of the teacher providing a verbal prompt (i.e., said, “To make a question, first think about the words in the heading. Then pick a wh-word to ask about the head.”). If the participant did not respond within 5-s of the first prompt, the second level of the hierarchy consisted of the teacher providing a model prompt (i.e., said the steps while selecting one of the five question words and matching it to the heading of the target text). If the participant made an error at any time, the teacher stopped the student and completed the steps previously modeled. Once a question was generated, the teacher wrote the question in the appropriate space on the graphic organizer. For the third step of the activity, the teacher instructed the participant to listen for the answer and then read the target section aloud. The participant was expected to raise a prop (i.e., small red stop sign made out of cardboard and a popsicle stick) if he or she heard the correct answer. For the fourth step of the activity, the teacher asked the participant whether he or she heard the answer after

the target section was read, or after the participant raised the prop, whichever occurred first. The participant responded by marking the “in the book,” “not in the book,” or “I don’t know” box on the graphic organizer. If the participant correctly marked “not in the book,” the teacher did not provide any more instruction on the question generated for the target section read. If the participant marked “I don’t know” or “not in book” and the answer was in the section, the teacher: (a) stated he or she heard answer in the book, (b) pointed to the answer while repeating the question, and (c) read the answer aloud. If the participant marked “I don’t know” or “in the book” and the answer was not in the section, the teacher said, “The answer is not in the book. We need more information to answer this question.” If the participant correctly marked “in the book” and the answer was in the section read, the teacher instructed the participant to provide the answer. If the participant did not provide the correct answer with 5-s of this instruction, the teacher implemented the second modified system of least prompts. Each level of the prompting hierarchy was provided in the order of the least obtrusive until the correct answer was provided. The first level prompt consisted of the teacher: (a) stating he or she heard the answer the book, (b) instructing the student to listen for the answer, (c) reading the sentence containing the correct answer, and (d) repeating the question. If needed, the second level prompt consisted of the teacher: (a) stating he or she heard the answer in the book, (b) pointing to the answer in the book as he or she reads it aloud, and (c) repeating the question.

In addition to the intervention phase, data were collected for each participant in a generalization condition once a week. A general education teacher conducted

generalization sessions with individual participants in a general education classroom. However, peers also participated in the reading activity. Procedures were similar to those followed in the intervention condition with one exception: peers from the class were asked to write the questions and answers dictated by participants in a journal rather than a graphic organizer. Participants advanced into the maintenance condition after they met a mastery criterion (80% independent correct responding across three days). Data were collected on three dependent variables: (a) the number of questions independently and correctly generated and answered in the baseline, intervention, and maintenance conditions; (b) the number of questions independently and correctly generated in the generalization condition; (c) the number of questions independently and correctly answered in the generalization condition. The findings of this study indicated all participants made mean increases in their abilities to correctly generate and answer questions about a text after the intervention was introduced. Participants' data remained high and above baseline in the generalization condition.

In a fifth study, Spooner et al. (2015) used a multiple probe across participants design to evaluate the effectiveness of systematic instruction on the comprehension levels of participants with a severe disability (IQ of 55 or below). Participants were five elementary students, aged 7 to 11 years, with an ID. Two participants were reported to have IQs between 47 and 50. As explained in the Direct Instruction section, the intervention package included CTD, system of least prompts, and direct instruction. The purpose of the training was to build the participants' generalization of literacy skills to a shared story-reading activity during which support was not provided. Literacy skills

focused on were book awareness skills (e.g., identify title and author, turn pages) and responding to listening comprehension questions. The short stories were two pages in length with each page including three to four sentences. The short stories used in this generalization training were read aloud to participants on an iPad2. Generalization training was provided immediately after a session was completed in the intervention condition. Sessions were administered by one of the researchers with individual participants in a resource room.

During the generalization training, the iPad2 was programmed to provide direct instruction on a variety of emergent literacy skills. The participant then listened to a short story read on the iPad2. CTD was used to teach motor responses while listening to the short story (e.g., turn pages). After the short was read, the iPad2 presented a comprehension question with four response options. The four response options were presented as titled picture symbols. Response options included the correct answer, two foil options, and a question mark symbol. The participant was trained to select the question mark if he or she did not know the correct answer. If the question mark symbol was selected, the iPad2 was programmed to turn to a page with a section of the text highlighted that included the correct answer. If the participant selected the question mark a second time, the iPad2 was programmed to turn to the page with a more focused section of the text highlighted that included the correct answer. A system of least prompts was used to train participants to select the question mark symbol if they provided an incorrect answer. The prompting system included a verbal, model, and physical prompt and each individual prompt was delivered in the order of the least intrusive (i.e., verbal, then

model, then physical). During sessions in the primary intervention condition, the researchers collected data on the number of listening comprehension questions the participant independently and correctly answered. Outcome data from Spooner et al. (2015) established a functional relation between the systematic instruction intervention and participants' generalization of literacy skills during the shared story-reading activities.

Summary of systematic instruction. A growing body of research exists suggesting systematic instruction can be used to improve the text-based comprehension levels of students with SDD. First, this review highlighted seven studies that used direct instruction with students with SDD. One of the seven studies used a published reading and language program built upon the principles of the direct instruction (Flores et al., 2013). The special education teachers in Flores et al. also used model-lead-test procedures to correct errors made by participants with ASD and ID. Six of the seven studies provided direct instruction using model-lead-test procedures with examples and nonexamples to students with SDD (Knight, 2010; Knight et al., 2012; Knight et al., 2013; Spooner et al., 2015; Zakas, 2011). One of these six studies provided direct instruction using model-test procedures with examples and nonexamples with students with a moderate ID (Hudson & Browder, 2014). Researchers provided direct instruction to teach science concepts (Knight et al., 2012). Researchers used direct instruction to provide training on concepts and vocabulary words that were later presented on a graphic organizer (Knight et al., 2013; Zakas, 2011). Researchers also used direct instruction to teach concepts or vocabulary words that were described in fictional and expository texts

(Hudson & Browder, 2014; Knight, 2010; Spooner et al., 2015; Zakas, 2011). Moreover, researchers provided direct instruction on wh-question words the students with SDD were expected to answer after reading a text (Hudson & Browder, 2014). Although more research is indeed needed, the literature does offer preliminary evidence that providing direct instruction on important vocabulary and concepts may help improve the text-based comprehension levels of students with SDD while reading or listening to texts (Hudson & Browder, 2014; Knight, 2010; Spooner et al., 2015; Zakas, 2011).

Second, an additional 15 studies were identified that successfully used a system of least prompts during a shared story-reading activity (e.g., Hudson et al., 2014; Mims, Hudson, et al., 2012; Mims, Lee, et al., 2012) or before/after a text was accessed to support students with SDD (e.g., Browder et al., 2013, Mims, Lee, et al., 2012; Zakas, 2011). More studies had students with SDD access fictional texts ($n = 10$) than expository texts ($n = 6$). Ten of the 15 reviewed studies provided examples for how to modify a system of least prompts (Browder et al., 2013; Hudson & Browder, 2014; Hudson et al., 2014; Mims, 2009; Mims, Hudson, et al., 2012; Mims, Lee, et al., 2012; Spooner et al., 2014; Wood, 2013; Wood et al., 2015; Zakas, 2011). The significance of using a modified system of least prompts is that the interventionist provides guided assistance to help these students answer questions before disclosing the target answer. Almost all of these noted studies used a modified system of least prompts that trained students with SDD listen for the target response as progressively narrower sections of were reread aloud before attempting to answer a question again (e.g., Hudson and Browder, 2014; Mims, Hudson, et al., 2012; Spooner et al., 2014; Wood et al., 2015). However, a few

also provided explicit instruction on the rules for answering the wh-question word presented in the question (e.g., Hudson & Browder, 2014; Mims, Hudson, et al., 2012). One of the described studies introduced a novel modified system of least prompts that included a think aloud prompt that may help students answer inferential questions (Hudson et al., 2014). One also provided an example for how to use a modified system of least prompts to teach students with SDD to generate questions about a text (Wood et al., 2015).

Of particular interest to this study, four studies were identified that used graphic organizers with students with SDD (Mims, Hudson, et al., 2012; Mims, Lee, et al., 2012; Wood et al., 2015; Zakas, 2011). For instance, Mims, Lee, et al. (2012) taught students with moderate and severe developmental disabilities to complete a KWLH chart after listening to a nonfiction text using a model. Students in this study used the chart to explain (a) what they knew about the topic described in the text, (b) what they wanted to know about the topic, (c) how they will learn, and (d) what they learned. Mims, Hudson, et al. (2012) taught students with moderate and severe developmental disabilities to sequence the first, second, and third events described in biographies. Zakas (2011) taught students with ASD to summarize informational texts using a graphic organizer using a modified system of least prompts. In a similar study, Mims, Hudson, et al. (2012) trained students to sequence the three main events of a biography using a graphic organizer with the support of a modified system of least prompts. Wood et al. (2015) trained a special educator to complete a graphic organizer as students with a moderate ID generated and answered questions about science texts.

While the overall literature base substantiates the use of a modified system of least prompts to support the comprehension levels of students with SDD, there is a need for future studies to strengthen this line of research by limiting the extent these students are exposed to the same questions and texts across sessions. It is understood repeated reading is one of the foundations of the shared story-reading strategy used in many of these studies. It is also acknowledged the learning characteristics of students with SDD suggest it is unlikely they will retain all information described in a given passage after it accessed one or two times. However, the repeated use of materials across sessions should be kept to a minimum. Giving greater consideration toward controlling the amount of times materials during training and assessment sessions will help strengthen the overall quality of evidence in this line of research. One method researchers have used to address this limitation is to present novel questions each time a text is reread (e.g., Hudson & Browder, 2014; Spooner et al., 2014; Wood et al., 2015). For example, Hudson and Browder (2014) used a novel subset of a larger set of questions in each comprehension probe. Spooner et al. (2014) randomly selected one of four comprehension questions to ask during a single session. Wood et al. (2015) randomly selected texts from a pool that were not used in the prior session.

A second gap in the literature is none of the studies identified included students in high school grades. More research should be conducted with students with SDD in high school grade levels given the well-documented academic and vocational importance of reading (Mastropieri & Scruggs, 1997; Morgan et al., 2011; Shur & Taber-Doughty, 2012). Furthermore, research indicates students in secondary grade levels are expected to

complete reading-based activities based on information presented in textbooks (Berkeley & Riccomini, 2013).

Since the ultimate goal of reading instruction is to teach independence, there is also a need for future research to identify effective ways to use systematic instruction to teach students with SDD independent reading skills. The current literature indicates students with SDD can learn key concepts and vocabulary after receiving direct instruction. Research also substantiates the use of a modified system of least prompts to support these students during a shared story-reading activity. However, only one study offered evidence students with SDD may be able to generalize skills learned to a shared story-reading activity when no support is provided after a systematic instruction package was introduced (i.e., system of least prompts, CTD, direct instruction; Spooner et al., 2015). Two of the aforementioned studies offer preliminary evidence students with SDD may be able to learn how to complete a graphic organizer in order to extract key facts from texts (Mims, Hudson, et al., 2012; Zakas, 2011). Both studies trained students with SDD to complete a graphic organizer using a modified system of least prompts. While students in Mims, Hudson, et al. (2012) increased in the overall number of correct unprompted responses, data were not reported on the students' with moderate and severe developmental disabilities abilities to use the graphic organizer separately. Zakas (2011) provided evidence students with ASD can complete a graphic organizer with and without support after receiving training using a modified system of least prompts. However, more research is needed to determine whether learning to complete a graphic organizer is an attainable independent reading skill for students with SDD. There is also a need for

research to extend the Zakas (2011) to evaluate whether students with SDD are able to retain information from a text after summarizing it using a graphic organizer.

Use of Graphic Organizers to Support Academic Instruction

Graphic organizers are visual tools that depict “the relationship between facts, terms, and/or ideas within a learning task” (Hall, Meyer, & Strangman, 2005, p. 173). Research purports teaching students to extract key facts from texts can help improve their abilities to remember what they read and in effect increase their comprehension levels (NRP, 2000). Graphic organizers can be used to support instruction across core content areas due to their structural flexibility (Watson, Gable, Gear, & Hughes, 2012). Graphic organizers can include (a) cognitive maps, (b) semantic maps, (c) semantic feature analysis, (d) visual displays, (e) advanced organizers, (d) visual displays, and (e) Venn diagrams (Vaughn & Edmonds, 2006).

The current literature base offers the strongest evidence for the use of graphic organizers to support academic instruction with students with learning disabilities (LD; e.g., Ciullo & Reutebuch, 2013; Dexter & Hughes, 2011; Kim, Vaughn, Wanzek, & Wei, 2004). In one review, Kim et al. (2004) identified 21 group-design studies published between 1963 and 1997 that examined the effects of graphic organizer training on the reading comprehension levels of students with LD. The findings of this analysis revealed the majority of the reviewed studies used graphic organizers categorized as semantic organizers ($n = 9$) and cognitive maps without a mnemonic ($n = 7$). A smaller number of studies used cognitive maps with mnemonic ($n = 3$) or framed outlines ($n = 2$). The researchers noted teaching students with a LD to use graphic organizers, regardless of

their category, was associated with large effects on reading comprehension measures. Both teacher/researcher-developed and student-developed graphic organizers had large effects, but teacher/researcher-developed graphic organizers yielded the highest effect sizes. In addition, graphic organizer training was associated with large effect sizes for students at upper-elementary, intermediate, and secondary grade levels.

In a second review, Dexter and Hughes (2011) reviewed 16 group-design studies conducted between 1975 and 2009 that included students with LD. Unlike Kim et al. (2014), these researchers analyzed the effects of graphic organizers by academic content areas (English/reading, science, social studies, math) and measure of comprehension (near, far). Graphic organizers were identified as (a) cognitive maps, (b) semantic maps, (c) semantic feature analysis, (d) syntactic/semantic feature analysis, and (e) visual displays. The researchers noted the majority of reviewed studies offered graphic organizer training using direct and explicit instruction. They explained studies typically began with one to two sessions during which explicit instruction was given on how to use the graphic organizer. Next, studies offered one to two guided practice sessions during which supports were given. Last, studies examined their respective participants' independent use of the graphic organizer. The findings of this review suggested the overall use of graphic organizers was associated with moderate to large effects on posttest and maintenance comprehension measures. Teaching students with LD to use graphic organizers had large effects on their comprehension levels in English/reading, social studies, and science content areas. However, the use of graphic organizers had moderate effect sizes on the comprehension levels of students with LD in math. While

large maintenance effect sizes were found in science, the findings of this review indicated graphic organizer training yielded moderate maintenance effect sizes in math and science content areas. Finally, graphic organizers had a large effect on near comprehension measures (e.g., application questions directly related to content reviewed) and a moderate effect on far comprehension measures (e.g., application questions not directly related to content reviewed).

In a more recent review, Ciullo and Reutebuch (2013) examined the efficacy of computer-based graphic organizers with students with a LD. Twelve studies, single-subject and group design, published between 1996 and 2012, were identified. Similar to Dexter and Hughes (2011), effects of graphic organizers were examined by content area: (a) social studies, (b) writing, and (c) reading comprehension of narrative texts. The researchers concluded evidence supporting the use of graphic organizers to supplement instruction was strongest in social studies content, emerging in writing, and inconclusive in reading comprehension.

Collectively, the literature base substantiates the use of graphic organizers with students with LD. Both paper- and computer-based graphic organizers were found to be particularly effective when used to support instruction in social studies (e.g., Boon, Fore, Blankenship, & Chalk, 2007; DiCecco & Gleason, 2002), science (e.g., Bos & Anders, 1992), and math content areas (e.g., Ives, 2007). However, paper-based graphic organizers had larger effects on student learning in English (e.g., Englert & Mariage, 1991; Mastropieri & Peters, 1987) than computer-based graphic organizers (e.g., Stetter & Hughes, 2011; Wade, Boon, & Spencer, 2010). The literature also suggests the use of

explicit and direct instruction may be an effective way to teach students how to use a graphic organizer when accessing academic content (e.g., Dexter & Hughes, 2011). Researchers should examine whether similar positive findings could be found with students with SDD after receiving training.

Evidence of success. The use of graphic organizers to support academic instruction for students with SDD is beginning to unfold. Research has used graphic organizers as part of curricula to teach early numeracy skills, equation solving, data analysis, and geometry with students with a moderate or severe ID and ASD (e.g., Browder & Spooner, 2014; Browder, Wood, Thompson, & Ribuffo, 2014; Jimenez & Kemmery, 2013). Graphic organizers have been used to teach students with moderate or severe ID and ASD science concepts (e.g., Browder et al., 2014; Jimenez et al., 2009; Knight et al., 2013). In the aforementioned Systematic Instruction section, six of the studies reviewed used a paper-based graphic organizer to support the text-based comprehension levels of students with SDD (Browder et al., 2013; Knight et al., 2013; Mims, Hudson, et al., 2012; Mims, Lee, et al., 2012; Wood et al., 2015; Zakas, 2011). Three studies used graphic organizers to support instruction on important vocabulary words and concepts to students with SDD (Browder et al., 2013; Knight et al., 2013; Mims, Hudson, et al., 2012). For example, Browder et al. (2013) taught participants to use a graphic organizer to match wh-definition word cards with their associated definition word cards and example cards. The graphic organizer was displayed on an 8 x 11 piece of paper with three columns. One of three columns were titled “WH word,” “definition word,” or “examples.” Participants were three middle school students, aged 11 to 13,

with moderate ID (IQs ranged from 45 to 51) who were identified as emergent readers. The researchers used CTD to support participants while they completed the graphic organizer. Data from this study established a functional relation between CTD training and the participants' abilities to correctly match the wh-definition word cards and example cards with the appropriate wh-question word cards.

In a similar study, Knight et al. (2013) used graphic organizers to support instruction on the concept of convection. Participants were three middle school students with ASD and moderate to severe ID (IQs ranged from 40 to 55). The researchers first taught the definitions of related vocabulary words using CTD. The researchers then taught participants to complete a T-chart to sort examples and nonexamples of different concepts. The researcher taught participants to complete the T-chart using model-lead-test procedures with examples and nonexamples. Training continued until participants met a mastery criterion. Last, the researchers offered explicit instruction with corrective feedback to teach participants how to complete a weather-cycle graphic organizer. Unique to Knight et al. (2013), the materials and overall design of the weather-cycle graphic organizer was changed throughout training. Data from this study established a functional relation between the systematic instruction and the number of correct steps performed by participants to complete the weather-cycle graphic organizer.

Mims, Hudson, et al. (2012) also used a graphic organizer to provide explicit instruction on wh-question words to participants with a moderate or severe developmental disability. The graphic organizer was displayed as T-chart that listed five wh-question words (i.e., what, why, who, when, and where) and rules to answer each wh-

question type (e.g., the rule for what was “listen for a thing”). The researchers used the T-chart as part of the first level supports provided within a system of least prompts in this study. More specifically, the researchers displayed the graphic organizer in order to identify the wh-question presented in the question (e.g., “this is a *WHO* question”) and its associated rule (e.g., “when you hear *WHO*, listen for a name”) if a participant did not provide the correct answer after a question was initially asked.

However, Mims, Hudson, et al. (2012) also used a second graphic organizer to help participants organize their response while answering sequence questions during a reading activity. This second graphic organizer was designed as a flowchart with three squares that, when read left to right, had the following words written inside each respective square: (a) “first,” (b) “next,” and (c) “last.” In addition, a black horizontally aligned arrow was presented in the middle of the first and second squares as well as between the second and third squares. Participants completed the flowchart using response cards created by the researchers that presented title picture symbols. The researchers used a modified system of least prompts to help participants answer sequence questions using the flowchart. Although data on the participants’ abilities to sequence the main events using a graphic organizer were not reported separately, findings from Mims, Hudson, et al. (2012) indicated independent responding to comprehension questions increased after the intervention was introduced.

Mims, Lee, et al. (2012) also used a graphic organizer to support the comprehension levels of participants during a research activity. Participants included 15 middle school students with a moderate developmental disability (IQs ranged from 40 to

65). A special education teacher had participants complete the graphic organizer after listening to and then identifying the main topic of a short nonfiction passage. The graphic organizer consisted of a KWHL chart that required participants to explain (a) what they knew about the topic, (b) what they wanted to know about the topic, (c) how they will learn, and (d) what they learned. The teacher provided a model before participants completed each part of the graphic organizer. Participants completed the graphic organizer using researcher-created response options.

Similar to Mims, Hudson, et al. (2012), Wood et al. (2015) also used a graphic organizer to help the participants organize their responses after an interventionist read a text. Participants included three middle school students, aged 10 to 11, who had a moderate ID (IQs ranged from 48 to 51). At the top of the graphic organizer, there were six question words listed with a pictorial representation of the noted word (i.e., who, what, when, where, why, how). Underneath, a five-column table was displayed that, if read left-to-right, presented the follow response options: (a) “question,” (b) “answer,” (c) “in the book,” (d) “not in the book,” and (e) “I don’t know.” During sessions in the intervention condition, the participants or a special education teacher first generated a question before reading a section of a social studies text. The questions generated by the special education teacher were selected from the three questions prepared by the researcher. The special education teacher then wrote the question that he she selected or the participant dictated in the appropriate spot on the graphic organizer. The special education teacher then read the selected section of the text. Finally, the participants used the graphic organizer to mark “in the book,” “not in book,” or “I don’t know” after being

prompted to indicate whether they heard the answer to the question. The special education teacher was trained to follow a modified system of least prompts to help participants correct errors in completing the described section.

Zakas (2011) also used a modified system of least prompts to train middle school participants to complete a graphic organizer. Unlike the aforementioned studies, participants in this study completed the graphic organizer in order to summarize key details from texts. Participants in this study included three students with ASD between the ages of 11 and 13 years. Two participants also had borderline/mild or a mild ID (IQs ranged from 61 to 69). Each part of the graphic organizer used in this study was titled with one of the following story-grammar concepts for social studies content: (a) event, (b) people, (c) time, (d) location, (e) first detail, (f) second detail, (g) third detail, and (h) outcome. After participants read an informational text, a special education teacher followed an instructional script to help the participant complete the graphic organizer. If needed, the teachers implemented the individual levels of a modified system of least prompts to help the participant complete a graphic organizer part. Participants wrote their answers in the correct graphic organizer parts. Findings from this study suggested a functional relation was established between the systematic instruction and participants' improved responding while completing the graphic organizer. Data also revealed participants continued to accurately complete the graphic organizer without any assistance when assessed at generalization.

While more research has trained students with SDD to complete a paper-based graphic organizer using a system of least prompts or CTD (e.g., Browder et al., 2013;

Mims, Hudson, et al., 2012; Zakas, 2011), Schenning, Knight, and Spooner (2013) found direct instruction may be another effective also approach (model-lead-test). In Schenning et al., participants learned to complete the graphic organizer as they carried out a seven-step guided inquiry procedure while listening to brief passages on social studies content. Participants were three middle school students with ASD who were between the ages of 11 and 13 years. Two participants had a coexisting moderate ID (IQ of 55 or below), while one had a severe ID (IQ of 33). The researchers created 17 adapted passages on various history topics related to Ancient Rome, the Renaissance, the Middle Ages, and the French Revolution that were written at the second- to third-grade reading level. The graphic organizers included seven parts that listed the following actions: (a) “describe what you see in a picture,” (b) “identify the problem,” (c) “predict a possible solution,” (d) “identify which solution was used,” (e) “decide whether the solution worked,” (f) “determine whether another solution is needed,” and (g) “offer an example for when they could use the same solution.” Using a multiple probe design across participants, the researchers trained a special education teacher to conduct all sessions of the study with individual participants in a special education classroom. After collecting baseline data, the teacher taught the definitions for problem and solution. Participants learned the definition for problem was “something is not working or a difficult situation.” They also learned solution meant something that “stops a problem.” Definitions were taught using CTD procedures. First, the teacher modeled selecting the definition then used 0-s time delay to prompt participants to select the correct definitions for vocabulary words (i.e., problem and solution). Second, the teacher gave the directive and permitted 5-s to elapse

before providing the controlling prompt. The aforementioned preintervention training continued until participants correctly matched both vocabulary words with their associated definitions across two consecutive sessions.

At intervention, the teacher read the brief passage describing the historical event two times in each session. During the first reading, the teacher used a model-lead-test procedure to help the participant perform each of the seven steps of inquiry methods using the graphic organizer. Six answer options were presented on a response board for the teacher and the participants to use to fill out the graphic organizer. First, the teacher modeled the process for finding the correct answer and placing it in the appropriate graphic organizer part. The teacher stated the question and then used a think-aloud to read the part of the passage or look at specific parts of the picture that provided the details necessary to identify the answer. The teacher then modeled how to select the correct answer on the response board and then where to place the identified answer card in the graphic organizer. Second, the teacher and participant completed the previously modeled step together. More specifically, the teacher: (a) placed the answer option back on the response board, (b) repeated the question, (c) told the participant to find the correct answer with him or her, (d) provided a verbal and/or physical clue to help the participant find the details in the text or picture necessary for finding the correct answer, (e) had the participant read aloud the correct answer option with him or her as they found it on the response board, and (f) used a gestural prompt to inform participant where to place the identified answer card on the graphic organizer. Third, the teacher repeated the question again and had the participant find the correct answer and place it the appropriate graphic

organizer part independently. If participants did not identify the correct response within 90-s of the teacher asking the question, the model-lead-test procedures were repeated. The described model-lead-test procedures were used to help the participants complete all seven steps of the inquiry method using the graphic organizer.

During the second reading, participants completed the aforementioned seven-step inquiry procedure as the teacher asked specific questions while reading the brief passage. Data were only collected on the number of independently correct steps executed by the participants during the second reading of the passage. The final step of the inquiry method that required the participants to identify when they could use the identified solution in their lives was used as a generalization probe. Participants moved into the maintenance phase once they were able to independently complete the graphic organizer with 85% accuracy across three consecutive probes. Outcome data indicated a functional relation between the explicit instruction on the seven-step inquiry method and participants' improved responding was established. Schenning et al. (2013) also reported participants maintained their improved performance during maintenance probes and were able to generalize this skill to real-life application. However, a limitation in this study was participants' abilities to perform the inquiry method were assessed immediately after they received systematic instruction on the same materials.

While there is evidence suggesting systematic instruction can be used to train students with SDD to complete a graphic organizer, less is known about whether this reading skill can promote these students' abilities to recall facts after it is completed. Douglas et al. (2009) used a single-subject design to examine the effectiveness of graphic

organizer instruction on participants' abilities to answer questions after listening to an adapted text. Participants were three students with a mild ($n = 1$) or moderate ($n = 2$) ID. Like Zakas (2011), participants in this study were trained to use paper-based graphic organizers to summarize texts. The texts were adapted versions of the first two chapters of a novel that were created and read to participants using Microsoft software. Each page of the electronic texts provided an image for the key vocabulary words and explicit instructions for participants to place their paper-based copies of the same images displayed on the screen on their paper-based graphic organizers. The paper-based graphic organizer contained five columns that were titled with one of the following wh-question words: (a) "who," (b) "what," (c) "when," (d) "where," and (e) "how." The electronic text presented a comprehension evaluation page after each instruction page. Comprehension pages displayed three images and told participants to identify the image that was presented on the previous page. If participants selected the correct image, the next page was presented. However, participants were instructed to repeat the previously presented instruction page if they selected the incorrect image. After the text and paper-based graphic organizer were completed, the researchers assessed participants' comprehension using open-ended questions. The researchers did not explicitly state whether the paper-based graphic organizer was available to participants during comprehension probes. No specific participant data were reported or graphed. However, the researchers noted all participants made improvements in the number of questions correctly answered after receiving the explicit instruction on the use of pictorial graphic organizers. The researchers also noted participants maintained their improved

comprehension with the use of graphic organizers during probes conducted the next day. However, the researchers did not report data on the extent participants completed the graphic organizer. The increases demonstrated in the number of questions answered might suggest the participants were also completing the graphic organizer. But the extent to which the graphic organizer training contributed to the participants' improved comprehension levels is unknown.

In a later study, Douglas, Ayers, Langone, and Bramlett (2011) used a multiple probe across participants design to examine the effectiveness of electronic functional text and pictorial graphic organizers on the comprehension of participants with mild and moderate ID (IQs ranged from 40 to 65). Participants included three middle school students between the ages of 13 and 15 years. Individual sessions were offered by one of the researchers in the special education classroom. The paper-based graphic organizer consisted of three separate, vertically aligned 7" x 27" poster board strips. Each strip was titled "Recipe," "Ingredients," or "Appliances." The participants learned to affix the researcher-prepared pictorial responses card to the Velcro tabs in the correct column as the electronic text was read aloud. The researchers used two versions of the same 12 functional texts in this study. Both versions included a title page, a page that listed the ingredients, and a page that listed the appliances or utensils for a given recipe. After these three pages, the texts presented 10 steps that provided the directions for completing the recipe. One direction was presented on each page. However, one version of the functional text included explicit instruction on how to complete the pictorial graphic organizer as the directions were presented. This explicit instruction explained under

which of the three headers (i.e., “Recipe,” “Ingredients,” “Appliances”) on the paper-based pictorial graphic organizers the participants needed to place the image displayed on the screen. After the page that presented the instruction, the electronic text displayed a comprehension evaluation page. Comprehension evaluation pages displayed three images and told participants to identify the image that was presented as part of the instruction on the previous page. If participants selected the correct image, the next page was presented. However, participants were instructed to repeat the previously presented instruction page if they selected the incorrect image. Both versions of the texts were read aloud to participants using audio recordings.

At baseline, participants listened as the electronic text that did include the graphic organizer instruction was read aloud. The paper-based graphic organizer and the images needed to complete it were available to participants while reading the texts; however, no directions to complete the graphic organizer were provided. The subsequent intervention phase consisted of two conditions: pictorial graphic organizer with computer instruction and pictorial graphic organizer without computer instruction. In the pictorial graphic organizer with computer instruction condition, participants listened as the electronic text with graphic organizer instruction was read aloud. The instruction was provided in the second version of the text, as described above. In the pictorial graphic organizer without computer instruction condition, participants listened as the electronic text without the graphic organizer instruction was read aloud. Immediately after participants listened to a text at baseline and intervention, the researcher asked three questions: (a) “tell me how to make a [said meal/snack],” (b) “what ingredients do you need to make a [said

meal/snack],” (c) “what appliances and utensils do you need to make a [said meal/snack].” Participants were instructed to respond verbally. The graphic organizer was available to participants while answering comprehension questions during session in both intervention conditions. After baseline data were collected, participants remained in the pictorial graphic organizer with computer instruction condition until they were able to answer three comprehension questions with a minimum of 90% accuracy for three consecutive sessions. The researcher then held sessions in the pictorial graphic organizer without computer instruction condition. Additionally, participants’ abilities to follow the steps of a recipe were measured once before and after the intervention were introduced as a generalization measure. Results of this study revealed a functional relation between the use of electronic text and pictorial graphic organizer and participants’ comprehension of texts. Pretest/posttest data collected in the generalization condition indicated the number of steps participants were able to independently complete increased after receiving the graphic organizer training. Like the earlier study, Douglas et al. (2011) did not report data in graphs on the number of graphic organizer parts completed by participants. Therefore, the extent to which the graphic organizer instruction contributed to the participants’ improved comprehension of functional texts is unknown.

Summary of findings on graphic organizers. Research suggests graphic organizers can be used to support students’ with SDD text-based comprehension of academic and leisure texts. Researchers have used graphic organizers to support these students’ comprehension of content during reading activities (Douglas et al., 2009; Douglas et al., 2011; Mims, Hudson, et al., 2012; Schenning et al., 2013) and before or

after accessing a text (Mims, Lee, et al., 2012; Wood et al., 2015; Zakas, 2011). More studies had students with SDD complete the graphic organizers by using researcher-prepared response cards (Douglas et al., 2009; Douglas et al., 2011; Mims, Hudson, et al., 2012; Mims, Lee, et al., 2012; Schenning et al., 2013) than by writing in their responses (Zakas, 2011). All nine studies identified in this section used paper-based graphic organizers.

Graphic organizers were used to teach students with SDD a variety of skills. Researchers used graphic organizers to support instruction on wh-questions (Browder et al., 2013; Mims, Hudson, et al., 2012) and to help these students sequence events from a story (Mims, Hudson, et al., 2012). Researchers also trained special education teachers to complete a graphic organizer in order to document the questions generated and answered about an expository text by students with a moderate ID (Wood et al., 2015). Researchers also used a graphic organizer to help students with ASD and moderate or severe ID perform an inquiry method about an expository text (Schenning et al., 2013).

Of particular interest to the current study, three previously conducted studies were identified that taught these students to complete a graphic organizer in order to summarize an academic or functional text (Douglas et al., 2009; Douglas et al., 2011; Zakas, 2011). Two of these three studies used expository texts, while the remaining study used fictional texts. All three studies applied one or more systematic instructional strategies to teach students with SDD how to complete a graphic organizer. One study provided systematic instruction on key vocabulary presented on the graphic organizer before starting the intervention (model-lead-test with examples and nonexamples, Zakas,

2011). One used a modified system of least prompts to support these students while they completed the graphic organizer (Zakas, 2011). Two studies offered explicit instruction and visual supports with and without corrective feedback (Douglas et al., 2009; Douglas et al., 2011).

While findings from these three studies offered support, there is a need for more research on using a graphic organizer with students with SDD. Only one study was identified that provided data in graphs demonstrating students with SDD learned to summarize texts by completing a graphic organizer (Zakas, 2011). Future research is necessary to investigate the effectiveness of systematic instruction to teach students with SCD to complete graphic organizers. Additional research is also needed to determine if students with SDD can learn to independently complete graphic organizers.

There is also a need for future research to examine the benefits of learning to complete a graphic organizer for students with SDD. One study found the number of details related to a functional text retold by students with mild and moderate ID increased after learning to complete a graphic organizer, with and without support (Douglas et al., 2011). Another study reported the number of questions correctly answered about an academic text increased by students with mild to moderate ID after completing a graphic organizer with some support (Douglas et al., 2009). However, Douglas et al. (2011) was the only study that reported data in graphs. It is not known whether a functional relation was established in Douglas et al. (2009) between the graphic organizer instruction and the participants' comprehension of the academic text used. In a similar study, Mims, Hudson, et al. (2012) reported students with moderate and severe developmental disabilities

increased the number of questions answered; however, data specific to the questions that required these students' use of the graphic organizer to sequence events were not extracted from the overall data. More research is needed to determine whether an ability to independently complete a graphic organizer is associated with increases in comprehension of academic text after receiving training with this student population. In addition, future research should consider evaluating whether differences exist in these students' comprehension of text when assessed with and without the graphic organizer displayed.

Last, future research should examine the effectiveness of teaching students with SDD to complete a computer-based graphic organizer. One potential promise for the use technology is that students may learn to independently complete a graphic organizer using a text. Past research has overwhelmingly required students with SDD to use researcher-created response options to fill out graphic organizers (e.g., Douglas et al., 2011; Mims, Hudson, et al., 2012; Schenning et al., 2013). It is acknowledged the literacy and communication deficits substantiate the use of response cards with these students. However, requiring these students to use the text rather than researcher-prepared response cards in order to complete the graphic organizer may help substantiate that improvements were a result of the intervention and not other confounding variables. A second potential promise for the use of computers is that students may learn to engage with the text and complete a reading activity with some level of independence. The Read: OutLoud 6 software, developed by Don Johnson Inc., allows emergent readers to use its text-to-speech with dynamic highlighting capabilities to listen to stories. These readers are able

to access a graphic organizer on one side of the computer screen and the text on the other side. Perhaps most importantly, emergent readers are able to quickly and independently complete the computer-based graphic organizers using smart bookmarks.

Summary of Literature

The challenges teachers of students with SDD face trying to provide access and instruction in academic content areas are understood. The majority of these students are reported to have rudimentary literacy skills that consist of reading sight words, bullets, or simple sentences with little fluency and very basic understanding (Kearns et al., 2011; Towles-Reeves, Kearns, Kleinert, & Kleinert, 2009). To further complicate matters, the types of texts used in some academic content areas are argued to be more difficult than others (Saenz & Fuchs, 2002). The current literature base offers two possible methods teachers may apply to promote access to literature for these students: (a) the use of a shared story-reading activity and (b) the use of technology. Once access is achieved, the current literature base is rich with successful demonstrations of the use of systematic instruction to support the comprehension levels of students with SDD. This review identified six studies that offered vocabulary and concept training using direct instruction to students with SDD. Five of these six studies provided the direct instruction using model-lead-test procedures with examples and nonexamples (Knight, 2010; Knight et al., 2012; Knight et al., 2013; Spooner et al., 2015; Zakas, 2011). The purpose of the direct instruction in three of these five noted studies was to prepare students for vocabulary or concepts that would be described in the text (Knight, 2010; Spooner et al., 2015; Zakas, 2011). One of the six studies provided direct instruction on wh-question words using

model-test procedures with examples and nonexamples. The researchers noted the training was intended to prepare the students with a moderate ID to answer wh-questions after reading a text. Two studies used fictional texts (Hudson & Browder, 2014; Spooner et al., 2015) and two used expository texts (Knight, 2010; Zakas, 2011).

This review also highlighted a number of studies that used a modified system of least prompts to promote the students' with SDD text-based comprehension during shared story-reading activities (e.g., Hudson & Browder, 2014) as well as before or after accessing a text (e.g., Wood et al., 2015; Zakas, 2011). Ten studies were identified that suggested the modified system of least prompts could be used to promote these students' comprehension of text (Browder et al., 2013; Hudson & Browder, 2014; Hudson et al., 2014; Mims, 2009; Mims, Hudson, et al., 2012; Mims, Lee, et al., 2012; Spooner et al., 2014; Wood, 2014; Wood et al., 2015; Zakas, 2011). Rather than immediately disclosing the answer, researchers used a modified system of least prompts to provide explicit instruction on the definition or rules for answering a wh-question (e.g., Browder et al., 2013; Hudson & Browder, 2014; Mims, Hudson, et al., 2012). Similarly, students with ASD in Zakas (2011) were instructed to state the definition of a story-grammar concept and then identify examples and nonexamples of the noted concept. Researchers have used system of least prompts that offer two separate rereads of progressively more focused sections of a text before stating the correct answer (e.g., Browder et al., 2013; Hudson & Browder, 2014; Hudson et al., 2014; Spooner et al., 2014; Wood, 2014). While more research is needed overall, more studies had students with SDD access fictional texts than expository texts. A particular strength revealed in the literature on the use of systematic

instruction to teach readings skills is that it appears to support generalization. Several of the studies reviewed reported participants' responding during shared story-reading activities remained high when accessing untrained texts with the support of a modified system of least prompts (e.g., Hudson & Browder, 2014; Mims, Hudson, et al., 2012). Of interest to the current study, students in Zakas (2011) were able to successfully complete a graphic organizer without any assistance from the teacher after training was provided.

While the status of the current literature base on a modified system of least prompts is promising, there is a need for future research to explore whether this systematic instruction strategy can be used to teach an independent reading skill to students with SDD. Although effective, the overall procedures followed while using a modified system of least prompts during a reading-based activity are directed by the interventionist. Research needs to investigate whether students with SDD can learn to independently apply the skills emphasized in the prompting system (e.g., reread parts of a text, remember definitions and rules of specific wh-questions). One approach experts have taken to promote independence is to use the systematic instruction strategy as part of generalization training. For instance, Spooner et al. (2015) used a modified system of least prompts to help students with moderate or severe ID answer a question about a short story not related to the text read in the primary intervention condition. Spooner et al. (2015) also provided direct instruction on vocabulary introduced in the text read to participants during the primary intervention condition. Findings from this study suggested these students demonstrated mean increases in their independent responding

during a shared story-reading activity in the primary intervention condition when no prompting was provided.

Another approach experts have investigated is to use systematic instruction to provide training on the steps for completing a graphic organizer. Five studies described in this review successfully used a systematic instruction strategy to train students with SDD to complete graphic organizers using facts from texts with some level of independence (Douglas et al., 2009; Douglas et al., 2011; Mims, Hudson, et al., 2012; Schenning et al., 2013; Zakas, 2011). One study had students with moderate and severe developmental disabilities use a graphic organizer to sequence events (Mims, Hudson, et al., 2012). Another had students with moderate or severe ID use a graphic organizer to execute an inquiry method (Schenning et al., 2013). Three of the five noted studies had students with SDD use the graphic organizers to summarize key facts in academic (Douglas et al., 2009; Zakas, 2011) or functional texts (Douglas et al., 2011). Of these three studies, one measured and graphed data that suggested these students' abilities to complete the graphic organizer improved after receiving training (Zakas, 2011). Zakas also provided evidence these students were able to independently complete the entire graphic organizer before any support was given when assessed in the generalization phase. In addition, one of the three noted studies measured and graphed data indicating the abilities of students with SDD to answer questions about texts improved after learning how to complete a graphic organizer to summarize texts (Douglas et al., 2011). Students with mild to moderate ID in Douglas et al. (2011) answered questions with the graphic organizer displayed after it was completed. The results from Douglas et al. also indicated the

number of questions correctly answered with the graphic organizer displayed remained high for all students after the explicit instruction on how to complete the graphic organizer was faded. While Douglas et al. (2009) also reported the number of facts recalled by students with mild to moderate ID improved after learning to complete a graphic organizer, instruction on the steps for completing the graphic organizer was never faded. However, the two studies by Douglas and colleagues (2009, 2011) did not report data in graphs on the students' abilities to complete the graphic organizers. While it is likely students in these two studies were completing the graphic organizer since the number of questions answered increased after the intervention, it is not known for sure. Therefore, it is unknown whether the ability to complete the graphic organizer was associated with increases in the number of questions correctly answered.

More research is needed to inform decisions regarding the efficacy of using specific systematic strategies to teach independent reading skills to students with SDD. Only a small number of studies have been conducted that taught students with SDD how to complete a graphic organizer about an academic or functional text (Douglas et al., 2009; Douglas et al., 2011; Mims, Hudson, et al., 2012; Schenning et al., 2013; Zakas, 2011). Even less research has evaluated whether teaching these students to complete a graphic organizer to summarize a text promoted their abilities to recall facts afterward (Douglas et al., 2009; Douglas et al., 2011). By combining two empirically supported systematic instruction strategies, direct instruction and system of least prompts, the current study measured the extent students with SDD were able to independently complete a computer-based graphic organizer, to independently recall key facts, and to

answer comprehension questions with and without materials displayed after listening to informational texts.

Chapter Three

This chapter describes the research methods followed to investigate the effectiveness of systematic instruction on the steps for completing and using a computer-based graphic organizer on the comprehension levels of high school students with SDD. The specific components of the research method discussed are: (a) permission to conduct research; (b) participants; (c) setting; (d) research design; (e) materials; (f) dependent variables; (g) independent variable; (h) data collection and scoring procedures; (i) reliability, fidelity, and social validity; and (j) data analysis.

Permission to Conduct Research

Prior to starting, the researcher contacted Dr. Tracie Lynn Zakas to ask for permission to conduct an extension of her doctoral study (Zakas, 2011). The researcher met with Dr. Zakas to discuss the procedures of the current study and to collect copies of the informational texts, instructional scripts, and teaching materials.

Institutional Review Board Approval

Once approval was obtained from the Institutional Review Board at George Mason University (GMU; Appendix A), permission to conduct the current study was received from the director of the Adapted Program (pseudonym) for students with ID at Private High School (pseudonym). With the assistance of the director and a classroom teacher, students were nominated for participation. An introduction letter and consent

form (Appendix A) were then sent to the parents of each of the nominated students via e-mail. Once signed consent forms were returned to Private High School, the researcher asked the nominated students to give their assent to participate. The assent forms were written at a lower reading level in order to promote their understanding of content and read aloud by the researcher (Appendix A). Finally, the Language Arts teacher who worked with the nominated students signed a consent form.

Participants

Participants were four high school students, between the ages of 16 to 18 years, who were enrolled in the Adapted Program at Private High School. The participants met the following criteria: (a) eligible for special education services due to an ID and/or ASD, (b) enrolled in an adapted academic program aligned with alternate academic standards, (c) were previously found eligible to participate in the AA-AAS program in the state in which the current study was held before enrolling in Private High School, (d) had no significant vision or hearing impairment, (e) were able to communicate verbally, (f) were able to independently use a mouse or track pad on a laptop computer, and (g) regularly attended class with no more than two absences per semester. Additional eligibility requirements included demonstrating a listening comprehension grade equivalency of a second-grade level or below. The researcher reviewed the nominated participants' most recent performance on the Brigance Inventory of Early Development-III (Brigance) assessment, which was administered by the teachers at Private High School, to confirm their current listening comprehension levels. Participants' demographic information is available in Table 1. All of the participants' names are pseudonyms.

Table 1

Participant Demographic Information

Participant	Age	Ethnicity	Gender	Disability	IQ	Listening Comprehension GE
Jen	18	C	F	Intellectual Disability	50	1 st grade
Mary	18	C	F	Down Syndrome	56	Below 1 st grade
Cathy	18	A	F	Down Syndrome	N/R	2 nd grade
Tony	16	A	M	Autism	62	Below 1 st grade

Note. C= Caucasian; A = Asian; F = Female; M = Male; IQ = Intellectual Quotient reported in participants' educational records; N/R = Not reported; Listening Comprehension GE = Listening comprehension grade equivalency score measured using the Brigance assessment.

Jen. Jen was an 18-year-old, Caucasian, 12th grade female who received special education services for an ID. Her IQ was tested and reported as 50. On the Brigance assessment in 2015, Jen performed at the first-grade equivalency level on the Listening Comprehension measure. Jen spent most of her days at school in special education classrooms; however, she did participate in two elective courses in general education settings. She was also enrolled in a transition course that required her to complete various vocational tasks on and off campus. Jen received speech and language services twice a month. Jen's current literacy goals on her individualized education program included learning to use a text and her prior knowledge to answer factual and inferential questions. Jen was also learning to edit her writing for errors in capitalization, spelling, punctuation, and verb tense. The Language Arts teacher described Jen as a student who enjoyed

participating in the various activities throughout the school day, but was also very self-aware of her strengths and limits. This awareness often resulted in her being reluctant to participate in new activities. The Language Arts teacher explained Jen often required frequent reinforcement and instructional scaffolding to complete novel tasks. With that said, she was a very hard worker and took pride in completing activities independently after she received sufficient training. After earning a program completion certificate from Private High School, Jen reported she would be attending a postsecondary vocational training program for students with ID in a mid-Atlantic state.

During this study, Jen requested that informational texts be read using a male voice and at the slowest rate, -10, offered on the Read: OutLoud 6 software. She wore glasses and required content displayed on the laptop to be enlarged to 150%, but expressed no difficulties once this adjustment was made. Jen elected to complete all computer-based activities using the mouse touch pad on the computer rather than a mouse. She did demonstrate some difficulties at the beginning of this study using the mouse touch pad to highlight sentences that were displayed across more than one line in the text on the screen. However, Jen was able to independently and appropriately use the mouse touch pad to complete activities after she received training from the researcher. In addition, Jen initially required consistent prompting and positive reinforcement to encourage her to attempt to answer questions independently without any of the support materials displayed during independent practice with feedback sessions.

Mary. Mary was an 18-year-old, Caucasian, 12th grade female who received special education services for an ID. She had a medical diagnosis of Down syndrome and

reported IQ of 56 (WAIS-IV). On the Brigance assessment in 2015, Mary scored below the first-grade equivalency level on the Listening Comprehension measure. Mary's current individualized program of study at Private High School primarily consisted of special education courses. She also participated in two elective classes in general education settings. Additionally, Mary was enrolled in a transition course that required she complete various vocational tasks on and off campus. Mary's current literacy goals on her individual education program included learning how to sequence events and recall important facts after reading a text. Mary was also learning to write complete sentences with proper punctuation and grammar as well as to edit her writing for errors. The Language Arts teacher described Mary as a highly motivated student who approached each lesson with sincere enthusiasm and a desire to do her best work. Mary was observed to be very social young woman who got along well with her classmates with and without disabilities. After graduating from Private High School with a program completion certificate, Mary reported she would be attending a postsecondary academic and vocational program for students with ID and developmental disabilities at a mid-Atlantic university.

During this study, Mary requested that informational texts to be read by a male voice at the slowest rate, -10, when using the Read: OutLoud 6. Mary wore glasses and requested materials displayed on the computer to be enlarged to 150%; however, she expressed no other difficulties accessing materials once content was modified. She preferred to complete all computer-based activities using the mouse touch pad on the laptop computer rather than a mouse. Mary responded well to consistent feedback and

positive reinforcement. She was observed to self-correct her responses to questions using recommendations provided by the researcher during independent practice with feedback sessions. Mary was also observed to monitor her performance as a form of self-motivation during later sessions of this study.

Cathy. Cathy was an 18-year-old, Asian American, 11th grade female who received special education services for an ID. Her educational records indicated she has a medical diagnosis of Down syndrome, but they did not report an IQ score. In 2015, Cathy performed at the second-grade equivalency level on the Listening Comprehension measure on the Brigance. Her individualized program of study included five special education classes in special education classrooms; however, she did participate in three elective classes in general education settings. Cathy's current literacy goals on her individualized education program included learning to use a text and her prior knowledge to make predictions. Cathy was also learning to use correct verb tense in her writing and to edit her work for errors in grammar and punctuation. The Language Arts teacher described Cathy as a student who was very happy and social with her classmates, but was also very shy when completing lessons with teachers in the classroom. She was observed to require consistent prompting and encouragement to speak louder in order to participate in activities. Cathy also appeared to require considerable time to process instructions and complete tasks independently.

During this study, Cathy preferred that informational texts be read using a male voice and at the slowest rate, -10, offered by the Read: OutLoud 6 software. She wore glasses and in effect required all materials displayed on the laptop to be enlarged to

150%. Cathy preferred to complete all computer-based activities using the mouse touch pad instead of a standard-issue mouse. Cathy required consistent encouragement to keep her head up as well as to speak louder while answering questions throughout this study.

Tony. Tony was a 16-year-old, Asian American, 10th grade male who received special education services for an ASD. His IQ was tested and reported as 62. In 2015, Tony performed below the first-grade equivalency level on the Listening Comprehension measure on the Brigance. Tony's current literacy goals on his individualized education program included learning to sequence events described in a text and to make predictions about what might happen next. Tony was also learning to use proper grammar and punctuation in writing and to edit his work for errors. His current education program consisted of five special education classes in special education classrooms; however, he participated in three elective courses in general education settings. The Language Arts teacher described Tony as a very social and inquisitive young man who enjoyed researching topics he learned about in his classes on the Internet. He was also very creative and would tell stories about himself to his teachers using information he had learned on the Internet. Tony had a unique talent for remembering facts and dates, but often required reminders to focus on the topic at hand to complete tasks.

During this study, Tony preferred that informational texts be read by a male voice at the slowest rate, -10, offered by the Read: OutLoud 6 software. He wore glasses and in effect required all materials displayed on the laptop to be enlarged to 150%. Tony used a standard mouse to complete all activities on the computer. During sessions in the guided practice and independent practice with feedback conditions, Tony required frequent

reminders to only respond to the question asked. He also needed reminders to only use facts described in the informational texts to answer questions.

Setting

All participants were enrolled in an Adapted Program at a private high school located in a mid-Atlantic state. The Adapted Program was created less than 20 years before the study and served high school students with ID. A total of 16 students with ID, ASD, and other developmental disabilities were enrolled in the Adapted Program at the time of the current study. The Adapted Program offered special education courses aligned to alternate standards in language arts, math, and science. In addition to these classes, underclassmen (i.e., freshmen, sophomores) participated in three elective courses in general education settings. Upperclassman (i.e., juniors, seniors) participated in two elective classes and a transition course. Elective courses available to students were all grade-level options, such as driver's education, health education, weight training, biology, and astronomy. The transition course covered topics related to job etiquette and career planning. Students in the transition course also completed a wide variety of skills related to various vocations on and off campus. Unique to the Adapted Program, students without disabilities served as peer mentors in the classes in which the students in the Adapted Program were enrolled in both special and general education settings. All students enrolled in the Adapted Program were on the same four-year graduation schedule as their peers without disabilities and would earn a program completion certificate. Upon graduating, students typically returned to their respective base schools

within a public school system or a postsecondary program for young adults with ID or developmental disabilities.

All sessions of the current study were held in a special education classroom at Private High School. The classroom was approximately 10 x 24 feet in size. The classroom had four student desks placed in the center of the room that were arranged as a half-circle facing the front wall of the room. A white board was placed on the center of the front wall. Teachers' desks were located on the left- and right-hand sides of the room against the back wall from the front door, respectively. In addition, a half-kitchen equipped with a sink and four cabinets directly above and below it was on the left-hand side of the room near the front door. On the opposite side, a small table with a desktop computer on it was placed near the corner of the right-hand and front walls.

Although all individual sessions were held in the same special education classroom, the specific arrangement of the setting differed for one participant. When working with Mary, Jen, or Cathy, the researcher had the participant sit at one of four desks that were prearranged by the teacher, as described above. The researcher sat on the left-hand side of the participant during individual sessions. All sessions were held with the aforementioned participants individually and no other students were in the room. In contrast, the researcher had Tony sit at a desk placed against the front wall to the left-hand side of the white board. Two other students who were not included in the study were present because no other classrooms on the same floor of the special education classroom were available. In order to minimize possible distractions, the researcher completed all individual sessions with Tony on the opposite, left-hand side of the room

from the other nonparticipating students. The researcher also stood on the right-hand side of Tony to block his view of the other nonparticipating students. The classroom teacher and peer mentors worked with the students who did not participate in the study on the opposite, right-hand side of the classroom. All other variables were held constant.

Research Design

The current study used a single-subject, multiple-baseline design across participants (Gast & Ledford, 2010) to examine the effectiveness of systematic instruction on the steps for completing and using a computer-based graphic organizer on the comprehension levels of students with SDD. The dependent variables included three measures of comprehension: (a) task completion, (b) total independent story-statements, and (c) total guided story-statements. The current study included four phases: (a) baseline, (b) preintervention training and independent practice with feedback, (c) computer-based graphic organizer use, and (d) generalization.

Gast and Ledford (2010) explained a multiple-baseline design is appropriate for applied research in educational settings. The authors noted experimental control is established by demonstrating three attempts of change in the target behaviors at three different points of time across three or more tiers. First, a minimum of five baseline data points is simultaneously collected on all noted dependent variables from all participants across tiers. Next, the researcher introduces the intervention to the participant in tier one after his or her average performance on the noted dependent variables are deemed stable, while leaving the participants in the other tiers in baseline. Then, the one-by-one introduction of the intervention to participants in the other tiers continues in the described

staggered fashion, after stable baselines on the noted the dependent variables are obtained.

To exhibit experimental control, changes in the target behaviors should be immediate and in the desired therapeutic direction for the participant in the first tier, but only after a stable baseline is obtained and the intervention is introduced (Gast & Ledford, 2010). The performance levels on the target behaviors for participants kept in the baseline condition in the other tiers should remain unchanged. A replication of the immediate effect on the target behaviors should then be demonstrated with the participant in the second tier once the intervention is introduced after a stable baseline is obtained, while the participants' performance levels on the target behaviors in the other tiers remain unchanged on the target behaviors. This process is then repeated in the described staggered fashion for participants in the third and fourth tiers, respectively.

Single-subject design standards. The current study meets the quality standards for single-subject design research with reservations, as described in Kratochwill et al. (2013). First, a multiple-baseline design was used to systematically manipulate the introduction of the independent variable. Second, interassessor agreement was reviewed for 31 to 42% of the data collected in each phase for all participants and resulted in agreement above 80%. Third, the staggered introduction of the independent variable across tiers in this study offered four attempts to demonstrate an effect on the dependent variables at four different points in time. Fourth, five data points were collected for all four participants in the baseline and computer-based graphic organizer use phases. Only one data point was collected for one of the four participants in the generalization phase.

Materials

This section describes the materials used during sessions at each phase of the study. As described in the research design section, the current study included four phases: (a) baseline, (b) preintervention training and independent practice with feedback, (c) computer-based graphic organizer use, and (d) generalization. During sessions held in the baseline, independent practice with feedback, and computer-based graphic organizer use conditions, the following materials were used: (a) informational texts, (b) comprehension questions, (c) computer-based graphic organizer, (d) Read: OutLoud 6 software, and (e) hardware. The aforementioned preintervention training consisted of two separate types of instruction: direction instruction and guided practice on the steps for completing and using a computer-based graphic organizer. During direct instruction sessions, story-grammar concepts training materials, Read: OutLoud 6 software, and hardware were utilized. In contrast, the aforementioned materials used at baseline were also used during both guided practice sessions. During sessions offered in the generalization condition, the researcher used: (a) comprehension questions, (b) computer-based graphic organizer, (c) Read: OutLoud 6 software, (d) hardware, and (e) generalization informational texts.

Informational texts. Twenty-four informational texts written at the second- to third-grade level were used for the first three phases of this study (i.e., baseline, preintervention training and independent practice with feedback, and computer-based graphic organizer use). Each was written on a topic covered in the same United States History textbook used in the general education classroom at Private High School in which the current study took place. Topics ranged from the Native Americans, English

Colonies and the American Revolution, to the Modern Civil Rights Movement and the Space Race. Eleven of the 24 informational texts were validated in the Zakas (2011) study. However, the 11 original texts were edited for this study by the researcher in order to minimize the differences in the participants' reading levels, as measured using the Lexile Analyzer. Edits included reducing the length of sentences and breaking one lengthy sentence into two sentences. Some technical words were also replaced with more commonly used high-frequency words. Moreover, the 11 original informational texts were further edited in order to control for the number of people, groups, and locations introduced. The names of key people, groups, and locations were also capitalized across texts. Such precautions were followed to increase the consistency and readability of facts presented across informational texts. Lastly, the 11 original informational texts were edited in order to repeat facts across multiple sentences. These final edits were made because the text-to-speech software used in the current study did not allow individual words or sentences in an informational text to be placed in multiple parts of the graphic organizer.

The researcher wrote the remaining 13 informational texts following the same structure introduced by Zakas (2011). All 24 texts included 8 facts that were related to specific story-grammar concepts for social studies content (i.e., event, location, time, people, details, outcome). The story-grammar concepts described in the current study refer to the same social studies concepts taught in Zakas (2011). The informational texts first described an event, its time and location, and the people involved. Next, the informational texts discussed the first, second, and third details of the event in the correct

sequential order. The informational texts then ended with a description of the outcome of the event. An additional one to three sentences were included in between facts in order to provide a definition, example, and/or additional contextual information. The definitions of the relevant story-grammar concepts are provided in Table 2.

Table 2

Story-Grammar Concepts and Definitions

Story-Grammar Concept	Definition
Event	An incident that happens in the past
Location	Where the event takes place
Time	The moment when the event takes place
People	The person or group at the event
Detail	A description about the event
Sequence	The order that details happen (1 st , 2 nd , 3 rd)
Outcome	The result of the event

Informational texts were written using Microsoft Word and then converted to PDFs. All content was written in size 16, Arial font with double-spacing. A title was displayed at the top center of the page in bold. Informational texts were one page in length and had a mean word count of 123.1 (range of 94-152). The mean Lexile measure for the 24 texts was 580 (range of 540 to 640). For this study, the PDF copies of texts were accessed and read using the Read: OutLoud 6 software. Sample informational texts are provided in Appendix B.

Validation of texts. Before beginning the current study, three experts were consulted to review all validity of the informational texts. One served as the U.S. History content expert, while the other two served as the reading experts. The content expert was

a professor at George Mason University who earned a doctorate in secondary education and had published research on teaching and learning history and social studies content in peer-reviewed journals. The two reading experts had doctorates in special education and more than 10 years of teaching experience with students with intellectual and developmental disabilities. Of the two reading experts, one expert currently serves as a special education specialist at a large public school system in the southeast. The noted reading expert had presented at national conferences and published research and chapters on teaching academics to students with moderate to severe disabilities. The other expert is a professor at George Mason University and teaches a course on language and reading development for students with severe disabilities. The second noted reading expert had presented at national conferences and conducted multiple trainings on topics related to teaching students with severe disabilities, including reading instruction, across the state in which the study was held.

The researcher created two questionnaires to guide the experts' reviews. One questionnaire was prepared for the content expert and another one for the reading experts. Experts used their respective questionnaires to independently review 17% to 58% of the randomly selected informational texts. All three experts confirmed the reviewed informational texts provided facts for each of the story-grammar concepts that were listed on the computer-based graphic organizer used in the current study. The U.S. History content expert confirmed the reviewed informational texts were accurate. The content expert also confirmed the reviewed informational texts described topics typically covered in a high school general education classroom. The two reading experts confirmed the

reviewed texts were appropriately written for students with significant developmental disabilities, as recommended in the literature (e.g., Hudson, Browder, & Wakeman, 2013).

Comprehension questions. Eight factual recall comprehension questions were created and available for use for each informational text during the two guided comprehension probes. The eight questions directly related to the story-grammar concepts listed on the computer-based graphic organizer. For the purposes of this study, the social studies concepts taught in Zakas (2011) are referred to as story-grammar concepts for social studies content, or more succinctly story-grammar concepts. This change was made to emphasize the researcher's intent to measure the participants' abilities to identify facts related to the concepts that were described in the informational texts, rather than their knowledge of the specific story-grammar concepts. Each specific question required participants to identify facts related to one of the following story-grammar concepts: (a) event, (b) location, (c) time, (d) people, (e) first detail, (f) second detail, (g) third detail, and (h) outcome. The specific questions used during the guided comprehension probes are listed in Table 3.

Table 3

Comprehension Questions Used During Guided Comprehension Probes

Story-Grammar Concept	Comprehension questions
Event	What was the EVENT?
Location	What was the LOCATION?
Time	What was the TIME?
People	Who were the PEOPLE?
First Detail	What was the FIRST DETAIL?
Second Detail	What was the SECOND DETIAL?
Third Detail	What was the THIRD DETAIL?
Outcome	What was the OUTCOME?

Computer-based graphic organizer. The researcher used a modified version of the paper-based graphic organizer introduced in Zakas (2011). Similar to the earlier investigation, the parts of the computer-based graphic organizer (CBGO) used in the current study were titled with one story-grammar concept (i.e., event, location, time, people, first detail, second detail, third detail, outcome). However, all parts of the CBGO used in the current study were aligned vertically, one by one. The CBGO parts also were not uniquely color-coded. In addition, the CBGO was displayed and accessed using Read: OutLoud 6. The CBGO was displayed on the right-hand side of the screen, while the informational text was presented on the left-hand side. Participants used one of smart bookmarks provided in Read: OutLoud 6 to copy and paste content from the informational text into specific CBGO parts. A screen shot of how the informational text and graphic organizer were presented using this text-to-speech software is provided in Appendix C.

Read: OutLoud 6. In the current study, the researcher used Read: OutLoud 6 to display the CBGO and all texts. Read: OutLoud 6, developed by Don Johnson Inc., is a text-to-speech software program that offers several tools to support the comprehension levels of individuals with accessing texts, such as highlighters, CBGO, notes, and smart bookmarks. The software reads electronic texts and Web content using a synthetic voice while simultaneously highlighting individual words. In addition, individuals are able to quickly and automatically fill out the CBGO using smart bookmarks. Individuals may also select preferred user settings. Individuals may select their preference regarding the size of the text displayed on the computer as well as the rate at which the text is read. Before each session, the researcher adjusted the user settings to each participant's preference.

Hardware. The researcher used a laptop computer with a 15.6" widescreen for the current study. The computer had Read: OutLoud 6 downloaded and saved PDF copies of all texts and needed training materials (e.g., story-grammar chart). A standard-issue mouse compatible with the laptop was available to participants who requested it throughout the current study. In addition, the researcher used a digital video recorder to record all sessions. The researcher also used an analog watch during comprehension probes. The researcher had participants wear their personal headphones while listening to the texts.

Story-grammar concepts training materials. The researcher used vocabulary cards, story-grammar charts, and T-charts to offer direct instruction on seven story-grammar concepts for social studies content. As previously noted, the story-grammar

concepts reviewed were the same social studies concepts taught in Zakas (2011). The design of the vocabulary cards was similar to those used in Zakas (2011). However, the researcher made edits to instructional scripts presented on the back of vocabulary cards. The current study also did not extend the use of the paper-based vocabulary map and paper-based vocabulary guide from Zakas (2011). Instead, the researcher used a paper-based T-chart to support students during the initial direct instruction on the story-grammar concepts. As described in the Data Collection Procedures section below, both changes were made to meet the novel procedures of the current study and the unique needs of participants. The researcher also had participants complete a story-grammar chart on the computer to demonstrate their understanding of concepts after the initial direct instruction on the concepts was provided. As explained below, the researcher had participants complete the chart on the computer in order to offer instruction on the use of the Read: OutLoud 6 software used in the current study. Definitions of the story-grammar concepts taught during direct instruction sessions are provided in Table 2.

Vocabulary cards. One laminated vocabulary card was created on a white, 8.5 x 11” piece of paper for each of the seven story-grammar concepts. The seven concepts were: (a) event, (b) people, (c) time, (d) location, (e) details, (f) sequence, and (g) outcome. On the front, which was presented to the participant, the story-grammar concept was displayed with its definition directly underneath. The displayed concept was written with capitalized letters in size 72, Times New Roman font, while the definition was written using capital and lowercase letters in size 24, Times New Roman font. The story-grammar concept included in the definition was also underlined. The front side also had a

bolded black border that outlined all edges of the page. On the back, which was presented to the researcher, the instructional script was displayed. Instructional scripts were coded and written in two text colors to distinguish the words/actions to be completed by the researcher and the participants. Unique to the current study, motor actions to be performed by the researcher and/or participants were written inside parentheses. General procedures were also written in small caps. A copy of the front and back of a sample vocabulary card is available in Appendix D.

Story-grammar charts. Four story-grammar charts were created using Microsoft Word and then converted to PDFs. The left side was titled “Definitions” and listed the definitions for seven story-grammar concepts vertically, one by one. The right side was titled “Story-Grammar Concepts” and listed the seven story-grammar concepts vertically, one by one (i.e., event, people, time, location, details, sequence, outcome). All content was presented in size 16, Arial font with double-spacing.

The story-grammar charts were displayed and accessed using Read: OutLoud 6. The researcher primarily used story-grammar charts to assess the participants’ understanding of the seven story-grammar concepts after they were initially taught. However, the researcher also used the charts as the sample to provide instruction on the use of Read: OutLoud 6. More specifically, the researcher explained how to use the yellow smart bookmark to copy and paste definitions into the chart. The researcher also demonstrated how to rearrange content within the chart if initially placed in an unintended location.

T-charts. Two laminated T-charts were created on a white, 8.5 x 11” piece of paper. Each had one black horizontal line displayed approximately 1.5” from the top of the paper with 1” left- and right-hand side margins, respectively. A vertical black line was placed directly below the horizontal line to approximately .5” from the bottom of the paper. The vertical line was indented to the left of the center of the page. Headers were written above the horizontal line, but to the left- and right-hand sides of the vertical line that read “Story-Grammar Concepts” and “Definitions,” respectively. On the left-hand side of the T-chart, the appropriate figures for numbers one through seven were presented vertically in the correct order. One of the following seven story-grammar concepts was listed to the immediate right of each number: (a) “event,” (b) “people,” (c) “time,” (d) “location,” (e) “details,” (f) “sequence,” and (g) “outcome.” On the right-hand side, the correct definition for each story-grammar concept was displayed in the same order. All content was presented in size 16, Arial font with double-spacing.

Generalization informational texts. Three additional informational texts were prepared to evaluate the participants’ abilities to identify and extract facts related to story-grammar concepts in untrained texts. The new informational texts were adapted from passages published in an elementary-level social studies textbook on Virginia History and U.S. History. Texts were edited so their reading levels were equivalent to a second- to third-grade level, as measured using the Lexile Analyzer. Edits included shortening the lengths of sentences and replacing specific vocabulary that required prior knowledge with high-frequency words. Certain pronouns were replaced with the names for the people and location if they were not repeated across multiple sentences. However,

the researcher also repeated certain facts throughout the texts so that the participants had multiple opportunities to use such information in order to complete the CBGO. As described above, the text-to-speech software used in the current study did not allow users to place the same content in two separate CBGO parts.

The texts used at generalization included eight facts related to the same story-grammar concepts that were presented in the texts used in sessions at earlier phases of the current study. However, informational texts used at generalization did not follow the same writing template. Most notably, the first and last sentences did not consistently describe the event and outcome of a topic, respectively. The texts used in the generalization phase also did not include the same specific keywords employed to sequence the facts related to the three details of the event. Instead, general transition words (e.g., also, in addition, as a result) and other formatting strategies (e.g., introduce details in separate paragraphs, present details in a similar sentence structure) to present facts related to story-grammar concepts.

Informational texts used at generalization were written using Microsoft Word and converted to PDFs. Content was written in size 16, Arial font with double-spacing. All texts had a title presented at the top center of the page in bold. All texts were one page in length and had a mean word count of 112.3 (range of 96-135). The Lexile measure for all three texts was 640. PDF copies of texts were accessed and read using Read: OutLoud 6 on a laptop computer. During generalization sessions, the CBGO was displayed on the right-hand side of the screen, while the informational text was presented on the left-hand

side. The CBGO used at generalization was also the same one used in sessions at earlier phases of this study.

Dependent Variables

The current study measured the effectiveness of systematic instruction on the steps for completing and using the CBGO on three dependent variables: (a) task completion; (b) total independent story-statements; and (c) guided story-statements, with and without materials displayed. Copies of the sample informational texts referenced below to describe scoring conventions for all three dependent variables are provided in Appendix B.

Task completion. The first dependent variable, task completion, was defined as the number of CBGO parts correctly completed by participants using facts from an informational text. The CBGO had eight parts that were titled with one of the following story-grammar concepts: (a) “event,” (b) “location,” (c) “time,” (d) “people,” (e) “first detail,” (f) “second detail,” (g) “third detail,” and (h) “outcome.” The definitions of the relevant story-grammar concepts are provided in Table 2. Participants completed the CBGO after listening to the information text using Read: OutLoud 6. After each session, the researcher saved a copy of the participant-completed CBGO on the laptop. The saved copy was later printed out and added to the participants’ records. Individual CBGO parts were scored as (a) correct, (b) incorrect, and (c) no response.

A CBGO part was scored as correct if completed by a participant using an accurate key fact described in an informational text. The identified fact qualified as an accurate key fact if it was directly related to the story-grammar concept presented as the

title of the said CBGO part. For example, using the Technology in America text in Appendix B, the CBGO part titled “People” would be scored as correct if completed using “Americans.” Similarly, using the Technology in America text provided in Appendix B, the CBGO part titled “Location” would be marked as correct if completed using “America.” In addition, a CBGO part was scored as correct if it included a key and minor fact described in an informational text, as long as both were accurate. Minor facts were presented in the one to three sentences that followed key facts and were intended to define or give context for the said key fact. For example, using the Technology in America text provided in Appendix B, the CBGO part titled “First Detail” would be scored as correct if completed using “First, Americans listened to the radio” (key fact) and “Americans listened to important news on the radio” (minor fact). Unique to the CBGO parts titled “Event,” “Time,” “Location,” and “Outcome,” participants did not have to include the full sentence from a text that contained the facts related to one of the respective story-grammar concepts. The noted CBGO parts were scored as correct if completed by participants using the target facts. The accuracy of the identified fact was determined by whether it met the definition of the story-grammar concept displayed as the title of the said CBGO part. For example, using the Modern Civil Rights Movement text provided in Appendix B, the CBGO part titled “Outcome” would be scored as correct if it included “African Americans won equal rights” (key fact) with or without “From this work.” Unique to CBGO parts titled “First Detail,” “Second Detail,” and “Third Detail,” participants did not have to include the specific keywords used to signal and sequence the related facts described in the informational text (i.e., first, second,

third). The aforementioned CBGO parts were scored as correct if completed using the appropriate key facts. For example, using the Modern Civil Rights Movement text provided in Appendix B, the CBGO part titled “Second Detail” would be scored as correct if “African Americans sat in the seats that were only for white people at restaurants” was placed in it, with or without the keyword “Second.” Last, the CBGO part titled “Time” was marked as correct if completed using the accurate key fact, with or without the prefix (e.g., early, mid, late). For example, using the Technology in America text provided in Appendix B, the CBGO part titled “Time” would be marked correct if completed using either “1900s” or “early-1900s.”

A CBGO part was scored as incorrect if completed by a participant using an inaccurate key or minor fact described in an informational text. The identified key or minor fact was marked as inaccurate if it did not meet the definition of the story-grammar concept presented as the title of the said CBGO part. For example, using the Modern Civil Rights Movement text provided in Appendix B, the CBGO part titled “Location” would be scored as incorrect if completed using “Americans” rather than “America.” In addition, a CBGO part was scored as incorrect if completed by a participant using an appropriate minor fact from an informational text, but not a key fact. Minor facts were provided in the one to three sentences written in between key facts throughout the texts and were intended to provide a definition, example, and/or additional contextual information. For example, using the Modern Civil Rights Movement text provided in Appendix B, the CBGO part titled “Location” would be scored as incorrect if it included “schools” (minor fact) and not “America” (key fact). Minor facts also included the title of

texts that were provided to give an overview of the event discussed in the text. Although some minor facts partially met the definitions of the story-grammar concept, participants were expected to identify and extract the specific key facts from the text on the historical topic. Additionally, a CBGO part was scored as incorrect if completed by a participant using part, but not all, of a key fact. The identified fact qualified as only part of the key fact if it was an incomplete description of the story-grammar concept from the text. For example, using the Modern Civil Rights Movement text provided in Appendix B, the CBGO part titled “Outcome” would be scored as incorrect if it included “African Americans won” and not “African Americans won equal rights.” Finally, a CBGO part would be scored as incorrect if a participant completed it using accurate and inaccurate facts from the text. For example, using the Modern Civil Rights Movement text provided in Appendix B, the CBGO part titled “Outcome” would be identified as incorrect if it included “African Americans showed they would not be treated badly anymore” (inaccurate) and “From this word, African Americans won equal rights” (accurate). The identified inaccurate fact would be marked as wrong because it served as the minor fact for the “Third Detail.” A CBGO part was scored as a nonresponse if left blank by the participant.

All correct, incorrect, and nonresponses were documented on a data sheet. Correct responses received one point. Incorrect responses and nonresponses earned zero points. Total task completion scores were calculated by summing the number of points received across CBGO parts. Total task completion scores ranged from zero to eight points.

Generalization data. All the aforementioned scoring conventions were followed to evaluate the CBGOs completed in the generalization phase with one exception: Participants could sequence facts related to the three details in the CBGO as they wished. The noted exception was permitted since informational texts used at generalization did not explicitly sequence the three details. Unlike the informational texts used during sessions at other phases of the current study, the three details were introduced using general transition words and structural strategies. With that said, a CBGO part titled “First,” “Second,” or “Third” was only scored as correct if completed by a participant using an accurate key fact.

Total independent story-statements. The second dependent variable, total independent story-statements, was defined as the number of independent story-statements made by participants during the independent comprehension probe. An independent story-statement was an independent retell of a fact related to a story-grammar concept described in an informational text. The story-grammar concepts for social studies content that were presented in all texts were: (a) event, (b) location, (c) time, (d) people, (e) first detail, (f) second detail, (g) third detail, and (h) outcome. A complete list of the relevant story-grammar concepts with their respective definitions is provided in Table 2. After participants listened to an informational text on the computer, the researcher initiated the independent comprehension probe using a general prompt (e.g., said, “[participant’s name], tell me everything you remember about what you just read”). All independent story-statements were scored individually as (a) correct, (b) partial correct, (c) incorrect, and (d) nonresponse.

An independent story-statement was scored as correct if a participant accurately retold a key fact from an informational text. The identified fact qualified as a key fact if it was described in a text and directly related to a story-grammar concept. For example, using the Modern Civil Rights Movement text provided in Appendix B, an independent retell that included “1950s and 1960s” would be scored as a correct independent story-statement of the time described in the text. In addition, an independent story-statement was scored as correct if a participant accurately retold a key fact, but did not identify the story-grammar concept to which it corresponded. For example, using the Modern Civil Rights Movement text provided in Appendix B, a retell that included either “I remembered reading about African Americans” or “the people were African Americans” would be scored as a correct independent story statement of the people described in the text. Moreover, an independent story-statement was scored as correct if the retell included a close approximation of a key fact, as long as some part of the target key fact was distinguishable. Accepted close approximations of key facts included participants’ mispronunciations of the names of a person, group, or location. For example, using the Modern Civil Rights Movement text, an independent retell that mispronounced the word “African” while saying “African Americans” was scored as a correct independent story statement of the people described in the text. Permitted close approximations also included participants’ exclusions of prefixes presented with dates (e.g., early, mid, late). Furthermore, an independent story-statement that used a synonym for a key fact was also scored as correct. For example, using the Modern Civil Rights Movement text provided in Appendix B, a retell that included “I read about USA” would be scored as a correct

independent story-statement of the location described in the text, even though the actual location described in the noted informational text was America. Moreover, an independent story-statement was scored as correct if a key fact was accurately retold, but with some grammatical errors. For example, using the Technology in America text provided in Appendix B, an independent retell that included “Americans listened-did to radio” would be scored as a correct independent story statement of the first detail described in the text. Additionally, an independent story-statement that retold a key fact using a unique paraphrasing was also scored as correct. However, the described story-statement had to be accurate and a complete thought that included a subject and verb. For example, using the Technology in America text provided in Appendix B, a retell that included “Americans used new technology” would be scored as a correct independent story-statement of the event described in the text. Unique to the event, three details, and outcome described in a text, an independent story-statement was marked as correct if a participant used a pronoun (e.g., he, she, they) while describing a key fact related to any of the noted story-grammar concepts, but only if the participant also accurately identified the people from the same text. For example, using the Modern Civil Rights Movement text, an independent retell that included “they stopped riding the bus” (first detail) after previously stating, “I read about African Americans” (people) would be scored as a correct independent story-statement of the first detail described in the text because the people were also correctly identified. Additionally, an independent story-statement that included a key and minor fact was scored as correct. Minor facts included the titles of texts and information presented in the sentences written in between key facts. Such facts

were categorized as minor because their purpose was to provide a definition, example, and/or contextual information about key facts. For example, using the Technology in America text provided in Appendix B, a retell that included “I read about technology in America” (minor fact) and “Americans used new technology” (key fact) would be scored as a correct independent story-statement of the event described in the text. Last, an independent story-statement that included an initial incorrect retell of a fact related to a story-grammar concept, but then an accurate retell of the fact related to the same concept, was scored as correct. For example, using the Modern Civil Rights Movement text provided in Appendix B, an independent retell that initially included “1900s” (inaccurate), but then later “1950s and 1960s” (accurate) would be scored as a correct independent story-statement of the time described in the text. The described independent story-statement would be scored as correct because it was perceived as an attempt to acknowledge and self-correct a previously made error.

An independent story-statement was scored as partial correct if a participant accurately retold some part, but not all, of a key fact described in an informational text. The identified fact was judged to only be part of a key fact if it was an incomplete retell of a story-grammar concept described in the text. For example, using the Modern Civil Rights Movement text provided in Appendix B, an independent retell that included “African Americans worked” instead of “African Americans worked for rights” would be scored as a partial correct independent story-statement of the event described in the text. The noted story-statement would be scored as partial correct because it did not represent a complete thought about the fact. In addition, an independent story-statement was scored

as partial correct if the participant accurately retold a minor fact described in the text. Minor details were provided in the sentences in between those presenting the key facts. For example, using the Technology in America text provided in Appendix B, an independent retell that included “they listened to music” (minor fact) would be scored as a partial correct independent story-statement of the first detail described in the texts. Minor details also included the titles of individual texts. For example, using the Technology in America text provided in Appendix B, a retell that included “Technology in America” (minor fact) would be scored as a partial correct independent story-statement of the event described in the text. Such facts were categorized as minor because their purpose was to provide a definition, example, and/or contextual information about key facts. Finally, an independent story-statement was scored as partial correct if a pronoun was used while describing a fact related to an event, detail, or outcome described in the texts. For example, using the Modern Civil Rights Movement text provided in Appendix B, an independent story-statement that included “they won rights” would be scored as partial correct for outcome described in the text.

An independent story statement was scored as incorrect if the participant inaccurately retold a key or minor fact from the informational text. The identified fact qualified as an inaccurate independent retell if it did not, at least in part, relate to a story-grammar concept described in the text. Finally, an independent story-statement was scored as incorrect if it included an accurate retell of a key or minor fact, but then an incorrect retell of the key or minor fact that were both related to the same specific story-grammar concept. For example, using the Modern Civil Rights Movement text provided

in Appendix B, an independent story-statement that initially included “I read about America,” but then “I mean North America” would be scored as incorrect for location described in the texts. The described independent story-statement would be scored as incorrect because it was viewed as a guess-and-hope approach to discussing an informational text. An independent story statement was scored as a nonresponse if a participant did not initiate a verbal response within 10-s of the general prompt being delivered, or otherwise indicated he or she did not know the answer (e.g., say, “I don’t know”).

All independent story-statements across story grammar concepts were documented on a data sheet. Correct independent story-statements received two points. Partial correct independent story-statements received one point. Incorrect independent retells and nonresponses received zero points. Total independent story statement scores were calculated by summing the number of independent story-statements made during the independent comprehension probe. Total independent story-statements scores ranged from zero to 16 points.

Generalization data. All the aforementioned scoring conventions were followed to evaluate independent story-statement data collected in the generalization phase with one exception: participants were able to sequence facts related to the three details as they deemed fit. The noted exception was permitted since informational texts used at generalization did not explicitly sequence the three details. Unlike the informational texts used during sessions at other phases of the current study, the texts used at generalization introduced the three details using general transition words and structural strategies. With

that said, participants' story-statements during independent comprehension probes only received credit if they accurately retold, at least in part, a key fact or reteold a minor fact related to a first, second, or third detail described in a text.

Total guided story-statements. The third dependent variable, total guided story-statements, was defined as the number of guided story-statements made by participants during the guided comprehension probe. A guided story-statement was a guided retell of a key fact directly related to a story-grammar concept described in a text, provided in response to a specific question. The story-grammar concepts that were presented in all texts were: (a) event, (b) location, (c) time, (d) people, (e) first detail, (f) second detail, (g) third detail, and (h) outcome. A complete list of the relevant story-grammar concepts with their respective definitions is provided in Table 2. After completing the independent comprehension probe, the researcher conducted the guided comprehension probe using eight specific questions. Each specific question prompted participants to retell a key fact from related to a story-grammar concept described in a text. The eight specific questions were asked individually and in the same order in which the related concepts were listed on the CBGO. The eight questions are provided in Table 3. Participants' guided story-statements were scored as (a) correct, (b) incorrect, and (c) nonresponse. Partial credit was not awarded as participants were expected to identify key facts related to the story-grammar concepts that were presented in the specific questions.

A guided story-statement was scored as correct if a participant accurately retold the key fact from a text that was requested in a specific question. The identified fact qualified as the accurate key fact if it was described in the text and directly related to the

story-grammar concept presented in the question. For example, using the Modern Civil Rights Movement text provided in Appendix B, a guided retell that included “African Americans” after the related specific question was asked (i.e., “Who were the People?”) would be scored as a correct guided story-statement of the people described in the text. In addition, a guided story-statement was scored as correct if a synonym or close approximation was used to describe the key fact directly related to a story-grammar concept that was requested in a specific question. Close approximations of key facts were considered guided story-statements that included mispronunciations of the names of a person, group, or location. Accepted close approximations also included guided story-statements that left out a prefix presented with dates. Moreover, a guided story-statement was marked as correct if imperfect grammar was used to retell the key fact related to a story-grammar concept that was requested in a specific question. Furthermore, a guided story-statement that retold a key fact using a unique paraphrasing was marked as correct if the identified fact was accurate and presented as complete thought. For example, using the Modern Civil Rights Movement text, a guided retell that included “African Americans won rights” after the related specific question was asked (i.e., “What was the Outcome?”) would be scored as a correct guided story-statement of the outcome described in the text. For questions requiring participants to retell the event, outcome, or one of the three details described in the text, a guided story-statement that used a pronoun while retelling the key fact related to one of the noted story-grammar concepts from a text was scored as a correct guided story-statement, as long the people from the same text were also accurately identified. For example, using the Modern Civil Rights Movement

text provided in Appendix B, a guided retell that included “they won rights” (outcome) after the related specific question was asked (i.e., “What was the Outcome?”) would be scored as a correct guided story-statement of the outcome described in the text, if the people (i.e., African Americans) from the same text were also correctly identified. Moreover, a guided story-statement was scored as correct if it provided the key and minor facts related to the same story-grammar concept presented in a specific question. Minor facts included the titles of the informational texts as well as the sentences written in between key facts. The noted minor facts were included to provide a definition, example, and/or additional contextual information about key facts. For example, using the Technology in America text provided in Appendix B, a guided retell that included “I read about technology in America” (minor fact) and “Americans bought new technology” (key fact) after the related specific question was asked (i.e., “What was the Event?”) would be scored as a correct guided story-statement of the event described in the text. Last, a guided story-statement was scored as correct if it included an initial inaccurate retell of the key fact related to a story-grammar concept presented in the specific question, but then an accurate retell of the key fact related to the same story-grammar concept. For example, using the Technology in America text in Appendix B, a guided retell that initially included “1940s” after the related specific question was asked (i.e., “What was the Time?”), but then stated “early-1900s” would be scored as a correct guided story-statement of the time described in the text. The described guided story-statement would be permitted because it was viewed as an attempt to acknowledge and self-correct a previously made error. However, in order to ensure individual sessions

were completed within the allotted time frame, the participant had to initiate the described self-correction of her or his initial guided story-statement before answering the next question.

A guided story-statement was scored as incorrect if the participant retold some part, but not all, of the key fact from a text that was requested in a specific question. The identified fact was judged to be only part of the key fact if it was an incomplete description of a story-grammar concept described in a text. For example, using the Modern Civil Rights Movement text provided in Appendix B, a guided retell that included “Africans” after the related specific question was asked (i.e., “Who were the People?”) would be scored as an incorrect guided story-statement of the people described in the text. In addition, a guided story-statement was scored as incorrect if the participant retold the appropriate minor fact, but not the key fact related to the concept requested in a specific question. For example, using the Technology in America text provided in Appendix B, a guided retell that included “Technology in America” after the related specific question was asked (i.e., “What was the Event?”) would be scored as an incorrect guided story-statement of the event described in the text. Although some minor facts partially met the definitions of the story-grammar concept, guided story-statements that only included minor facts were marked as incorrect because participants were expected to identify and retell the specific key facts from the texts on the history topic. Unique to the specific question related to the event, outcome, or details described in the text, a guided story-statement was scored as incorrect if a pronoun (e.g., he, she, they) was used while describing the key facts related to any of the noted story-grammar concepts. Further, a

guided story-statement was scored as incorrect if a participant inaccurately retold the key fact from a text that was related to the concept requested in a specific question. For example, using the Modern Civil Rights Movement text provided in Appendix B, a guided retell that included “Africa” after the specific question to retell the location described in the text was presented (i.e., “What was the Location?”) would be scored as an incorrect guided story-statement. The described guided story-statement was scored as incorrect because the location described in the noted text was “America.” In addition, a guided story-statement was scored as incorrect if a participant retold a fact not related to a story-grammar concept requested in a specific question. Similarly, a guided story-statement was scored as incorrect if a participant initially retold the accurate key fact from the text that was requested in a specific question, but then retold a nonrelated fact. For example, using the Modern Civil Rights Movement text provided in Appendix B, a guided retell that included “they won rights” (related) and then “African Americans marched” (not related) after the specific question to retell the outcome described in the text was presented (i.e., “What was the Outcome?”) would be scored as an incorrect guided story-statement. The noted nonrelated fact would be marked as wrong because it was the minor fact for the third detail described in the text. Last, a guided story-statement was scored as incorrect if a participant retold the accurate key fact and then an inaccurate fact about the same story-grammar concept requested in a specific question. For example, using the Technology in America text provided in Appendix B, a guided retell that included “America” (accurate) and then “all over the universe ” (inaccurate) after the specific question to retell the location described in the text was presented (i.e., “What was

the Location?") would be scored as an incorrect guided story-statement. The described guided story-statement would be score as incorrect because it was perceived as a guess-and-hope approach to answering the question. The same rule applied for independent story-statements that provided an accurate retell of a key or minor fact, but then an inaccurate retell of a minor or key fact that were both related to the same specific story-grammar concept. A guided story-statement was scored as a nonresponse if a participant did not initiate a verbal response within 10-s of the researcher asking the specific question. A guided story-statement was also marked as a nonresponse if a participant provided a response that indicated he or she did not know the answer (e.g., say, "I don't know").

All guided story-statements to the specific questions were documented on a data sheet. Correct guided story-statements received one point. Incorrect guided story-statements and nonresponses received zero points. Total guided story-statement scores were calculated by summing the number of points received across all questions. Total guided story-statement scores ranged from zero to eight points.

Total guided story-statements with materials displayed. The third dependent variable, total guided story-statements, was extended to also measure the number of guided story-statements made by participants during the second guided comprehension probe when materials are displayed. Materials were the CBGO and a paper-based version of the informational text displayed to participants at the onset of the same session, before beginning the independent and guided comprehension probes. However, the researcher only asked the specific questions to which the participants did not provide the correct

guided story-statement during the first guided comprehension probe. Therefore, the second guided comprehension probe only measured the number of guided story-statements made by participants out of the specific questions that were not initially correctly answered. The number of specific questions asked during the second guided comprehension probe ranged from zero to eight. The specific questions were asked one by one and in the same order in which they were listed on the CBGO. Participants' guided story-statements were scored as (a) correct, (b) incorrect, and (c) nonresponse. Participants' guided story-statements did not earn partial credit as it was expected that they identify key facts related to the story-grammar concepts presented in the specific questions

The researcher evaluated participants' guided story-statements during the second guided comprehension probe using the same scoring conventions followed to review data from the first guided comprehension probe. All guided story-statements to the specific questions were documented on a data sheet. Correct guided story-statements received one point. Incorrect guided story-statements and nonresponses received zero points. Total guided story-statement scores were calculated by summing the number of points received across all questions. Total guided story-statement scores ranged from zero to eight points. Data collected from the first and second guided comprehension probes were presented on separate graphs.

Generalization data. All the aforementioned scoring conventions were followed to evaluate guided story-statements with and without materials displayed for the data collected in the generalization phase with one exception: participants could sequence

facts related to the three details as they wished. The noted exception was permitted since informational texts used at generalization did not explicitly sequence the three details.

Unlike the informational texts used during sessions at other phases of the current study, the texts used at generalization introduced the three details using general transition words and structural strategies. With that said, participants' guided story-statements from both guided comprehension probes only received credit if they accurately retold a key fact related to a first, second, or third detail described in a text.

Independent Variable

The current study evaluated the effectiveness of systematic instruction on the steps for completing and using a CBGO on the participants' comprehension of informational texts. The independent variable, systematic instruction, included four distinct trainings: (a) direct instruction on the story-grammar concepts, (b) guided practice on the steps for completing the CBGO, (c) guided practice on the steps for using the CBGO, and (d) independent practice with feedback. The CBGO was displayed using Read: OutLoud 6 and consisted of eight parts. Each part was titled with one of the following story-grammar concepts: (a) "event," (b) "location," (c) "time," (d) "people," (e) "first detail," (f) "second detail," (g) "third detail," and (h) "outcome." The definitions of the relevant story-grammar concepts are provided in Table 2.

Direct instruction on the story-grammar concepts. The researcher offered direct instruction on the definitions of seven story-grammar concepts for social studies content (i.e., event, location, time, people, detail, sequence, outcome). Training was scripted and occurred across two sessions. During the first session, the research reviewed

the story-grammar concept using model-lead-test with examples and nonexamples using procedures similar to what was followed in Zakas (2011). First, the researcher modeled the correct answer by explicitly stating the definition of one of the story-grammar concepts. Next, the researcher and participants identified the definition of the noted story-grammar concept together on a T-chart. Last, the researcher had the participants identify the definition of the noted story-grammar concept independently on a T-chart. After each concept was reviewed, the researcher had participants identify examples and nonexamples of the noted concept. During the second session, the researcher had the participants complete a story-grammar chart in order to demonstrate their understanding of the story-grammar concepts. The story-grammar chart was presented on the laptop using Read: OutLoud 6. The researcher provided a brief but explicit instruction with models on the steps for completing the story-grammar chart. The researcher then used response-prompting procedures to provide positive reinforcement and corrective feedback (i.e., verbal, gestural prompts) as the participants completed the story-grammar chart. Greater details on the specific strategies employed by the researcher to offer the noted direct instruction are described in in the Data Collection Procedures section.

Guided practice on the steps for completing the CBGO. Once the two direct instruction sessions conducted, the researcher taught the participants how to complete the CBGO after listening to a text on the computer using Read: OutLoud 6. Procedures were scripted and began with the researcher providing a brief but explicit instruction with models on the steps for filling out the CBGO. The researcher then guided participants as they completed individual CBGO parts using a modified system of least prompts. The

first, second, and third levels of the modified system of least prompts used in the study were: (a) state the definition of the story-grammar concept, offer two examples, and repeat the directive; (b) reread, while also pointing to the individual words, three sentences from the text and then repeat the directive; and (c) read and point to the correct answer in the text. Unique to the modified system of least prompts used in the current study, the first and second levels of the hierarchy consisted of supports that did not reveal the target answer. The inclusion of such supports is consistent with recent research and intended to build participants' independence in completing a task (e.g., Hudson & Browder, 2014; Hudson et al., 2014). Rather than requiring participants to complete the CBGO by simply imitating a model provided by the researcher, the participants learned to apply their knowledge of story-grammar concepts and to focus on progressively narrower parts of the informational texts in order to identify the correct answer. Greater details on the strategies employed by the researcher during guided practice sessions are provided in the Data Collection Procedures section.

Guided practice on the steps for using the CBGO. Immediately after the CBGO was completed, the researcher taught the participants how to use the CBGO to make guided story-statements in response to specific questions. Procedures were scripted and began with the researcher providing a brief but explicit instruction with models on the steps for using the CBGO to answer specific questions. The researcher then had participants practice using the CBGO in order to make guided story-statements in response to three to four untrained and randomly selected specific questions from the overall pool of eight (see Table 3). Questions were asked one by one with the CBGO

displayed to the participants. The researcher delivered positive reinforcement to participants if they provided correct guided story-statements. In contrast, the researcher offered verbal and gestural prompts to support participants if they provided incorrect guided story-statements to specific questions. The guided practice on the steps for completing and using the CBGO occurred over four sessions. Greater details on the strategies employed by the researcher during guided practice sessions are provided in the Data Collection Procedures section.

Independent practice with feedback. After four guided practice sessions were provided, the researcher conducted the independent practice with feedback sessions. The purpose was to evaluate the participants' abilities to complete the CBGO and then make guided story-statements in response to specific questions before receiving any support from the researcher. All procedures followed in this condition were scripted. First, the participants listened to a randomly selected informational text and then independently completed the CBGO. Second, the researcher reviewed the completed CBGO. The researcher provided positive reinforcement to participants for correctly completed CBGO parts. However, the researcher implemented the aforementioned modified system of least prompts to help participants fix incorrect or uncompleted CBGO parts. Third, the researcher conducted the independent and guided comprehension probes. The noted comprehension probes were administered using procedures similar to those followed at baseline. During the guided comprehension probes, the researcher asked eight specific questions (see Table 3). However, unlike the baseline condition, the researcher provided positive reinforcement if participants provided correct guided story-statements in

response to a specific question. The researcher used verbal and gestural prompts if participants did not provide the correct guided story-statement to specific questions that were presented two times. In addition, the researcher provided models to demonstrate how to paraphrase while making guided story-statements of facts that consisted of more than one word or a date after correctly identified by participants.

The independent practice sessions continued until participants were able to independently and correctly complete six of the eight (75%) CBGO parts across two consecutive sessions. Data on the participants' abilities to independently and correctly complete the CBGO in this condition were measured and reported using the first dependent variable, task completion, of the current study. Greater details on the strategies employed by the researcher during guided practice sessions are provided in the Data Collection Procedures section.

Data Collection Procedures

The researcher conducted all sessions in a self-contained classroom. All sessions were video recorded and held with individual participants with the exception of the one introduction to software session, as described below. Individual sessions were offered four to six times a week for six weeks. The current study included (a) a baseline phase, (b) preintervention training and independent practice with feedback phase, (c) CBGO use phase, and, (d) a generalization phase. Data were collected and graphed on the three dependent variables from sessions in the baseline, independent practice with feedback, CBGO use, and generalization conditions. The data collection sessions lasted on average

15 to 20 minutes per participant. The sessions in the preintervention training condition lasted on average 10 to 30 minutes per participant.

One informational text from a pool of 21 was randomly selected without replacement for each baseline, independent practice with feedback, and CBGO use session. No informational texts were used more than once during the aforementioned sessions. In contrast, one informational text from a pool of two additional texts were randomly selected for use during a preintervention training session. Thus, informational texts could be used in more than one preintervention training session, although not in consecutive sessions. Finally, one informational text from a pool three additional texts adapted from an elementary-level social studies book were selected without replacement for each generalization session. No informational texts were read more than once in any generalization session.

Introduction to the Read: OutLoud 6 software. Before starting the current study, the researcher introduced the Read: OutLoud 6 software to participants in a small group (two to four students). A one-page, two-paragraph summary of a chapter from a narrative text was used in each introduction session (i.e., *Call of the Wild*). The CBGO used in the current study was available on the screen during this introduction. First, the researcher explained the purpose of the software and then demonstrated how to use its text-to-speech with dynamic highlighting feature. The researcher also briefly noted and described the overall purpose of a graphic organizer. However, the researcher did not provide any explicit instruction on the steps for completing or using the CBGO at this time. Second, the researcher had participants practice using Read: OutLoud 6.

Participants learned to use the keyboard and the appropriate icon displayed on the screen by the software in order to start and stop the text-to-speech with dynamic highlighting feature. Third, the researcher had participants select their preferred user and reading settings. After reviewing different options, all participants indicated their preferred view setting for displaying the texts was 150%. Participants then selected the rate at which they preferred the text to be read using the software. The researcher had participants wear their headphones while listening to the first paragraph of the summarized chapter. The researcher had initially programmed the software to read text at the slowest rate, -10, using a male voice. After the first paragraph was read, the researcher asked participants if they wanted to make any changes. While some asked to try different options, all participants indicated they preferred text to be read at the slowest rate, -10, using the male voice.

Baseline phase. A minimum of five baseline sessions was conducted for all participants. Before each session, the researcher uploaded the informational text and the CBGO on the computer using Read: OutLoud 6 software. The CBGO was displayed on the right-hand side of the screen, while the informational text was presented on the left-hand side. The settings for displaying content and the rate at which the informational text was read on the computer were adjusted to the participant's preference. Although the CBGO was available on the screen, the researcher did not provide any instruction on the steps for completing it.

Once the informational text and CBGO were uploaded, the researcher asked the participant to sit at the desk with the laptop computer. The researcher told the participant

to put on her or his headphones, listen as the text is read aloud, and then raise her or his hand when finished. If at any time the participant did not appear to be using the text-to-speech feature, as evidenced by the highlighter on the screen stopping on an individual word for more than 5-s, the researcher provided a verbal reminder to use the support. However, no participants were observed to refuse the text-to-speech software at any time.

After the participant indicated he or she was finished reading, the researcher closed the laptop and administered the comprehension probes at the desk. First, the researcher began the independent comprehension probe using a general prompt (e.g., said, “[participant’s name], tell me everything you remember about text you just read”). The participant was then given up to 10-s to respond. If the participant did not provide a correct independent story-statement within this time frame, or initiate an attempt to do so, the independent comprehension probe was ended. Likewise, the independent comprehension probe was ended if the participant indicated she or he did not have a response (e.g., shrugged shoulders, said, “I don’t know”), or otherwise suggested she or he was finished responding (e.g., more than 10-s break in response, said “I’m done”).

Second, the researcher conducted the two guided comprehension probes using specific questions (see Table 3). The researcher administered the first guided comprehension probe by asking all eight specific questions. A copy of the informational text and the participant-completed CBGO were not displayed. Specific questions were asked one by one and required the participant to retell facts related to the story-grammar concepts that were described in the informational text. The order in which specific questions were presented mirrored the order in which the related story-grammar concepts

were listed on the CBGO. The researcher provided up to 10-s for the participant to initiate a response to each question. If the participant did not provide a correct guided story-statement within this time frame, or at least an attempt to do so, the researcher asked the next specific question. The researcher also proceeded to ask the next question if the participant indicated she or he did not have a response (e.g., shrugged shoulders, said, “I don’t know”), or otherwise suggested she or he was finished responding (e.g., more than 10-s break in response, said “I’m done”). The participant was given the chance to answer all eight questions.

For only those specific questions to which the participant did not provide the correct guided story-statement, the researcher moved on to the second guided comprehension probe. However, unlike before, the researcher provided a paper-based copy of the informational text read at the onset of the same session and redisplayed the student-completed CBGO on the laptop. The CBGO was enlarged so that all content could be seen clearly. Once materials were presented, the researcher provided a brief directive for the participant to use the aforementioned materials to help him or her answer the questions. The researcher then repeated the specific questions to which the participant did not provide the correct story-statement during the first guided comprehension probe. The specific questions were asked one by one and in the same order in which the related story-grammar concepts were listed on the CBGO. The researcher provided up to 10-s for the participant to initiate a response to each question. If the participant did not provide a correct guided story-statement within this time frame, or at least an attempt to do so, the researcher asked the next specific question. The researcher also proceeded to ask the next

question if the participant indicated she or he did not have a response (e.g., shrugged shoulders, said, “I don’t know”), or otherwise suggested she or he was finished responding (e.g., more than 10-s break in response, said “I’m done”). The participant was given the opportunity to respond to all specific questions she or he did not initially provide a correct guided story-statement.

During the independent and guided comprehension probes, the researcher provided noncontingent reinforcement and general prompting as means to motivate the participant to continue working; however, the researcher did not provide answer-specific reinforcement or any other instruction outside of what was described above (e.g., hints to use the CBGO). Acceptable noncontingent reinforcement included general statements, such as “thank you for working so hard,” “great job answering questions,” or “almost done, two more left.” In contrast, feedback specific to participants’ responses (e.g., “that’s correct,” or “try again”) were not permitted.

Preintervention training and independent practice with feedback phase.

After baseline, the researcher provided instruction on the story-grammar concepts and training on the steps for completing and using the CBGO. All training sessions were scripted and offered to participants individually. First, the researcher provided direct instruction on the definitions of seven story-grammar concepts for social studies content. The researcher used model-lead-test with examples and nonexamples procedures similar to what was followed in Zakas (2011) in order to offer the direct instruction over two consecutive sessions. Second, the researcher offered guided practice training on the steps for completing the CBGO in order to summarize an informational text. The researcher

used a modified system of least prompts to support each participant while she or he completed the CBGO. Third, immediately after the CBGO was completed, the researcher provided guided practice training on the steps for using the CBGO to answer comprehension questions. The researcher used response-promptings strategies to provide feedback and offer assistance to the participant as she or he answered questions (i.e., positive reinforcement, verbal and gestural prompts). Both guided practice trainings described above occurred in a single session. A total of four consecutive guided practice sessions were provided. All together, the preintervention training, as defined above, was offered across six consecutive sessions.

After preintervention training was completed, the researcher began the independent practice with feedback sessions. During these sessions, the participant's ability to complete the CBGO and then answer specific questions before receiving support from the researcher was assessed. Independent practice with feedback sessions continued until a participant was able to independently and correctly complete 6 of 8 (75%) CBGO parts across two consecutive sessions. Data on the participants' abilities to independently and correctly complete the CBGO in this condition was measured and reported using the first dependent variable, task completion, of the current study.

Direct instruction on story-grammar concepts. For the first direct instruction session, the researcher reviewed the definitions of seven story-grammar concepts for social studies content (i.e., event, location, time, people, detail, sequence, outcome). Overall training procedures followed a model-lead-test with examples and nonexamples format similar to Zakas (2011) with the exception of three modifications. One

modification to procedures made in the current study was the use of alternate response mode. Participants were allowed to use a thumb-up or thumb-down gesture to identify examples and nonexamples of specific concepts. Participants were also permitted to identify the definitions of concepts using a T-chart. Alternate response modes were allowed due to concerns with the participants' abilities to memorize and accurately recall the story-grammar concepts and their definitions with sufficient proficiency within a single instructional session. The goal of the direct instruction was to familiarize participants with the story-grammar concepts for social studies content that were introduced in the informational texts. Another modification to procedures made in the current study was the use of a story-grammar concept map. In place of the paper-based vocabulary map described in Zakas (2011), participants completed the story-grammar chart to demonstrate their understanding of the concepts. After the first direct instruction session was provided, participants completed the story-grammar charts on the computer using Read: OutLoud 6. The noted change was made to allow the researcher to offer explicit instruction on the use of Read: OutLoud 6 while he also introduced and explained the steps for completing the story-grammar chart. The last modification to procedures made in the current study was the exclusion of the mastery criterion established in Zakas (2011). Participants were not expected to be able to independently complete the story-grammar charts with certain proficiency before advancing to the next condition of the current study. The noted change was made since participants' understanding of story-grammar concepts was measured during session in the independent practice with feedback condition. Participants had to independently and correctly complete 6 of 8

(75%) CBGO parts across two consecutive sessions in the independent practice with feedback condition in order to advance into the CBGO phase.

Before starting, the researcher placed one T-chart on the desk in front of the participant. The researcher then followed an instructional script to provide the direct instruction to individual participants (See Appendix D). First, the researcher presented one vocabulary card to the participant and read the displayed story-grammar concept and its definition aloud. Second, the researcher and participant pointed to the definition of the said story-grammar concept written on the T-chart together, while the researcher reread the definition aloud. The researcher modeled using one finger to point to the definition, but permitted the participant to use one or two fingers as long as it was clear the correct definition had been identified. Third, the researcher instructed the participant to independently point to the correct definition of the story-grammar concept presented on the T-chart. If the participant answered incorrectly at any time, the three aforementioned steps were repeated until she or he provided the correct response for the second and third steps. Fourth, the researcher had the participant identify examples and nonexamples of the target story-grammar concept for social studies content. Examples and nonexamples were read aloud by the researcher. The participant identified examples and nonexamples using a thumb-up or thumb-down gesture. A thumb-up gesture was defined as the participant extending her or his thumb upward while clenching the remaining fingers inward on or near her or his palm. In contrast, a thumb-down gesture was defined as the participant extending her or his thumb downward while clenching the remaining fingers inward on or near her or his palm. For the purposes of the current study, a thumb-up

gesture indicated the participant believed the answer option presented by the researcher was an example of the story-grammar concept, while a thumb-down gesture indicated she or he did not think it was an example. If the participant provided an incorrect response at any time, the researcher used the model-lead-test instructional model to give corrective feedback. More specifically, the researcher first clarified whether the answer option was an example or nonexamples and then provided a reason. Next, the researcher and participant answered whether the answer option was an example or nonexample of the reviewed story-grammar concept together, using the response modes described above. Then, the researcher had the participant answer whether the reviewed story-grammar concept was an example or nonexample independently, using the same response mode described above. Fifth, the researcher told the participant to independently identify the definition of the reviewed story-grammar concept by pointing to the appropriate definition written on the T-chart. The researcher then repeated the correct answer and provided positive verbal reinforcement. The fourth and fifth steps described above were repeated until all seven story-grammar concepts for social studies content were reviewed.

For the second direct instruction session, the researcher had the participant complete a story-grammar chart to demonstrate her or his understanding of the story-grammar concepts previously reviewed. The story-grammar chart was displayed on the computer using Read: OutLoud 6 (see Appendix C). The settings for displaying content on the chart using the software were adjusted to the participant's preference. The participant learned to complete the chart by using the yellow smart bookmark offered in Read: OutLoud 6 in order to match the definitions presented on the left side with the

correct story-grammar concepts presented on the right side. Procedures were scripted and began with the researcher reading all the content presented on the chart aloud to the participant. The researcher then explicitly stated and modeled the procedures for using the software to complete the chart as he matched two story-grammar concepts with their appropriate definitions. More specifically, the researcher: (a) read and clicked one story-grammar concept presented on right side, (b) identified its definition on the left, (c) highlighted the definition using the mouse, and then (d) clicked the yellow bookmark icon. The order in which content in the chart was completed (e.g., read and click the story-grammar concept then read and click the highlight definition, or vice versa) wavered, but the instruction on the general procedures for using the Read: OutLoud 6 software did not.

After the researcher modeled the steps for two story-grammar concepts, he instructed the participant to match the remaining five story-grammar concepts with their appropriate definitions. If the participant matched a definition to the incorrect story-grammar concept, the researcher (a) said the correct definition for the selected story-grammar concept, (b) pointed to the correct answer on screen, and (c) asked the participant to select the correct answer using the mouse or touch pad. If the participant appeared to have stopped working, as evidenced by allowing more than 10-s to elapse before initiating a novel response using the mouse or mouse touch pad, the researcher provided a direction to complete one of the steps he previously modeled, as described above. The researcher also provided supports specific to using the software and laptop computer while the participant completed the charts, as necessary. The supports related to

using the software included offering verbal and gestural prompts to help the participant locate the yellow bookmark, or to locate requested content in the story-grammar chart. The researcher also demonstrated how to move content around in the chart if the participant placed content in an unintended location. The supports related to the use of the laptop included reminders for the participant to hold the mouse, or touch pad, down until all words in the definitions were highlighted, or to simply double click the first word of the sentence in order to highlight the entire sentence. The supports specific to using the laptop were initially explicitly stated. However, if greater assistance was needed, the researcher modeled the desired task and then asked the participant to perform it independently.

The aforementioned steps were repeated until all story-grammar concepts were matched with their appropriate definitions. The researcher provided verbal and gestural positive reinforcement as the participant correctly completed parts of the chart (e.g., compliments, high-fives). Once completed, the researcher reviewed the story-grammar chart one last time with the participant. The researcher reviewed the chart by pointing to and reading the story-grammar concepts and their appropriate definitions in the order in which they were presented on the screen, when read top-to-bottom.

Guided practice on the steps for completing the CBGO. After the two direct instruction sessions were completed, the researcher taught individual participants how to complete the CBGO. This training was scripted and began with explicit instruction with a model on the steps for completing the CBGO. The researcher then implemented a modified system of least prompts to support the participant as she or he completed the

remaining CBGO parts. Before each session, the researcher uploaded a copy of the randomly selected informational text and the CBGO on the computer using Read: OutLoud 6. The CBGO was displayed on the right-hand side of the screen, while the informational text was presented on the left-hand side. The settings for displaying content and the rate at which the informational text was read on the computer were adjusted to the participant's preference.

To begin, the researcher asked the participant to sit at the desk with the laptop. The researcher then told the participant to put on her or his headphones, listen as the text was read aloud, and raise her or his hand when finished. Once the participant indicated she or he was done, the researcher provided the training on the steps for completing the CBGO. First, the researcher explained the purpose of completing the CBGO (e.g., "the CBGO allows you to take notes after reading so you can remember key facts about what you just read"). Second, the researcher used verbal and gestural prompts to direct the participant's attention toward the CBGO (e.g., point while saying, "lets look at the CBGO we will complete"). The researcher briefly reviewed the CBGO and reminded the participant the concepts listed in each of its parts were the same ones she or he learned about before. Third, the researcher explicitly stated the steps for completing the CBGO as he simultaneously modeled the noted steps for one to two randomly selected parts (i.e., read CBGO part, state definition, find correct answer, copy and paste it to CBGO).

Fourth, the researcher instructed the participant to complete the rest of the CBGO. Fifth, the researcher pointed to and read the story-grammar concept presented as the title of one CBGO part aloud. The researcher then directed the participant to highlight the fact

provided in the informational text that was needed to fill out the stated CBGO part. For example, the researcher said, “highlight the [CBGO part read in step five] in the text.” If the participant did not highlight the correct answer or was not in the process of doing so, as evidenced by having the mouse arrow over the correct answer, within 10-s of receiving the directive, the researcher provided support using a modified system of least prompts. The first level prompt consisted of the researcher stating the story-grammar concept and its definition, offering two examples, and then repeating the directive. If the participant did not highlight the correct answer or was not in the process of doing so, as evidenced by having the mouse arrow over the correct answer, within 10-s of the directive being repeated, the researcher delivered the second level prompt. The second level prompt consisted of the researcher instructing the participant to listen for the said story-grammar concept as he read three sentences, while simultaneously pointing to the individual words, from the text aloud. The researcher then repeated the directive to highlight the fact from the text related to the noted story-grammar concept. The specific sentences read by the researcher varied depending on the story-grammar concept listed on the CBGO, but the first or last sentence always included the correct answer. The remaining two foil sentences were always those that immediately followed or preceded the sentence containing the correct answer, as written in the informational text. For example, to help the participant identify the fact related to the event described in the text, the researcher read the first (correct answer), second (foil), and third (foil) sentences. However, to help the participant identify the fact related to the outcome, the researcher read the fourth (foil), fifth (foil) and sixth (correct answer) sentences. If the participant did not highlight

the correct answer or was not in the process of doing so, as evidenced by having the mouse arrow over the correct answer, within 10-s of repeating the directive again, the researcher delivered the third level prompt. The third level prompt consisted of the researcher saying the target answer while simultaneously pointing to it in the informational text presented on the computer screen. The researcher then told the participant to highlight the stated correct answer. Additional verbal supports were provided to remind the participant to only highlight the correct answer, as necessary. For example, the participant was told she or he did not need to include the sentences that followed the target answer. In some instances, the participant was also provided explicit instruction as well as a model on the steps for using the mouse, or mouse touch pad, to highlight a sentence that was written across two lines.

Sixth, the researcher instructed the participant to place the highlighted correct answer in the appropriate CBGO part listing the said story-grammar concept. To do this, the participant needed to select the desired CBGO part and then click the yellow bookmark icon displayed at the top of the screen. Verbal and gestural prompting was provided to help the participant locate the yellow bookmark or the desired CBGO part, as necessary. After the said part of the CBGO was completed, the researcher provided verbal and gestural positive reinforcement (e.g., compliment, high-five).

Steps five and six were repeated until all CBGO parts were completed. However, as participant's mastery for completing the CBGO increased, the researcher sometimes stated the aforementioned fifth and sixth steps as the participant was already completing them. By the latter stages of guided practice training, all participants demonstrated the

ability to identify the facts related to certain story-grammar concepts and understood how to complete the CBGO. Therefore, the researcher simply stated the direction aloud as the participant completed it as a reminder and positive reinforcement. With that said, the researcher stopped the participant if she or he selected an incorrect answer at any time and implemented the modified system of least prompts, as described above.

Guided practice on the steps for using the CBGO. Immediately after the CBGO was completed, the researcher taught individual participants how to use it in order to make guided story-statements in response to three to four specific questions. Specific questions were randomly selected from the pool of eight (see Table 3). The number of specific questions asked depended on the amount of time left in the session. Procedures were scripted and began with explicit instruction and a model on the steps for using the CBGO to make guided story-statements. The researcher then guided the participant as she or he attempted to make guided story-statements using response-prompting procedures.

First, the researcher stated the purpose for using the CBGO to answer questions. Second, the researcher directed the participant's attention toward the CBGO using a verbal and gestural prompt. Third, the researcher provided explicit instruction on the steps for using the CBGO to make guided story-statements in response to specific questions. Fourth, the researcher repeated the steps aloud as he also modeled them in order to make guided story-statements for one to two randomly selected specific questions. Fifth, the researcher stated it was the participant's turn and asked one of the specific questions. No questions modeled by the researcher were repeated to the

participant in a single session. If the participant provided a correct guided story-statement to the specific question, the researcher provided verbal and gestural positive reinforcement (e.g., compliment, high-five). If the participant did not provided a correct story-statement, or initiate an attempt to do so, within 10-s of a specific question being asked, the researcher used response prompting strategies to support the participant. Response prompting strategies included a verbal prompt and a seperate verbal and gestural prompt. The initial verbal prompt instructed the participant to find the appropriate CBGO part and then read the answer written that part (e.g., said “find the concept you heard in the question on your graphic organizer and read what you put in it.”). If greater assistance was required, the researcher pointed to the appropriate CBGO part and read the correct answer aloud. The participant was then told to read the correct answer aloud. The researcher then provided same positive reinforcement noted above. The fifth step was repeated until all randomly selected specific questions were asked. A total of four consecutive guided practice sessions were provided on the steps for completing and using the CBGO.

Independent practice with feedback. Independent practice sessions were provided to individual participants as an opportunity to practice completing the CBGO and then make guided story-story statements to specific questions before receiving assistance from the researcher. Procedures were similar to those followed at baseline. Before starting, the researcher uploaded a PDF copy of the randomly selected informational text and the CBGO on the computer using Read: OutLoud 6 software. The settings for displaying content and the rate at which the informational text was read on

the computer were adjusted to the participant's preference. The CBGO was displayed on the right-hand side of the screen, while the informational text was presented on the left-hand side. The participant sat at a desk, wore headphones, and listened to the informational text read on the laptop computer. The participant was told to raise her or his hand when done. Unlike the procedures followed at baseline, the initial directive included an instruction to complete the CBGO.

After the participant indicated she or he was done, the researcher followed a script to review the participant-completed CBGO and provide feedback. First, the researcher read aloud each CBGO part in the order in which they were presented and, if applicable, the participant's answer. Second, the researcher provided the feedback. If the participant provided the correct response, the researcher provided positive reinforcement (e.g., compliment, high-five) and proceeded to read the next CBGO part. In contrast, if the reviewed CBGO part was blank or did not contain the correct response, the researcher used the modified system of least prompts to help the participant locate the target answer in the informational text. The first level prompt consisted of the researcher stating the definition of the story-grammar concept, providing two examples, and then providing a directive (e.g., "highlight [say story-grammar concept listed in the graphic organizer part] in the text). If the participant did not highlight the correct answer or was not in the process of doing so, as evidenced by having the mouse arrow over the correct answer, within 10-s of presenting the directive, the researcher implemented the second level prompt. The second level prompt consisted of the researcher instructing the participant to listen for the said story-grammar concept as he read three sentences, while also pointing

to the individual words, from the text. The researcher then repeated the initial directive. The specific sentences read by the researcher varied depending on the story-grammar concept listed on the CBGO, but the first or last sentence always included the correct answer. The other two foil sentences were those that immediately followed or preceded the sentence containing the correct answer, as written in the informational text. If the participant did not highlight the correct answer or was not in the process of doing so, as evidenced by having the mouse arrow over the correct answer, the researcher delivered the third level prompt. The third level prompt consisted of the researcher saying the target answer while simultaneously pointing to it in the informational text presented on the computer screen. The participant was then told to highlight the identified correct answer and place it in the appropriate CBGO part. If the participant demonstrated difficulty using the Read: OutLoud 6 software to complete the CBGO part, the researcher explicitly stated the step that was needed aloud. If greater assistance was needed, the researcher modeled the identified step and then instructed the participant to independently perform the modeled step. The aforementioned two steps were repeated until all CBGO parts were reviewed.

Once the CBGO was reviewed, the researcher then began the independent and guided comprehension probes. Procedures were similar to those followed at baseline; however, the researcher used response-prompting strategies to provide feedback to participants. First, the researcher closed the laptop and administered the independent comprehension probe. The researcher initiated the independent comprehension probe using a general prompt (e.g., said, “[student’s name], tell me everything you remember

about the text you just read”). The participant was then given up to 10-s to respond. If the participant did not provide a correct independent story-statement within this time frame, or initiate an attempt to do so, the independent comprehension probe was ended. Likewise, the independent comprehension probe was ended if the participant indicated she or he did not have a response (e.g., shrugged shoulders, said, “I don’t know”), or otherwise suggested she or he was finished responding (e.g., more than 10-s break in response, said “I’m done”).

Second, the researcher administered the first guided comprehension probe. The researcher conducted the first guided comprehension probe by asking eight specific questions, one-by-one. The specific questions were the same eight questions asked at baseline that required participants to recall facts related to the specific story-grammar concepts that were described in the informational text (See Table 3). The participant was given up to 10-s to respond to each specific question. If the participant made a correct guided story-statement to a specific question, the researcher provided positive reinforcement (e.g., compliment, high-five). If the participant did not provide a correct guided story-statement within this time frame, or at least an attempt to do so, the researcher asked the next specific question. The researcher also proceeded to ask the next question if the participant indicated she or he did not have a response (e.g., shrugged shoulders, said, “I don’t know”), or otherwise suggested she or he was finished responding (e.g., more than 10-s break in response, said “I’m done”). The participant was given the chance to answer all eight questions.

Third, the researcher conducted the second guided comprehension probe. Unlike the second step, the researcher only repeated specific questions to which the participant did not initially provide a correct guided story-statement. In addition, the researcher provided the student-completed CBGO, a paper-based copy of the informational text, and a directive to use these materials before he began repeating the questions. The participant was given up to 10-s to respond to specific questions. If the participant provided a correct guided story-statement to a specific question, the researcher provided positive reinforcement (e.g., compliment, high-five). If the participant did not provide a correct story-statement or at least initiate an attempt within this time frame, indicated she or he does not have a response (e.g., shrugged shoulders, said, “I don’t know”), or otherwise suggested she or he was finished responding (e.g., more than 10-s break in response, said “I’m done”), the researcher pointed to and read aloud the correct response written in the CBGO. The participant was then told to read the answer aloud. The researcher then provided positive reinforcement (e.g., compliment, high-five). Additional feedback was also provided on how to correctly paraphrase facts related to the specific story-grammar concepts from the informational text that consisted of full sentences. More specifically, the researcher explained and modeled how the participant could just retell the key fact instead of trying to remember an entire sentence. The retells modeled by the researcher were presented as complete thoughts that included a subject and verb. For example, the researcher demonstrated that participants could say “American Leaders made rules,” instead of “After America was created, a group of American Leaders made some new rules and laws” in response to being asked to retell the event from the text on the

Constitutional Convention. Such feedback was given as means to encourage participants to attempt to make guided story-statements for facts that required retelling more than a date or one to two words. It was observed that some participants, such as Jen and Cathy, were often hesitant to respond to questions independently without the support of the CBGO or the informational text. The researcher had participants practice paraphrasing one to two facts within a single session, depending on the amount of time available. The third step was followed until all specific questions to which the participant did not provide a correct guided story-statement during the first guided comprehension probe were repeated and accurately answered. Independent practice with feedback sessions continued until the participant was able to independently and correctly complete six of eight (75%) CBGO parts across two consecutive sessions.

CBGO use phase. Before each session, the researcher uploaded a PDF copy of the informational text and the CBGO on the computer using Read: OutLoud 6. The CBGO was displayed on the right-hand side of the screen, while the informational text was presented on the left-hand side. The settings for displaying content and the rate at which the informational text was read on the computer were adjusted to the participant's preference.

To begin, the researcher instructed the participant to listen to the informational text as it was read aloud. Next, the researcher told the participant to complete the CBGO using content from the informational text. Last, the researcher told the participant to raise her or his hand when finished. After the participant indicated she or he was done, the

researcher began the independent and guided comprehension probes using the same procedures followed at baseline.

Generalization phase. Immediately after her or his last CBGO use phase, a participant was advanced into the generalization condition. Procedures in this condition mirrored those followed at CBGO use with one exception: The informational texts randomly selected for use were adapted from an elementary-level social studies book. Before starting a session, the researcher uploaded a copy of the randomly selected informational texts to the laptop using the text-to-speech software. The same CBGO used in sessions at earlier phases of this study was also uploaded. The CBGO was displayed on the right-hand side of the screen, while the informational text was presented on the left-hand side. The settings for displaying content and the rate at which the informational text was read on the computer were adjusted to the participant's preference.

Next, the researcher instructed the participant to listen to the informational text as it was read aloud. Then, the researcher told the participant to complete the CBGO using content from the informational text. Last, the researcher told the participant to raise her or his hand when finished. After the participant indicated he or she was done, the researcher began the independent and guided comprehension probes using the same procedures followed at baseline.

Reliability, Fidelity, and Social Validity

This section describes the procedures followed to review the reliability, fidelity, and social validity of the current study. An interobserver agreement analysis was conducted to review the reliability with which data were scored for all four participants at

each phase of the current study. In addition, a review of recorded sessions against instructional and procedural scripts was done to measure the extent the current study was implemented as planned at each phase and across participants. Feedback on the social significance of the intervention implemented was collected from the participants and their Language Arts teacher using social validity questionnaires.

Interobserver reliability. Interobserver agreement (IOA) analysis was completed to review the accuracy in which participant data were scored on all dependent variables. This reliability analysis was done for 31% to 42% of all data collected during sessions in the baseline, preintervention training and independent practice with feedback, CBGO use, and generalization phases across participants. The researcher created an Independent and Guided Story-Statements Answer Key and a Task Completion Answer Key for each informational text to help guide the reliability evaluation. Both answer keys listed the definitions of the dependent variables and story-grammar concepts. They also explained the scoring conventions for analyzing data and provided multiple examples of correct and partial correct answers. In addition, copies of the same data sheets used by the researcher to document and score participant data were prepared for this review. Last, copies of transcripts created by the researcher to document participants' responses during independent and guided comprehension probes were provided. The observer used the appropriate data sheets described above to score participant data.

The observer was a doctoral student at George Mason University who was not directly involved in the current study. Before data were independently reviewed, the researcher trained the observer on the established scoring conventions. First, the

researcher explained which data sheets and answer keys should be used to review specific participant data. Second, the researcher explained the definitions of terms unique to the current study and provided examples. Third, the researcher modeled how to use the answer keys and data sheets for a series of hypothetical responses using one informational text. Although printed copies of the CBGO were not reviewed during this training, the researcher displayed the informational text and pointed to specific content as the hypothetical responses. The researcher then explicitly stated how the hypothetical responses should be scored against the Task Completion Answer Key. Fourth, the researcher had the observer practice using the answer keys to score hypothetical responses. The researcher provided corrective feedback and additional explanations of definitions and scoring conventions to support the observer, as necessary. Training continued until the observer scored hypothetical responses provided by the researcher with 95% accuracy.

After the training was provided, the observer independently reviewed video recordings of randomly selected sessions and scored data on participants' total independent story-statements and total guided story-statements, with and without materials displayed. The observer also reviewed paper-based copies of the CBGOs that were completed by the participants in the same sessions. Once the independently reviewed data were returned, the researcher calculated the reliability coefficient by dividing the number of agreements by the number of agreements and disagreements. The aggregate IOA was 99% across all participants at each phase and ranged from 93% to 100%. The IOA for the first dependent variable, task completion, was 98% and ranged

from 93 % to 100%. The IOA for the second dependent variable, total independent story-statements, was 100% and ranged from 99% to 100%. The IOA for the third dependent variable, total guided story-statements, was 99% and ranged from 93% to 100%.

Procedural reliability. Procedural reliability was conducted to measure the extent to which the procedures of the current study were implemented as planned. This reliability analysis was done for 31% to 42% of all data collected during sessions in the baseline, preintervention training and independent practice with feedback, CBGO use, and generalization phases across participants. Procedural reliability data sheets were developed using the same scripts prepared at the start of the current study. In addition, copies of the randomly selected recorded sessions were provided. The observer used the data sheet to record the number of steps the researcher implemented correctly while reviewing recorded sessions.

The same observer who independently reviewed and scored participant data also conducted the procedural reliability evaluation. Before sessions were independently reviewed, the researcher trained the observer on the procedures of the current study using a sample of the scripts. First, the researcher explained the general structure of the scripts and noted which needed to be followed while watching specific sessions at each phase. Second, the researcher modeled the procedures listed in the sample scripts. Third, the researcher explained and modeled the procedures for using the fidelity data sheets. Fourth, the researcher had the observer practice using the fidelity data sheets as the researcher followed two training scripts.

After training, the observer independently reviewed the video recordings of randomly selected sessions using the procedural reliability data sheets. Once completed and returned, the researcher calculated the fidelity coefficient by dividing the number of steps correctly implemented by the total number of procedural steps. The aggregate procedural fidelity was 100% across all participants at each phase of the current study and ranged from 98% to 100%. The procedural reliability for the first phase of the study, baseline, was 100% and did not vary. The procedural reliability for the second phase of the study, preintervention training and independent practice with feedback, was 99% and ranged from 98% to 100%. The procedural reliability for the third phase of the current study, CBGO use, was 100% and did not vary. The procedural reliability of the fourth phase of the current study, generalization, was 100% and ranged from 99% to 100%.

Social validity. Two questionnaires were developed to collect feedback on the social significance of this study's goals, procedures, and outcomes. One was prepared for the participants (Table 4), while the other was created for the participants' Language Arts teacher (Table 5). The participant questionnaire consisted of five items. Each item presented a statement about the study with three response options. These response options were a happy face (agreed with the statement), an indifferent face (uncertain about the statement), and a sad face (disagreed with the statement). The teacher questionnaire consisted of five items that presented a statement about the study with five answer options that ranged from completely agree to completely disagree. At the bottom of both questionnaires, there was space for the participants and the teacher to write individualized comments. The researcher had participants complete the questionnaire

with the support of their teacher immediately after the last session held in the generalization phase. The researcher then collected the completed questionnaires from the teacher. The teacher questionnaire was sent to the participant's Language Arts teacher via e-mail the day after the date of the last session of the current study. The researcher instructed the teacher to return the completed questionnaire via e-mail. Questionnaires were expected to take 5 to 10 minutes to complete.

Table 4

Participant Questionnaire

Statement	Response Options
1. I think learning to read is important.	Happy face/indifferent face/sad face
2. I liked learning how to use a graphic organizer.	Happy face/indifferent face/sad face
3. I think completing the graphic organizer was easy.	Happy face/indifferent face/sad face
4. I think the graphic organizer helped me understand what I was reading better.	Happy face/indifferent face/sad face
5. I would like to use a graphic organizer in my other classes.	Happy face/indifferent face/sad face

Table 5

Teacher Questionnaire

Statement	Response Options
1. I think my students should be taught to read and comprehend texts aligned with the general curriculum.	Strongly Agree/Agree/Not Sure/Disagree/Strongly Disagree
2. I think teaching my students to use a graphic organizer was appropriate.	Strongly Agree/Agree/Not Sure/Disagree/Strongly Disagree
3. I think teaching my students how to use a graphic organizer helped them remember what they were reading.	Strongly Agree/Agree/Not Sure/Disagree/Strongly Disagree
4. I want to learn how to incorporate the use of graphic organizers into my regular teaching practices.	Strongly Agree/Agree/Not Sure/Disagree/Strongly Disagree
5. I would recommend the use of graphic organizers to other teachers of students with significant developmental disabilities.	Strongly Agree/Agree/Not Sure/Disagree/Strongly Disagree

Data Analysis

Prior to data analysis, participants' performances on each dependent variable were reviewed and scored using an answer key. First, the researcher reviewed the videorecordings and transcribed the participants' responses during independent and guided comprehension probes. Next, the researcher scored the participants' data collected during the independent and guided comprehension probes against the Independent and Guided Story-Statements Answer Key. Last, the researcher reviewed and scored the CBGOs completed by participants against the Task Completion Answer Key. Participant performance data were then reported as percentages on separate graphs. Visual analysis strategies commonly used in single-subject research were utilized to review data presented on the graphs.

The researcher also used descriptive statistics to calculate the number of guided story-statements made by participants during the two guided comprehension at baseline, CBGO use, and generalization phases. Descriptive analysis was also used to calculate the individual and aggregate responses by participants on social validity questionnaires.

Visual analysis. The researcher used visual analysis strategies recommended in the literature to review participants' task completion, total independent story-statements, and total guided story-statements data that were reported on separate graphs (Gast, 2010). Campbell and Herzinger (2010) argued there are three benefits to using visual analysis in single-subject research. First, visual analysis of data maintains a conservative threshold for evaluating the effectiveness of data reported on graphs. Data must present a distinct and readily apparent behavioral change in the desired therapeutic direction before a researcher can judge an intervention as effective. Second, visual analysis allows independent observers to review the same primary participant data reported on graphs. Thus, visual analysis permits decisions made regarding the overall effectiveness of the intervention to be verified across multiple independent observers. Third, visual analysis allows a researcher to make data-based decisions. A researcher is able to keep a participant in the baseline condition until data are stable and present a behavioral concern of social significance. The researcher is also able to modify the intervention if data indicates the participant's behavior has not changed in the desired therapeutic direction. For these reasons, these authors concluded visual analysis is the recommended approach for evaluating single-subject data.

In this study, visual analysis was used to inspect the level, variability, trend, overlap, consistency, and immediacy of effect in individual participant data within and between phases (Kratochwill et al., 2013). Level was defined as the mean of a data pattern within a phase. The researcher reviewed the amount of change in level within a condition using an absolute level change and a relative level change metric (Gast & Spriggs, 2010). The absolute level change within a condition was calculated by (a) identifying the values of the first and last data points in a data pattern, (b) subtracting the smallest value from the largest value, and then (c) stating whether the change was or was not in the desired therapeutic direction. The relative level change within a condition was calculated by (a) identifying the median of a data pattern, (b) computing the means of the first and second halves of the same data pattern, (c) subtracting the smallest mean value from the largest mean value, and then (d) stating whether the change was or was not in the desired therapeutic direction. In the current study, the researcher calculated the absolute and relative level changes within baseline and CBGO use conditions for data collected on the third dependent variable (total guided story-statements, with and without materials displayed). The aforementioned analysis was not calculated for the first (task completion) and second (total independent story-statements) dependent variables due to concerns regarding ceiling and floor effects in data across all four participants. Trend referred to the slope of the data pattern within a phase and was calculated using the split-middle method. First, the researcher identified the midpoint of the data pattern and then the midpoint of the respective halves. Then, the researcher drew a line through the noted midpoint of each half to identify the trend line. The stability of the identified level or

trend line, when applicable, within a condition was determined by its variability.

Variability was calculated using the 80-20 rule and referred to the extent to which data deviated from the identified level or trend line, when applicable, within a single phase.

Using the 80-20 rule, data were reported to present low variability if 80% of data points fell within a 20% of its level or trend line. Overlap described the extent to which data fell within the same range between two adjacent phases. The researcher evaluated the overlap of participant data between two phases using the percentage of nonoverlapping data metric (PND; Scruggs & Mastropieri, 1998). PND was calculated by (a) identifying the value of the single highest data point in the baseline condition, (b) counting the number of data points in the treatment condition, (c) counting the number of data points in the treatment condition that exceeded the highest valued data point from the baseline condition, (d) dividing the number of points in the treatment condition that exceeded the highest valued data point from the baseline condition by the total number of data points in the second condition, and (e) multiplying the quotient by 100 (Scruggs & Mastropieri, 1998). PND is interpreted as the percentage of data from one phase that exceed the single highest data point in the two conditions. The literature indicates a researcher may report a PND of 70% or greater as effective, 50 to 70% as questionably effective, and 50% or below as having little to no observable effectiveness (Scruggs & Mastropieri, 1998).

Consistency referred to the extent data patterns were consistent across phases with similar conditions. Immediacy of change was defined as the magnitude of the behavioral change between the last data points in one phase and the first data points in the next phase.

Descriptive analyses. Descriptive analyses were done to review participant-supported retell and social validity data. The researcher calculated the percentage of correct guided story-statements made by participants out of all the specific questions asked during the two guided comprehension probes at baseline, CBGO use, and generalization. The researcher also calculated the frequency at which each item on the participant social validity questionnaire was identified to analyze individual and group responses.

Summary

This chapter reviewed the research methods followed to investigate the effectiveness of systematic instruction on the steps for completing and using a CBGO with four high school participants with SDD. The unique demographic and learning characteristics of participants were presented. The operational definitions of the independent variable, systematic instruction, and dependent variables, independent story-statements and guided story-statements with and without materials displayed, were detailed. The procedures implemented to systematically introduce the intervention across participants using a single-subject, multiple-baseline design were discussed. The procedures taken to review the reliability, fidelity, and social validity of the current study were described. Finally, the data analysis strategies used to evaluate participant data were reviewed. The following chapter presents the results of the current study.

Chapter Four

This chapter describes the results of the current multiple-baseline study, which examined the functional relation between systematic instruction on the steps for completing and using a CBGO and the comprehension levels of participants with SDD. The participants' comprehension levels were measured using three dependent variables: (a) task completion; (b) total independent story-statements; and (c) total guided story-statements, with and without materials displayed. The current study included (a) a baseline phase, (b) preintervention training and independent practice with feedback phase, (c) CBGO use phase, and (d) a generalization phase. Participant data are reported in four graphs: (a) task completion, (b) total independent story-statements, (c) total guided story-statements, and (d) total guided story-statements with materials displayed. Data collected during the two guided story-statements were plotted in separate graphs to report the number of story-statements provided by participants when materials were and were not displayed. Social validity data collected after the current study was completed from participants and their Language Arts teacher are also discussed.

Task Completion

The first dependent variable, task completion, was defined as the number of CBGO parts correctly completed by participants using facts from an informational text. As described before, the CBGO had eight parts that were titled with one of the following

story-grammar concepts: (a) event, (b) location, (c) time, (d) people, (e) first detail, (f) second detail, (g) third detail, and (h) outcome. Individual CBGO parts were scored as (a) correct, (b) incorrect, and (c) nonresponse. Task completion scores were calculated and then reported as a percentage of points earned out of the total possible points on the graphs.

When analyzed as a group, findings from the current study revealed that all participants demonstrated mean increases in their task completion scores between the baseline, independent practice with feedback, and CBGU use conditions (see Figure 1). In the baseline phase, the mean task completion score for all participants was 0% ($SD = 0\%$). In the independent practice with feedback condition, the mean task completion score for all participants increased to 95% ($SD = 6\%$). Data collected in the independent practice with feedback condition also showed all four participants met the task completion mastery criterion for advancing into the next phase in two consecutive sessions. In the CBGO use phase, the mean task completion score for all participants was 97% ($SD = 6\%$). In the generalization phase, the mean task completion score for all participants was 89% ($SD = 11\%$). Therefore, based on the visual analysis of data presented in Figure 1, results of the current study demonstrate strong evidence of a functional relation between systematic instruction and the participants' task completion scores using informational texts.

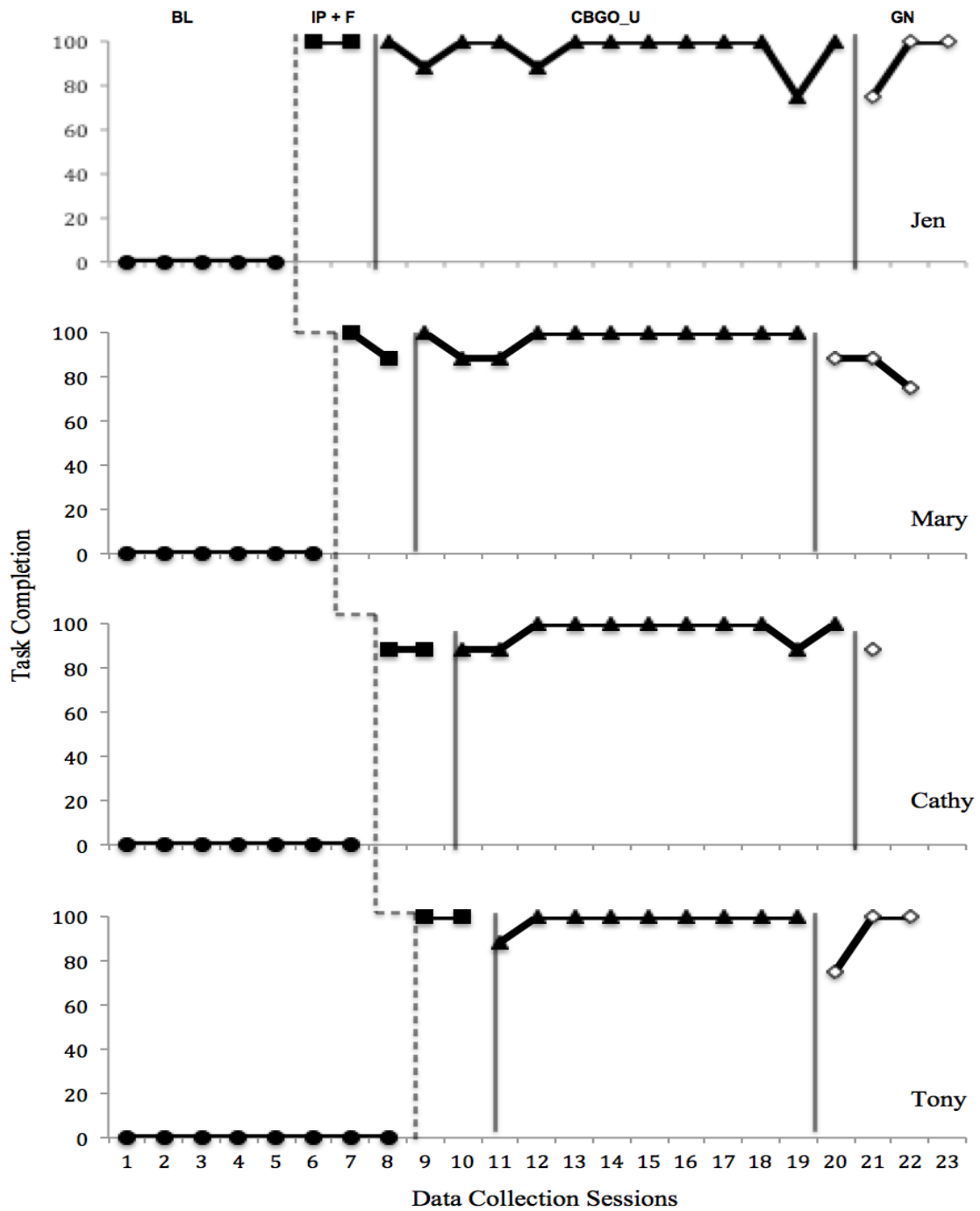


Figure 1. Task completion. The percentage of CBGO parts independently completed by participants in baseline (BL, closed circles), independent practice plus feedback (IP + F, closed squares), computer-based graphic organizer use (CBGO_U, closed triangles), and generalization (GN, open diamonds) conditions.

Jen. In the baseline phase, data were low and stable at 0%. Data presented a flat trend line without any variability. In the independent practice with feedback condition, data revealed an immediate change in level increasing to 100% ($SD = 0\%$) after the intervention was introduced. Data in this condition presented a flat trend line without any variability. PND was calculated at 100% indicating there was no overlap in data between this condition and the baseline phase. In the CBGO use phase, data remained consistent with the increased level established in the independent practice with feedback condition. Data in this phase presented a flat trend line with low variability, ranging from 75% to 100%. Her mean task completion score in the CBGO use phase was 96% ($SD = 8\%$). There was no overlap between data from the baseline phase and the CBGO use phase, resulting in a 100% PND. In the generalization phase, data remained high ($M = 92\%$, $SD = 14\%$) and consistent with the increased level established in the earlier condition. Data in this phase presented a slight upward trend line with low variability, ranging from 75% to 100%. Overall, Jen's task completion scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

Mary. In the baseline phase, data were consistently low and stable at 0%. Data presented a flat trend line without any variability. In the independent practice with feedback condition, data showed an immediate change in level increasing to 94% ($SD = 5\%$) after the intervention was introduced. Data presented a slight downward trend line with low variability, ranging from 88% to 100%. PND was calculated at 100% indicating there was no overlap in data between this condition and the baseline phase. In the CBGO

use phase, data remained consistent with the increased level established in the independent practice with feedback condition. Data in this phase presented a slight upward trend line with low variability, ranging from 88% to 100%. Her mean task completion score in the CBGO use phase was 98% ($SD = 5\%$). There was no overlap between data from the baseline phase and the CBGO use phase, which resulted in a 100% PND. In the generalization phase, data remained high ($M = 83\%$, $SD = 7\%$) and above baseline. Data in this phase displayed a slight downward trend line with low variability, ranging from 75% to 88%. Overall, Mary's task completion scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

Cathy. In the baseline phase, data were low and stable at 0%. Data presented a flat trend line without any variability. In the independent practice with feedback condition, data revealed an immediate change in level increasing to 88% ($SD = 0\%$) after the intervention was introduced. Data in this condition presented a flat trend line without any variability. PND was calculated at 100% indicating there was no overlap in data between this condition and the baseline phase. In the CBGO use phase, data presented an additional gradual change in level increasing to 97% ($SD = 6\%$). Data in this phase presented a flat trend line with low variability, ranging from 88% to 100%. There was no overlap between data from the baseline phase and the CBGO use phase, resulting in a 100% PND. In the generalization phase, the one data point collected was high (88%) and within range of the increased level established in the earlier condition (97%). Overall,

Cathy's task completion scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

Tony. In the baseline phase, data were low and stable at 0%. Data in this condition presented a flat trend line without any variability. In the independent practice with feedback condition, data revealed immediate change in level increasing to 100% ($SD = 0\%$) after the intervention was introduced. Data in this condition presented a flat trend line without any variability. PND was calculated at 100% indicating there was no overlap in data between this condition and the baseline phase. In the CBGO use phase, data remained consistent with the increased level established in the independent practice with feedback condition. Data in this phase presented a flat trend line with low variability, ranging from 88% to 100%. His mean task completion score in the CBGO use phase was 99% ($SD = 4\%$). There was no overlap between data from the baseline phase and the CBGO use phase, resulting in a 100% PND. In the generalization phase, data remained high ($M = 92\%$, $SD = 14\%$) and consistent with the increased level established in the earlier condition. Data in this phase displayed a slight upward trend with low variability, ranging from 75% to 100%. Overall, Tony's task completion scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

Total Independent Story-Statements

The second dependent variable, total independent story-statements, was defined as the number of independent story-statements made by participants during the independent comprehension probes. An independent story-statement was an independent

retell of a fact related to a story-grammar concept described in an informational text. As described before, the story-grammar concepts that were presented in all texts were: (a) event, (b) location, (c) time, (d) people, (e) first detail, (f) second detail, (g) third detail, and (h) outcome. After participants listened to an informational text on the computer, the researcher initiated an independent comprehension probe using a general prompt (e.g., said, “[participant’s name], tell me everything you remember about what you just read”). Participants’ independent story-statements were scored as (a) correct, (b) partial correct, (c) incorrect, and (d) nonresponse. Total independent story-statement scores were calculated and then reported as a percentage of points earned out of the total possible points on the graphs.

When analyzed as a group, findings of this study showed three out of the four participants did not demonstrate mean increases in their total independent story-statements score between the baseline, independent practice with feedback, and CBGU use conditions (see Figure 2). In the baseline phase, the mean total independent story-statements score for all four participants was 5% ($SD = 6\%$). In the independent practice with feedback condition, the mean total independent story-statements score for all participants slightly increased to 10% ($SD = 14\%$). In the CBGO use phase, the mean total independent story-statements score for all participants slightly increased again to 16% ($SD = 22\%$). In the generalization phase, the mean total independent story-statements score for all participants was 13% ($SD = 21\%$). Therefore, based on the visual analysis of data presented in Figure 2, results of the current study do not demonstrate

evidence of a functional relation between systematic instruction and the participants' independent story-statements about informational texts.

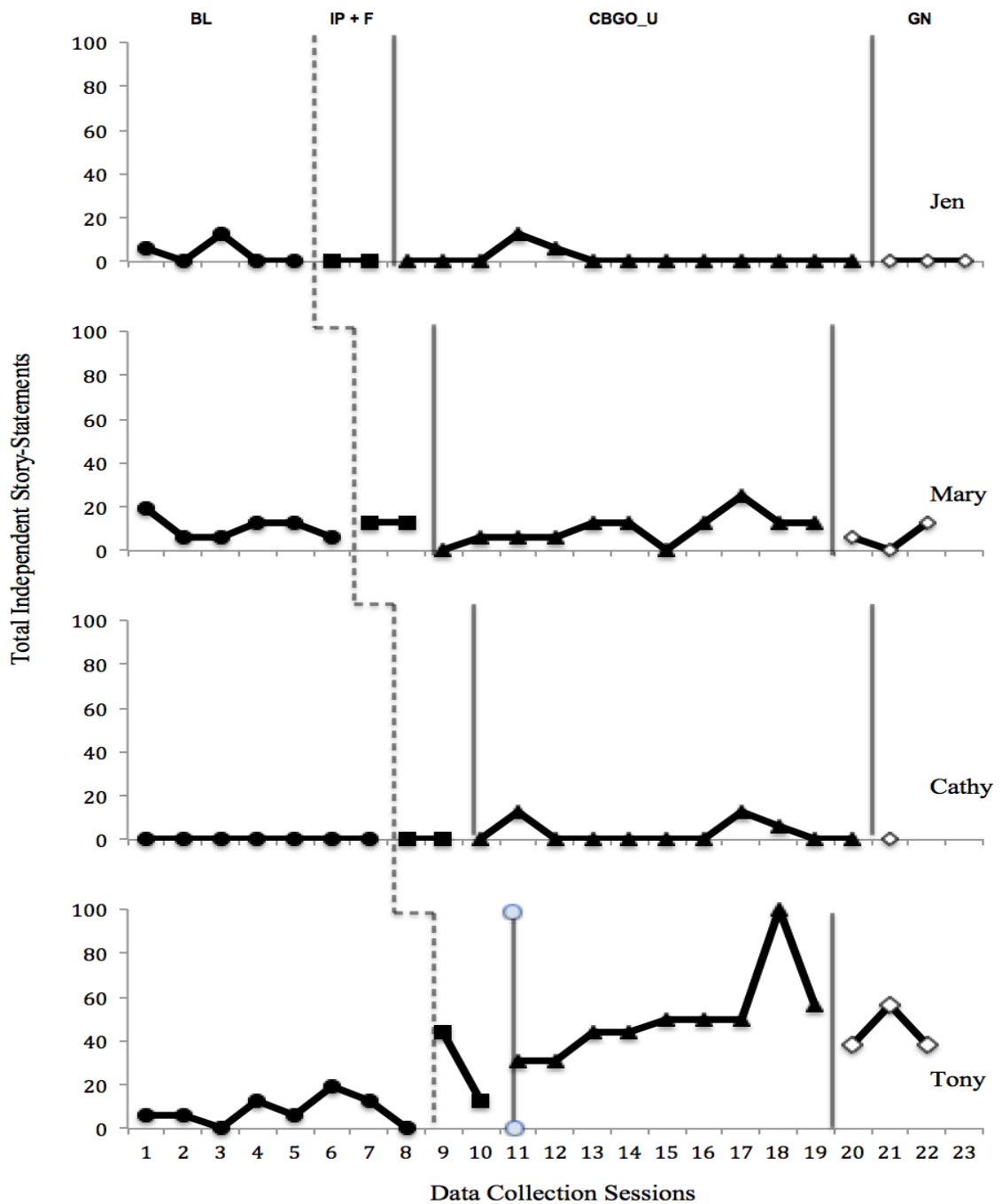


Figure 2. Total independent story-statements. The percentage of total independent story-statements made by participants out of the eight story-grammar concepts described in an informational text after receiving a general prompt in baseline (BL, closed circles), independent practice plus feedback (IP + F, closed squares), computer-based graphic organizer use (CBGO_U, closed triangles), and generalization (GN, open diamonds) conditions.

Jen. In the baseline phase, data were low and presented a flat trend line. Data were variable with a range of 0% to 13% and an overall level of 4% ($SD = 6\%$). In the independent practice with feedback condition, data did not demonstrate an immediate change after the intervention was introduced. Data presented a flat trend line at 0% without any variability. Data were consistent with the low level established at baseline. PND was calculated at 0% indicating there was a large degree of overlap in data between this condition and the baseline phase. In the CBGO use phase, data remained consistent with the low level established at baseline ($M = 1\%$, $SD = 4\%$). Data in this phase revealed a slight downward trend line that was variable with a range of 0% to 13%. There was a large degree of overlap between data from the baseline phase and the CBGO use phase, resulting in a 0% PND. In the generalization phase, data remained low ($M = 0\%$, $SD = 0\%$) and consistent with the low level established at baseline. Data in this phase displayed a flat trend without any variability. Overall, Jen's total independent story-statements score remained consistently low with minimal variability at all conditions of the current study.

Mary. In the baseline phase, data were low and presented a slight upward trend line. Data were variable with a range of 6% to 19% and an overall level of 10% ($SD = 5\%$). In the independent practice with feedback condition, data did not demonstrate an immediate change after the intervention was introduced. Data presented a flat trend line at 13% without any variability. Data were consistent with the low level established at baseline. PND was calculated at 0% indicating there was a large degree of overlap in data between this condition and the baseline phase. In the CBGO use phase, data remained

consistent with the low level established at baseline ($M = 10\%$, $SD = 0\%$). Data in this phase presented a slight upward trend line that was variable with a range of 0% to 25%. There was large degree of overlap between data from the baseline phase and the CBGO use phase, which resulted in a 9% PND. In the generalization phase, data remained low ($M = 6\%$; $SD = 6\%$) and consistent with the low level established at baseline. Data in this phase displayed a slight upward trend line that was variable, ranging from 0% to 13%. Overall, Mary's independent story-statement scores remained consistently low with minimal variability at all conditions of the current study.

Cathy. In the baseline phase, data were low and stable at 0%. Data presented a flat trend line without any variability. In the independent practice with feedback condition, data did not demonstrate an immediate change after the intervention was introduced. Data presented a flat trend line at 0% without any variability. Data were consistent with the low level established at baseline. PND was calculated at 0% indicating there was a large degree of overlap in data between this condition and the baseline phase. In the CBGO use phase, data remained consistent with the low level established at baseline. Data in this phase presented a slight upward trend line that was variable with a range of 0% to 13% and an overall level of 3% ($SD = 5\%$). There was a large degree of overlap between data from the baseline phase and the CBGO use phase, which resulted in a 27% PND. In the generalization phase, the one data point collected was low (0%) and consistent with the low level established at baseline. Overall, Cathy's independent story-statement scores remained consistently low with minimal variability at all conditions of the current study.

Tony. In the baseline phase, data were low and presented a slight upward trend line. Data were variable with a range of 0% to 19% and an overall level of 8% ($SD = 6\%$). In the independent practice with feedback condition, data demonstrated an immediate change in level increasing to 28% ($SD = 22\%$). Data in this condition presented a moderate downward trend line that was variable, ranging from 13 to 44%. PND was calculated at 50% indicating there was a large degree of overlap in data between this condition and the baseline phase. In the CBGO use phase, data showed an additional gradual change in level increasing to 51% ($SD = 20\%$). Data presented a moderate upward trend line that was variable with a range of 31% to 100%. There was no overlap between data from the baseline phase and the CBGO use phase, which resulted in a 100% PND. In the generalization phase, data remained high ($M = 44\%$, $SD = 11\%$) and consistent with the high level established in the CBGO use phase. Data in this phase showed a flat trend line that was variable, ranging from 38% to 56%. Overall, Tony's independent story-statement scores were consistently higher in the CBGO use and generalization conditions than in the baseline phase.

Total Guided Story-Statements

The third dependent variable, total guided story-statements, was defined as the number of guided story-statements made by participants during the guided comprehension probes. A guided story-statement was a guided retell of a key fact directly related to a story-grammar concept described in a text, provided in response to a specific question. A total of eight specific questions were asked, each requiring the participant to retell the key fact related to a story-grammar concept (see Table 3). After completing the

independent comprehension probe, the researcher conducted the guided comprehension probe by asking all eight specific questions one by one. Participants' guided story-statements were scored as (a) correct, (b) incorrect, and (c) nonresponse. Partial credit was not awarded as participants were expected to identify key facts related to the story-grammar concepts that were presented in the specific questions. Total guided story-statement scores were calculated and then reported as a percentage of points earned out of the total possible points on the graphs.

When analyzed as a group, findings from the current study revealed that all participants demonstrated mean increases in their total guided story-statements scores between the baseline, independent practice with feedback, and CBGU use conditions (see Figure 3). In the baseline phase, the mean total guided story-statements score for all participants was 5% ($SD = 8\%$). In the independent practice with feedback condition, the mean total guided story-statements score for all participants increased to 23% ($SD = 12\%$). In the CBGO use phase, the mean total guided story-statements score for all participants increased again to 48% ($SD = 16\%$). In the generalization phase, the mean total guided story-statements score for all participants was 36% ($SD = 9\%$). Therefore, based on the visual analysis of data presented in Figure 3, results of the current study demonstrate strong evidence of a functional relation between systematic instruction and the participants' guided story-statements about informational texts.

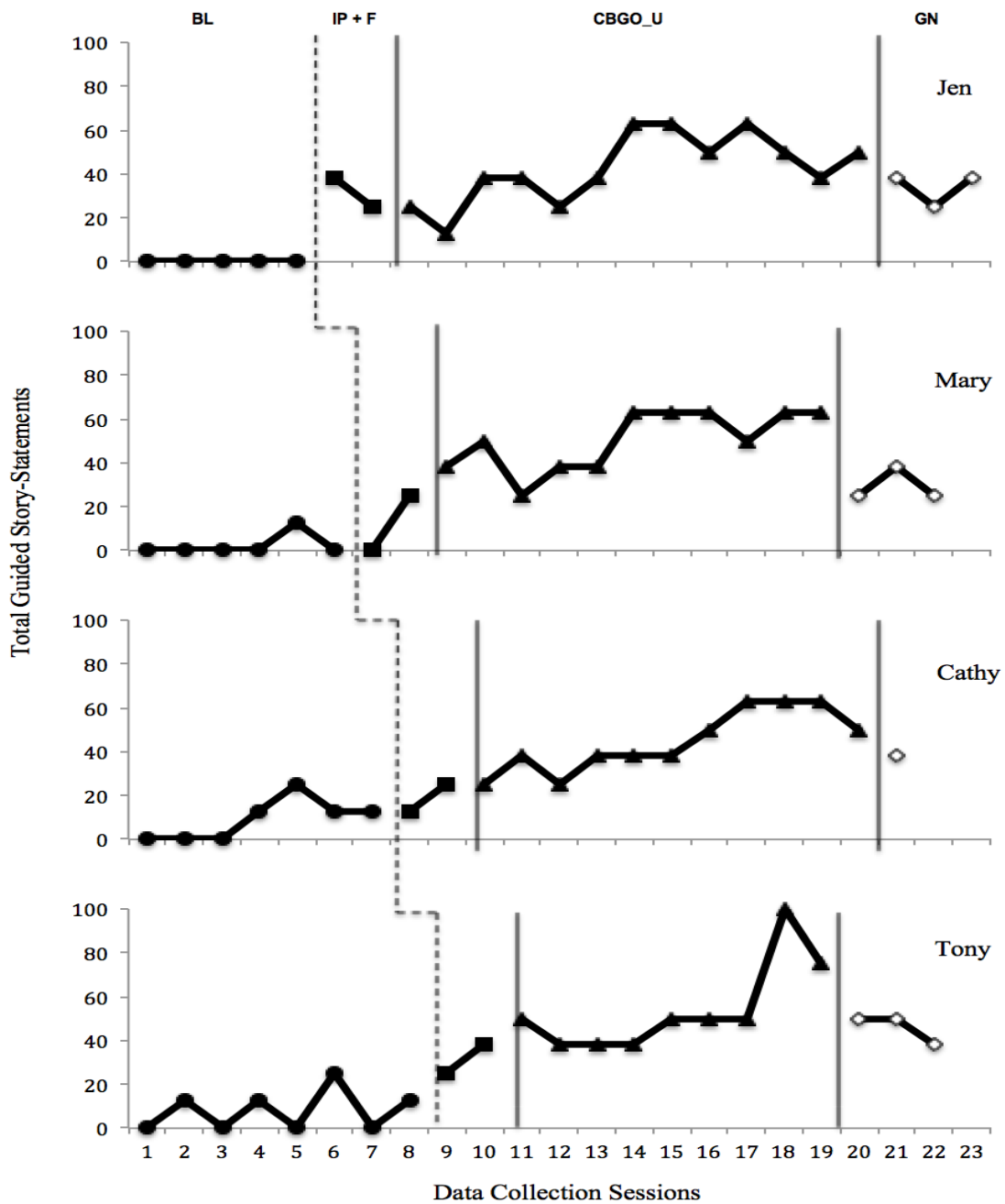


Figure 3. Total guided story-statements. The percentage of total guided story-statements made by participants out of the eight story-grammar concepts described in an informational text, provided in response to specific questions in baseline (BL, closed circles), independent practice plus feedback (IP + F, closed squares), computer-based graphic organizer use (CBGO_U, closed triangles), and generalization (GN, open diamonds) conditions.

Jen. In the baseline phase, data were low and stable at 0%. Data presented a flat trend line without any variability. In the independent practice with feedback condition, data demonstrated an immediate change in level increasing to 31% ($SD = 9\%$) after the intervention was introduced. Data presented a slight downward trend line that was variable and ranged from 25% to 38%. PND was calculated at 100% indicating there was no overlap in data between this condition and the baseline phase. In the CBGO use phase, data demonstrated an additional gradual change in level increasing to 42% ($SD = 16\%$). Data presented a slight upward trend line that was variable and ranged from 13% to 63%. The absolute level change within this phase using the values of the first (25%) and last (50%) data points was +25% in the desired improving direction. The relative level change within this phase using the means of the first (29%) and second (52%) halves of the data pattern was +23% in the desired improving direction. There was no overlap between data from the baseline phase and the CBGO use phase, resulting in a 100% PND. In the generalization phase, data remained high ($M = 33\%$, $SD = 7\%$) and consistent with the increased level established in the CBGO use phase. Data in this phase presented a flat trend line that included low variability and ranged from 25% to 38%. Overall, Jen's total guided story-statements were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

As depicted in Table 6, Jen's guided story-statements were more consistently accurate for certain story-grammar concepts after the intervention was introduced. In the CBGO use phase, she consistently provided correct guided story-statements using facts related to the location (85%), time (69%), and people (92%) described in the

informational texts after they were requested by the researcher using specific questions. She also offered correct guided story-statements with improved consistency using facts related to the event (46%) and outcome (38%) described in texts. In the generalization phase, the accuracy of her guided story-statements remained high and above baseline for location (100%), time (67%), and people (100%) while accessing untrained texts.

Table 6

Jen's Guided Story-Statements Accuracy

Concept	Baseline	Computer-Based Graphic Organizer Use	Generalization
	Guided Story-Statements 1	Guided Story-Statements 1	Guided Story-Statements 1
Event	0%	46%	0%
Location	0%	85%	100%
Time	0%	69%	67%
People	0%	92%	100%
First Detail	0%	8%	0%
Second Detail	0%	0%	0%
Third Detail	0%	0%	0%
Outcome	0%	38%	0%

Note. The percentage of sessions Jen provided correct guided story-statements for each story-grammar concept during the first guided comprehension probe, identified as “Guided Story-Statements 1” in the table, at baseline, computer-based graphic organizer use, and generalization.

Mary. In the baseline phase, data were low and presented a slight upward trend line. Data were variable with a range of 0% to 13% and a mean of 2% ($SD = 5\%$). The absolute level change within this phase using the values of the first (0%) and last (0%) data points was 0%. The relative level change within this phase using the means of the first (0%) and second (4%) halves of the data pattern was +4% in the undesired

improving direction. In the independent practice with feedback condition, data demonstrated a slight change in level increasing to 13% ($SD = 18\%$) after the intervention was introduced. Data had a slight upward trend line that was variable and ranged from 0 to 25%. PND was calculated at 50% indicating there was a large degree of overlap in data between this condition and the baseline phase. In the CBGO use phase, data demonstrated an additional gradual change in level increasing to 50% ($SD = 14\%$). Data presented a slight upward trend line that was variable and ranged from 25% to 63%. The absolute level change within this phase using the values of the first (38%) and last (63%) data points was +25% in the desired improving direction. The relative level change within this phase using the means of the first (38%) and second (60%) halves of the data pattern was +22% in the desired improving direction. There was no overlap between data from the baseline phase and the CBGO use phase, resulting in a 100% PND. In the generalization phase, data remained high ($M = 29\%$, $SD = 7\%$) and above baseline data. Data in this phase presented a flat trend line that was variable and ranged from 25% to 38%. Overall, Mary's total guided story-statements scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

As depicted in Table 7, Mary's guided story-statements were more consistently accurate for certain story-grammar concepts after the intervention was introduced. In the CBGO use phase, Mary consistently provided correct guided story-statements using facts related to the location (100%), time (91%), and people (100%) described in the informational texts after they were requested by the researcher using specific questions.

The accuracy of her guided story-statements also remained high and above baseline for event (55%) and outcome (55%). In the generalization phase, the accuracy of her guided story-statements remained high and above baseline for event (67%), location (100%), time (33%), and people (33%) while accessing untrained texts.

Table 7

Mary's Guided Story-Statements Accuracy

Concept	Computer-Based Graphic		
	Baseline	Organizer Use	Generalization
	Guided Story-Statements 1	Guided Story-Statements 1	Guided Story-Statements 1
Event	0%	55%	67%
Location	0%	100%	100%
Time	0%	91%	33%
People	17%	100%	33%
First Detail	0%	0%	0%
Second Detail	0%	0%	0%
Third Detail	0%	0%	0%
Outcome	0%	55%	0%

Note. The percentage of sessions Mary provided correct guided story-statements for each story-grammar concept during the first guided comprehension probe, identified as “Guided Story-Statements 1” in the table, at baseline, computer-based graphic organizer use, and generalization.

Cathy. In the baseline phase, data were low and presented a slight upward trend line. Data were variable with a range of 0% to 25% and a mean of 9% ($SD = 9\%$). The absolute level change within this phase using the values of the first (0%) and last (13%) data points was +13% in the undesired improving direction. The relative level change within this phase using the means of the first (0%) and second (17%) halves of the data pattern was +17% in the undesired improving direction. In the independent practice with

feedback condition, data demonstrated a slight change in level increasing to 19% ($SD = 9\%$) after the intervention was introduced. Data presented a slight upward trend line that was variable and ranged from 13% to 25%. PND was calculated at 50% indicating there was a large degree of overlap in data between this condition and the baseline phase. In the CBGO use phase, data presented an additional gradual increase in level ($M = 44\%$, $SD = 14\%$). Data had a slight upward trend line that was variable and ranged from 25% to 63%. The absolute level change within this phase using the values of the first (25%) and last (50%) data points was +25% in the desired improving direction. The relative level change within this phase using the means of the first (33%) and second (58%) halves of the data pattern was +25% in the desired improving direction. Two of the data points from the CBGO use phase overlapped with baseline data, resulting in an 82% PND. In the generalization phase, the one data point collected was high (38%) and consistent with the increased level established in the CBGO use phase. Overall, Cathy's total guided story-statements scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

As depicted in Table 8, Cathy's guided story-statements were more consistently accurate for certain story-grammar concepts after the intervention was introduced. In the CBGO use phase, Cathy consistently provided correct guided story-statements using facts related to the location (91%), time (82%), and people (100%) described in the informational texts after they were requested by the researcher using specific questions. She also offered correct story-statements with improved consistency using facts related to

the event (27%) and outcome (36%). In the one generalization session, Cathy retold the correct key fact related to the location, time, and people after reading an untrained text.

Table 8

Cathy's Guided Story-Statements Accuracy

Concept	Baseline	Computer-Based Graphic Organizer Use	Generalization
	Guided Story-Statements 1	Guided Story-Statements 1	Guided Story-Statements 1
Event	0%	27%	0
Location	0%	91%	+
Time	14%	82%	+
People	29%	100%	+
First Detail	0%	0%	0
Second Detail	0%	9%	0
Third Detail	29%	9%	0
Outcome	0%	36%	0

Note. The percentage of sessions Cathy provided correct guided story-statements for each story-grammar concept during the first guided comprehension probe, identified as “Guided Story-Statements 1” in the table, in the baseline and computer-based graphic organizer use phases. For the generalization phase, data is provided on the story-grammar concepts correctly (+) and incorrectly (0) retold using facts from the text since only one session was conducted.

Tony. In the baseline phase, data were low and presented a slight upward trend. Data were variable with a range of 0% to 25% and a mean of 8% ($SD = 9\%$). The absolute level change within this phase using the values of the first (0%) and last (13%) data points was +13% in the undesired improving direction. The relative level change within this phase using the means of the first (6%) and second (9%) halves of the data pattern was +3% in the undesired improving direction. In the independent practice with feedback condition, data demonstrated an immediate change in level increasing to 31% ($SD = 9\%$) after the intervention was introduced. Data presented a slight upward trend

line that was variable and ranged from 25% to 38%. PND was calculated at 50% indicating there was a large degree of overlap in data between this condition and the baseline phase. In the CBGO use phase, data demonstrated an additional gradual change in level increasing to 54% ($SD = 21\%$). Data presented a moderate upward trend line that was variable and ranged from 13% to 63%. The absolute level change within this phase using the values of the first (50%) and last (75%) data points was +25% in the desired improving direction. The relative level change within this phase using the means of the first (41%) and second (69%) halves of the data pattern was +28% in the desired improving direction. There was no overlap between data from the baseline phase and the CBGO use phase, resulting in a 100% PND. In the generalization phase, data remained high ($M = 46\%$, $SD = 7\%$) and consistent with the increased level established in the CBGO use phase. Data in this phase presented a slight downward trend line with low variability and ranged from 38% to 50%. Overall, Tony's total guided story-statements scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

As depicted in Table 9, Tony's guided story-statements were more consistently accurate for certain story-grammar concepts after the intervention was introduced. In the CBGO use phase, he consistently provided correct guided story-statements using facts related to the event (33%), location (100%), time (89%), and people (100%) described in the texts after they were requested by the researcher using specific questions. He also offered correct story-statements with improved consistency using facts related to the first detail (22%), second detail (22%), third detail (44%), and outcome (22%). In the

generalization phase, the accuracy of his guided story-statements remained high and above baseline for event (33%), location (100%), time (100%), people (100%), and third detail (33%) while accessing untrained texts.

Table 9

Tony's Guided Story-Statements Accuracy

Concept	Baseline	Computer-Based Graphic	
	Guided Story-Statements 1	Organizer Use Guided Story-Statements 1	Generalization Guided Story-Statements 1
Event	0%	33%	33%
Location	25%	100%	100%
Time	13%	89%	100%
People	25%	100%	100%
First Detail	0%	22%	0%
Second Detail	0%	22%	0%
Third Detail	0%	44%	33%
Outcome	0%	22%	0%

Note. The percentage of sessions Tony provided correct guided story-statements for each story-grammar concept during the first guided comprehension probe, identified as “Guided Story-Statements 1” in the table, in the baseline, computer-based graphic organizer use, and generalization phases.

Total guided story-statements with materials displayed. The third dependent variable, total guided story-statements, was extended to also measure the number of guided story-statements made by participants during the second guided comprehension probe when materials were displayed. Materials were the CBGO and a paper-based version of the informational text displayed to participants at the onset of the same session, before listening to the text read aloud on the computer. However, the researcher only asked the specific questions to which the participants did not provide the correct guided story-statement during the first guided comprehension probe. Therefore, the second guided comprehension probe only measured the number of guided story-statements made by participants out of the specific questions that were not initially correctly retold. The number of specific questions asked during the second guided

comprehension probe ranged from zero to eight. After completing the first guided comprehension probe, the researcher conducted the second comprehension probe by asking the specific questions one by one. Participants' guided story-statements were scored as (a) correct, (b) incorrect, and (c) no response. Participants' guided story-statements did not earn partial credit as they were expected to identify key facts related to the story-grammar concepts presented in the specific questions. Total guided story-statement with materials displayed scores were calculated and then reported as a percentage of points earned out of the total possible points on the graphs.

When analyzed as a group, findings from the current study revealed that all participants demonstrated mean increases in their total guided story-statements with materials displayed scores between the baseline, independent practice with feedback, and CBGU use conditions (see Figure 4). In the baseline phase, the mean total guided story-statements with materials displayed score for all participants was 34% ($SD = 28\%$). In the independent practice with feedback condition, the mean total guided story-statements with materials displayed score for all participants increased to 94% ($SD = 8\%$). In the CBGO use phase, the mean total guided story-statements with materials displayed score for all participants increased to 96% ($SD = 9\%$). In the generalization phase, the mean total guided story-statements with materials displayed score for all participants was 82% ($SD = 18\%$). Therefore, based on the visual analysis of data presented in Figure 4, results of the current study demonstrate strong evidence of a functional relation between systematic instruction and the participants' guided story-statements with materials displayed scores.

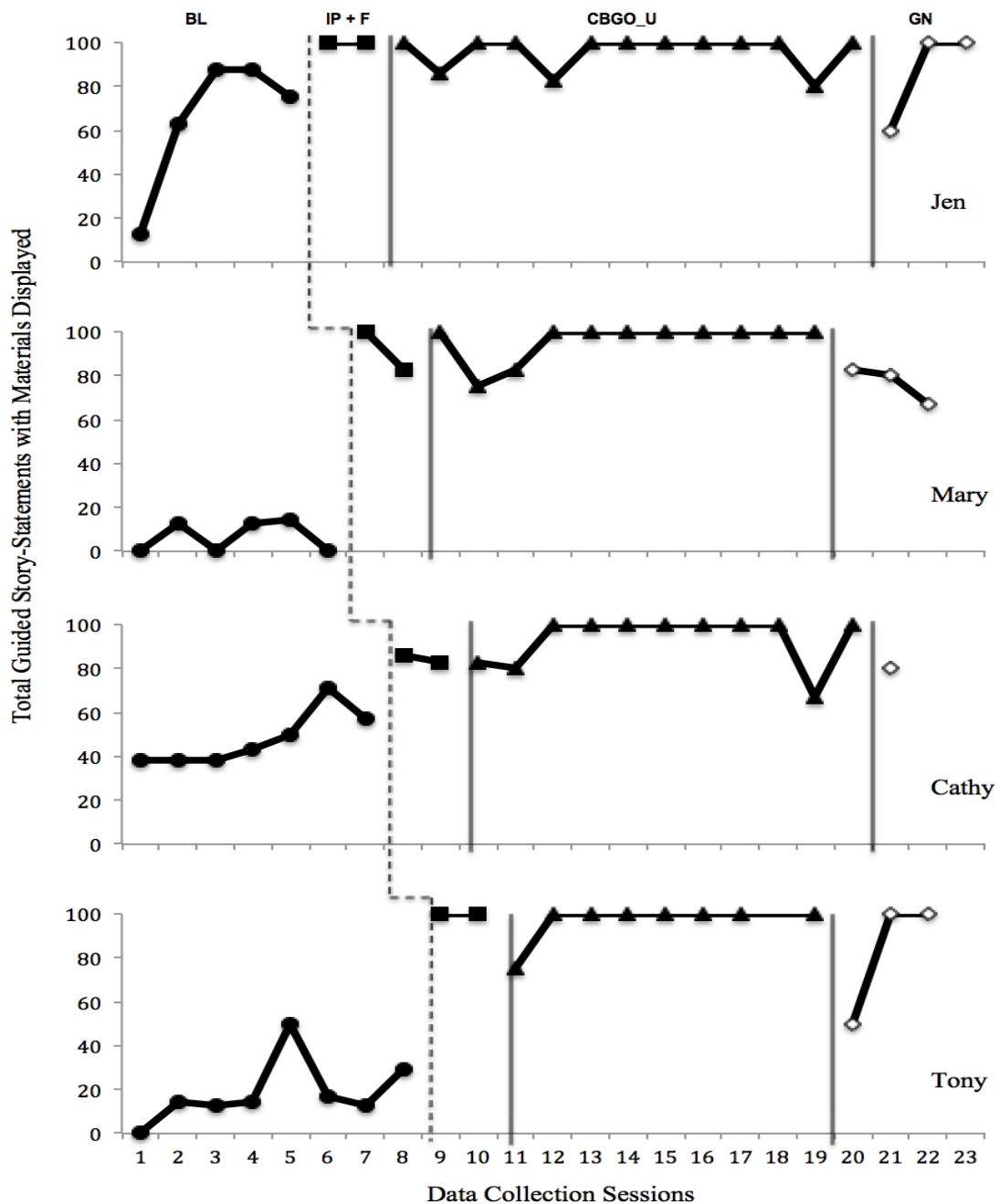


Figure 4. Total guided story-statements with materials displayed. The percentage of story-grammar concepts identified by participants after materials were displayed and the specific questions to which they did not initially answer correctly were repeated by the researcher in the baseline (BL, closed circles), independent practice plus feedback (IP +

F, closed squares), computer-based graphic organizer use (CBGO_U, closed triangles), and generalization (GN, open diamonds) conditions.

Jen. In the baseline phase, data were high and presented an abrupt upward trend. Data were variable with a range of 13% to 88% and an overall level of 65% ($SD = 31\%$). The absolute level change within this phase using the values of the first (13%) and last (75%) data points was +62% in the undesired improving direction. The relative level change within this phase using the means of the first (38%) and second (81%) halves of the data pattern was +43% in the undesired improving direction. In the independent practice with feedback condition, data demonstrated an immediate change in level increasing to 100% ($SD = 0$) after the intervention was introduced. Data presented a flat trend line without any variability. PND was calculated at 100% indicating there was no overlap in data between this condition and the baseline phase. In the CBGO use phase, data were high ($M = 96\%$, $SD = 8\%$) and consistent with the increased level established in the independent practice with feedback condition. Data presented a flat trend line with low variability, ranging from 80% to 100%. The absolute level change within this phase using the values of the first (100%) and last (100%) data points was 0%. The relative level change within this phase using the means of the first (95%) and second (97%) halves of the data pattern was +2% in the desired improving direction. Three of the data points collected in the CBGO use phase overlapped with baseline data, resulting in a 77% PND. In the generalization phase, data remained high ($M = 87\%$, $SD = 23\%$) and consistent with the increased level established in the earlier conditions. Data in this phase presented an abrupt upward trend line that was variable, ranging from 60% to 100%.

Overall, Jen's total guided story-statements with materials displayed scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

As depicted in Table 10, Jen's guided story-statements with materials displayed were more consistently accurate for certain story-grammar concepts after the intervention were delivered. In the CBGO use phase, she consistently provided correct guided story-statements with materials displayed using facts related to the event (100%), time (100%), first detail (100%), second detail (100%), and third detail (100%) described in the informational texts with improved accuracy. The two story-grammar concepts (i.e., location, people) for which Jen's performance fell from the baseline to CBGO use phase reflect two sessions in which she retold minor facts related to one of the noted story-grammar concepts rather than key facts. In other words, Jen provided one incorrect guided story-statement with materials displayed in two sessions. In the generalization phase, the accuracy of her guided story-statements with materials displayed remained high and above baseline for event (100%), time (67%), first detail (100%), and second detail (100%) while accessing untrained texts.

Table 10

Jen's Guided Story-Statements with Materials Displayed Accuracy

Concept	Baseline	Computer-Based Graphic Organizer Use	Generalization
	Guided Story-Statements 2	Guided Story-Statements 2	Guided Story-Statements 2
Event	80%	100%	100%
Location	20%	0%	—
Time	60%	100%	100%
People	60%	0%	—
First Detail	60%	100%	100%
Second Detail	60%	100%	100%
Third Detail	80%	100%	67%
Outcome	100%	100%	67%

Note. The percentage of sessions Jen provided correct guided story-statements for each story-grammar concept during the second guided comprehension probe, identified as “Guided Story-Statements 2” in the table, at baseline, computer-based graphic organizer use, and generalization. A dash (—) indicates the specific question was not repeated because the related fact was correctly retold during the first guided comprehension probe.

Mary. In the baseline phase, data were low and presented a slight upward trend line. Data were variable with a range of 0% to 14% and an overall level of 7% ($SD = 7\%$). The absolute level change within this phase using the values of the first (0%) and last (0%) data points was 0%. The relative level change within this phase using the means of the first (4%) and second (9%) halves of the data pattern was + 5% in the undesired improving direction. In the independent practice with feedback condition, data demonstrated an immediate change in level increasing to 92% ($SD = 12\%$) after the intervention was introduced. Data presented a slight downward trend with low variability, ranging from 83% to 100%. PND was calculated at 100% indicating there was no overlap

in data between this condition and the baseline phase. In the CBGO use phase, data demonstrated an additional gradual change in level increasing to 96% ($SD = 9\%$). Data presented a slight upward trend line with low variability, ranging from 75% to 100%. The absolute level change within this phase using the values of the first (100%) and last (100%) data points was 0%. The relative level change within this phase using the means of the first (92%) and second (100%) halves of the data pattern was +8% in the desired improving direction. There was no overlap between data from the baseline phase and the CBGO use phase, resulting in a 100% PND. In the generalization phase, data remained high ($M = 77\%$, $SD = 9\%$) and above baseline. Data in this phase presented a slight downward trend line with low variability, ranging from 67% to 83%. Overall, Mary's total guided story-statements with materials displayed scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

As depicted in Table 11, Mary's guided story-statements with materials displayed were more consistently accurate for certain story-grammar concepts after the intervention were delivered. In the CBGO use phase, she consistently provided correct guided story-statements with materials displayed using facts related to the retold event (100%), time (100%), first detail (100%), second detail (100%), third detail (100%) and outcome (60%) described in the informational texts with improved accuracy. The specific questions related to location and people described in the texts were never repeated in the CBGO use phase because Mary correctly retold the correct key fact during the first guided comprehension probe. In the generalization phase, the accuracy of Mary's guided

story-statements with materials displayed remained high and above baseline for all story-grammar concepts when requested by the researcher using specific questions.

Table 11

Mary's Guided Story-Statements with Materials Displayed Accuracy

Concept	Baseline	Computer-Based Graphic Organizer Use	Generalization
	Guided Story-Statements 2	Guided Story-Statements 2	Guided Story-Statements 2
Event	0%	100%	100%
Location	17%	—	—
Time	17%	100%	100%
People	20%	—	100%
First Detail	0%	100%	100%
Second Detail	0%	100%	33%
Third Detail	0%	100%	33%
Outcome	0%	60%	100%

Note. The percentage of sessions Mary provided correct guided story-statements for each story-grammar concept during the second guided comprehension probe, identified as “Guided Story-Statements 2” in the table, at baseline, computer-based graphic organizer use, and generalization. A dash (—) indicates the specific question was not repeated because the related fact was correctly retold during the first guided comprehension probe.

Cathy. In the baseline phase, data were high and presented a slight upward trend line. Data had low variability with a range of 38% to 71% and an overall level of 48% ($SD = 13\%$). The absolute level change within this phase using the values of the first (38%) and last (57%) data points was +19% in the undesired improving direction. The relative level change within this phase using the means of the first (38%) and second (60%) halves of the data pattern was +22% in the undesired improving direction. In the independent practice with feedback condition, data demonstrated an immediate change in level increasing to 85% ($SD = 2\%$) after the intervention was introduced. Data had a

slight downward trend line and ranged from 83% to 86%. PND was calculated at 100% indicating there was no overlap in data between this condition and the baseline phase. In the CBGO use phase, data demonstrated an additional gradual change in level increasing to 94% ($SD = 12\%$). Data presented a flat trend line with low variability, ranging from 67% to 100%. The absolute level change within this phase using the values of the first (83%) and last (100%) data points was +17% in the desired improving direction. The relative level change within this phase using the means of the first (93%) and second (93%) halves of the data pattern was 0%. One data point collected in the CBGO use phase overlapped with baseline data, resulting in a 91% PND. In the generalization phase, the one data point collect was high (80%) and above baseline. Overall, Cathy's total guided story-statements with materials displayed scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

As depicted in Table 12, Cathy's guided story-statements with materials displayed were more consistently accurate for certain story-grammar concepts after the intervention were delivered. In the CBGO use phase, she consistently provided correct guided story-statements with materials displayed using facts related to the retold correct key facts related to the event (100%), time (100%), first detail (100%), second detail (100%), third detail (100%), and outcome (71%) described in the informational texts with improved accuracy. The one story-grammar concept (i.e., location) in which her performance fell from the baseline to the CBGO use phase reflects one session in which she did not correctly identify the related fact after reading an informational text. The specific

question related to the people described in the texts was never repeated in the CBGO use phase because she correctly retold the correct key fact during the first guided comprehension probe. In the one generalization session, Cathy retold the correct key fact related to the event, people, first detail, second detail, and outcome when materials were displayed after reading an untrained text.

Table 12

Cathy's Guided Story-Statements with Materials Displayed Accuracy

Concept	Baseline	Computer-Based Graphic Organizer Use	Generalization
	Guided Story-Statements 2	Guided Story-Statements 2	Guided Story-Statements 2
Event	0%	100%	+
Location	0%	0%	—
Time	33%	100%	—
People	40%	—	+
First Detail	71%	100%	+
Second Detail	100%	100%	+
Third Detail	100%	100%	0
Outcome	43%	71%	+

Note. The percentage of sessions Cathy provided correct guided story-statements for each story-grammar concepts during the second guided comprehension probe, identified as “Guided Story-Statements 2” in the table, at baseline, computer-based graphic organizer use, and generalization. A dash (—) indicates the specific question was not repeated because the related fact was correctly retold during the first guided comprehension probe. For the generalization phase, data is provided on the story-grammar concepts correctly (+) and incorrectly (0) retold using facts from the text since only one session was conducted.

Tony. In the baseline phase, data were low and presented a slight upward trend line. Data were variable with a range of 0% to 50% and an overall level of 19% ($SD = 17\%$). The absolute level change within this phase using the values of the first (0%) and last (29%) data points was +29% in the undesired improving direction. The relative level

change within this phase using the means of the first (10%) and second (27%) halves of the data pattern was +17% in the undesired improving direction. In the independent practice with feedback condition, data revealed an immediate change in level increasing to 100% after the intervention was introduced. Data presented a flat trend line at 100% without any variability. PND was calculated at 100% indicating there was no overlap in data between this condition and the baseline phase. In the CBGO use phase, data remained high ($M = 97\%$, $SD = 9\%$) and consistent with the increased level established in the independent practice with feedback condition. Data in this phase presented a flat trend line with low variability, ranging from 75% to 100%. The absolute level change within this phase using the values of the first (75%) and last (100%) data points was +25% in the desired improving direction. The relative level change within this phase using the means of the first (94%) and second (100%) halves of the data pattern was +6% in the desired improving direction. There was no overlap between data from the baseline phase and the CBGO use phase, resulting in a 100% PND. In the generalization phase, data remained high ($M = 83\%$) and above baseline. Data in this phase presented an abrupt upward trend line that was variable, ranging from 50% to 100%. Overall, Tony's total guided story-statements with materials displayed scores were consistently higher in the independent practice with feedback, CBGO use, and generalization conditions than in the baseline phase.

As depicted in Table 13, Tony's guided story-statements with materials displayed were more consistently accurate for certain story-grammar concepts after the intervention were delivered. In the CBGO use phase, he consistently provided correct guided story-

statements with materials displayed using facts related to the event (100%), time (100%), first detail (100%), second detail (100%), third detail (100%) and outcome (86%) described in the informational texts with improved accuracy. The specific questions related to location and people described in the texts were never repeated in the CBGO use phase because Tony correctly retold the correct key fact during the first guided comprehension probe. In the generalization phase, the accuracy of Tony's guided story-statements with materials displayed remained high and above baseline for all story-grammar concepts when requested by the researcher using specific questions.

Table 13

Tony's Guided Story-Statements with Materials Displayed Accuracy

Concept	Baseline	Computer-Based Graphic Organizer Use	Generalization
	Guided Story-Statements 2	Guided Story-Statements 2	Guided Story-Statements 2
Event	38%	100%	100%
Location	33%	—	—
Time	29%	100%	—
People	0%	—	—
First Detail	13%	100%	100%
Second Detail	0%	100%	67%
Third Detail	0%	100%	50%
Outcome	38%	86%	100%

Note. The percentage of sessions Tony provided correct guided story-statements for each story-grammar concept during the second guided comprehension probe, identified as “Guided Story-Statements 2” in the table, at baseline, computer-based graphic organizer use, and generalization. A dash (—) indicates the specific question was not repeated because the related fact was correctly retold during the first guided comprehension probe.

Supplementary analysis. In addition to reviewing the participants' progress on the individual dependent variables, the researcher evaluated the aggregate mean for the total number of guided story-statements provided without and with materials displayed across all the participants at each phase of the current study. In the baseline phase, the mean total guided story-statements without and with materials score for all participants was 2.88 ($SD = 2.21$). In the independent practice with feedback condition, the mean total guided story-statements without and with materials displayed score for all participants increased to 7.63 ($SD = .52$). In the CBGO use phase, the mean total guided story-statements without and with materials score for all participants was 7.80 ($SD = .41$). In the generalization phase, the mean total guided story-statements without and with materials score for all participants was 7.10 ($SD = .88$). Therefore, based on data reported in Figure 5, results of the current study indicate the mean total number of guided story-statements without and with materials displayed score increased across all participants from the baseline to the generalization phase.

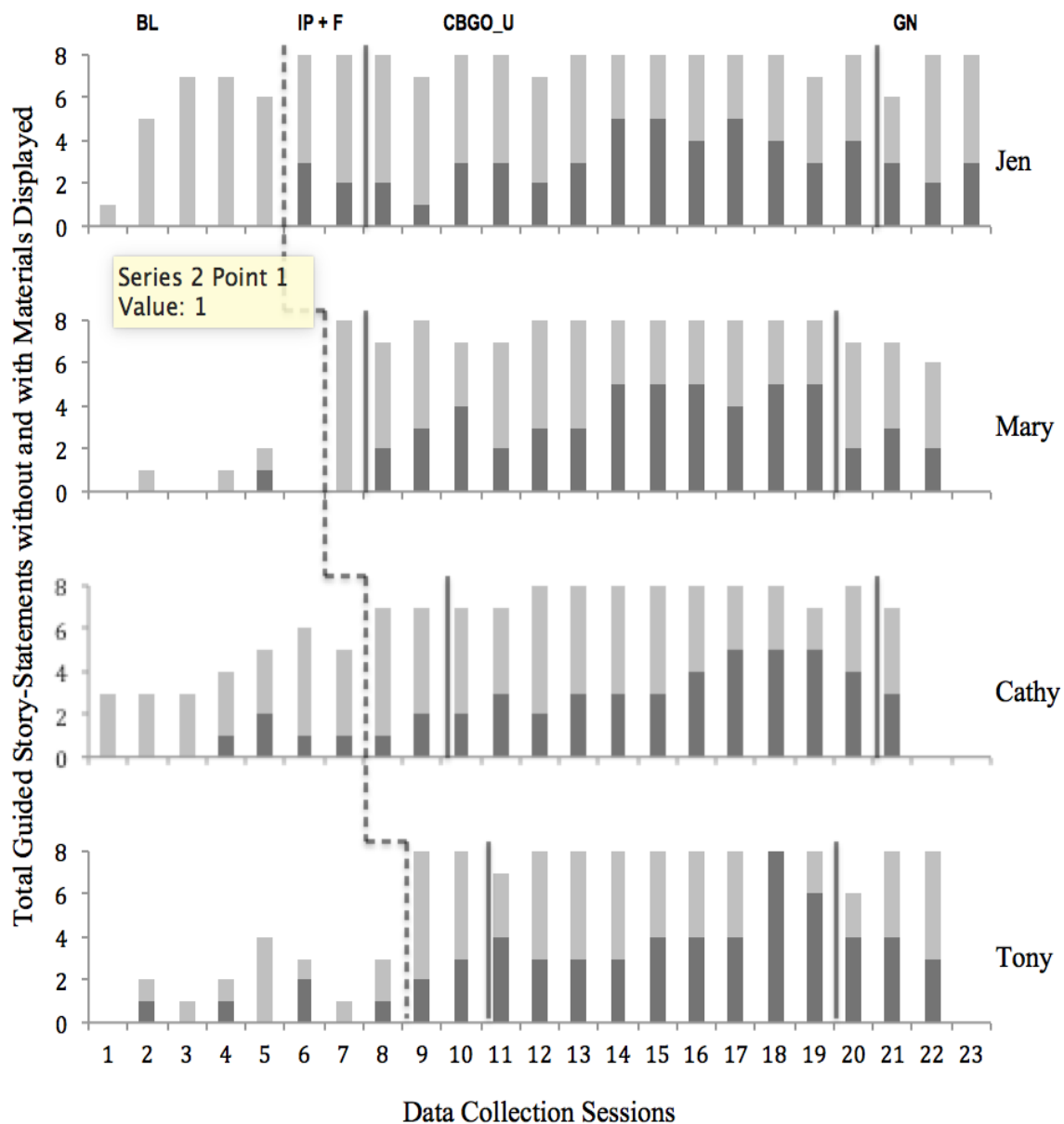


Figure 5. Total guided story-statements without and with materials displayed. The number of story-grammar concepts provided by participants without materials (dark line bars) and with materials (light line bars) were displayed, provided in response to specific questions during the two guided comprehension probes in the baseline (BL, closed circles), independent practice plus feedback (IP + F, closed squares), computer-based graphic organizer use (CBGO_U, closed triangles), and generalization (GN, open diamonds) conditions.

Social Validity

The researcher created two questionnaires to collect feedback on the social significance of the current study's goals, procedures, and effectiveness. The participants completed one questionnaire, while the participants' Language Arts teacher completed the other. The participant questionnaire included five items that presented a statement with the following three response options: (a) happy face, interpreted as agreeing with the statement; (b) indifferent face, interpreted as being uncertain about the statement; and (c) sad face, interpreted as disagreeing with the statement (see Table 4 in Chapter 3). The teacher questionnaire consisted of five items that presented a statement with five response options that ranged from completely agree to completely disagree (see Table 5 in Chapter 3). The participants completed the questionnaires with the support of their teacher immediately after their last session held in the generalization phase. The teacher questionnaire was sent to the participants' teacher after the completion of the current study and then returned to the researcher once completed via e-mail.

Participant feedback. Three participants agreed reading was an important skill to learn, while one participant indicated he or she was uncertain. All four participants agreed they enjoyed learning how to complete a CBGO. However, only two of the participants responded they felt completing the CBGO was easy. The remaining two participants responded they were uncertain about the ease of completing the CBGO. Two of the participants agreed they felt the CBGO helped them understand what they were reading, while two indicated they were uncertain. On the final item, one participant agreed he or she would like to use a CBGO in another class. Two participants were

uncertain about using a CBGO in another class. One participant indicated he or she would not like to use a CBGO in another class. No individualized feedback was provided on any of the participant questionnaires returned to the researcher.

Teacher feedback. The participants' teacher strongly agreed students with SDD should be exposed to content aligned to the general education curriculum. The teacher also strongly agreed teaching students with SDD how to use a graphic organizer was appropriate. In addition, the teacher strongly agreed the comprehension levels of the students who participated in the current study improved after the systematic instruction was provided. In terms of future use outside of the current study, the teacher stated she wanted to learn how to incorporate the use of graphic organizers into her instructional practices. The teacher also agreed she wanted to recommend the use of graphic organizers to other teachers of students with SDD.

Chapter Five

The purpose of the current study was to investigate the functional relation between the systematic instruction and the comprehension levels of four high school students with SDD. The systematic instruction introduced by the researcher in a special education classroom included four distinct trainings: (a) direct instruction on seven story-grammar concepts for social studies content, (b) guided practice on the steps for completing the CBGO, (c) guided practice on the steps for using the CBGO, and (d) independent practice with feedback. The participants' comprehension of informational texts was evaluated using three dependent variables: (a) task completion; (b) total independent story-statements; and (c) total guided story-statements, with and without materials displayed.

The efficacy of the systematic instruction was examined following the four design criteria for single-subject research outlined in Kratochwill et al. (2013). The first criterion requires single-subject research to systematically manipulate an intervention. The current study met this criterion as a multiple-baseline design was used to systematically introduce the intervention. The second criterion requires single-subject research to systematically measure the dependent variables over time with more than one assessor for a minimum of 20% data points collected in each condition. The result of this interassessor review must be within the 80 to 90% range in agreement for the assessment of the outcome variable to

be considered acceptable. The current study exceeded this second criterion. An independent observer reviewed 31% to 42% of data points in each condition. The mean interassessor agreement was above the 80% to 90% threshold for task completion data ($M = 98.7$), total independent story-statements data ($M = 100\%$), and total guided story-statements data ($M = 99\%$). The third criterion requires single-subject research to offer at least three attempts to demonstrate an intervention effect at three different points in time. The current study exceeded this third criterion as the intervention was introduced to participants in a staggered fashion across four different tiers. The fourth criterion requires single-subject research to collect three to five data points in each phase in order to demonstrate an intervention effect. The current study met this fourth criterion with reservations as five data points were collected for the four participants in the baseline and CBGO use phases. Therefore, the current study met the design quality standards for single-subject research with reservations (Kratochwill et al., 2013).

Summary of Findings

The results of the current study suggest high school students with SDD can benefit from systematic instruction on the steps for completing and using a CBGO. Using the evaluation criteria single-subject/case research evidence standards discussed in Kratochwill et al. (2013), the findings of the current study offer the following regarding the effectiveness of the use of systematic instruction:

1. All four high school participants with SDD demonstrated increases in their abilities to independently and correctly complete the CBGO from baseline to generalization phases. Therefore, the current study provides strong evidence

of a functional relation between the systematic instruction and this outcome variable (Kratochwill et al., 2013).

2. One of the four high school participants with SDD demonstrated an increase in the ability to make independent story-statements from baseline to generalization phases. Therefore, the current study provides no evidence of a functional relation between the systematic instruction and this outcome variable (Kratochwill et al., 2013).
3. All four high school participants with SDD demonstrated increases in their abilities to make guided story-statements with and without materials displayed from baseline to generalization phases. Therefore, the current study provides strong evidence of a functional relation between the systematic instruction and this outcome variable (Kratochwill et al., 2013).

Discussion

This section offers an analysis of how the findings of the current study contribute to and extend the literate base. Findings related to the effectiveness of the intervention are first reviewed by each dependent variable. Next, feedback from participants and their teacher regarding the social significance of the current study's goals, procedures, and effectiveness is discussed.

Task completion. The first question addressed in the current study focused on whether the high school students with SDD who participated in the current study could learn to complete a CBGO to summarize an informational text. Participants were instructed to complete the CBGO on the computer using Read: OutLoud 6 software after

listening to a text read aloud. After six preintervention training sessions, participants advanced into the independent practice with feedback condition. The researcher continued to provide feedback after participants completed the CBGO until they were able to independently and correctly complete six of the eight CBGO parts.

The current study established a functional relation between the systematic instruction and the participants' abilities to complete the CBGO. In fact, data indicated all four participants met the mastery criterion for advancing into the CBGO use phase in just two consecutive sessions. The improvements revealed in the participants' performance were immediate and near the ceiling of total possible points. Three of the participants completed all eight parts of the CBGO in at least one of the sessions offered in the independent practice with feedback condition (Jen, Mary, Tony). The remaining participant, Cathy, completed seven of the eight CBGO parts during the two independent practice with feedback sessions. The data indicated participants' improvements were sustained for the majority of the sessions conducted in the CBGO use phase after training was provided. As reported above, the aggregate task completion score was 97% and ranged from 75 (six of the eight CBGO parts correctly completed) to 100% in this phase. Moreover, the aggregate PND was calculated at 100% indicating there was no overlap in data between this phase and the baseline phase. Data collected on this dependent variable in the generalization condition was also high and above baseline. Using the evaluation criteria for interpreting PND suggested in Scruggs and Mastropieri (1998), the findings of the current study indicated the systematic instruction was effective with all four high school participants with SDD.

The current study contributes to the small number of studies that have used graphic organizers to support the comprehension of students with SDD while accessing texts (e.g., Douglas et al., 2009; Douglas et al., 2011; Mims, Hudson, et al., 2012; Schenning et al., 2013; Zakas, 2011). The findings of the current study are consistent with the study upon which it was designed (Zakas, 2011). The 24 texts used in the baseline, preintervention training and independent practice with feedback, and CBGO use phases followed the same structure of texts used in Zakas (2011). Data from Zakas (2011) indicated two of the three participants with ASD completed the graphic organizer with approximately 75% to 100% accuracy after the first six sessions in which the training was provided. Participants in the current study completed the same graphic organizer, although on a computer, with 88% to 100% accuracy after six instructional sessions. Unlike Zakas (2011), the four participants in the current study demonstrated the greatest difficulty extracting the key facts related to the outcome and event described in the informational texts. Two of the three participants with ASD in Zakas (2011) had difficulty identifying the event, location, time, and sequence when directed by the special education teacher. The current study did not require participants to explicitly state how the three details should be sequenced as they individually completed the CBGO. Participants in the current study sequenced the three details as they completed the CBGO.

However, the current study extends the findings from Zakas (2011). Participants in the current study demonstrate mean increases in their abilities to complete the CBGO after reading a new text in each session. With the exception of preintervention training sessions, no informational texts were used in more than one session. Additionally,

participants in the current study were able to complete the same graphic organizer to summarize informational texts that did not follow the same structure of texts introduced in Zakas (2011).

While the two studies by Douglas et al. (2009; 2011) did not report data on the participants' with mild and moderate ID abilities to complete the graphic organizers in graphs, Douglas et al. (2011) did provide data in graphs indicating participants' abilities to retell facts described in the functional texts improved after graphic organizer training was provided. While speculative, such data may infer participants were completing graphic organizers with greater accuracy since graphic organizers were available during the comprehension probes. Similar to Zakas (2011), students in the current study complete the graphic organizer using the texts. The majority of past research has required students to complete a graphic organizer using researcher-created response cards (e.g., Mims, Hudson, et al., 2012; Schenning et al., 2013). By requiring participants to use the text-to-speech software to extract key facts from the texts rather than response cards, the current study decreased the likelihood participants were providing the correct answers by chance.

The current study also adds to the related research supporting the use of a modified system of least prompts to promote the comprehension of students with SDD while accessing academic texts. Researchers have used a modified system of least prompts to increase these students' comprehension during story-reading activities (e.g., Hudson & Browder, 2014; Hudson et al., 2014; Mims, Hudson, et al., 2012) and after accessing a text (e.g., Browder et al., 2013; Spooner et al., 2014; Wood et al., 2015;

Zakas, 2011). Some of these noted studies used the first level of the modified system of least prompts to provide instruction on the definition or rule for a wh-question word (Browder et al., 2013; Hudson & Browder, 2014; Mims, Hudson, et al., 2012). Similar to Zakas (2011), the first level prompt used in the current study offered instruction on the definition for a story-grammar concept and included two examples. The second level prompt used in the current study is consistent with earlier research in that it offered a reread of a more focused section of a text that contained the correct answer; however, the correct answer was not explicitly stated alone (e.g., Browder et al., 2013; Hudson & Browder, 2014; Hudson et al., 2014; Mims, Hudson, et al., 2012; Spooner et al., 2014; Wood et al., 2014). Similar to Zakas (2011), the current study used a modified system of least prompts to teach an independent reading skill.

The findings of the current study add to the body of research that has provided systematic instruction on important vocabulary or concepts that were presented on a graphic organizer to this student population (Knight et al., 2013; Schenning et al., 2013; Zakas, Browder, Ahlgrim-Dezell, & Heafner, 2013). Like Knight et al. (2013) and Zakas (2011), the current study used model-lead-test procedures with examples and nonexamples to offer instruction on important concepts to participants.

Finally, the current study offers evidence students with SDD can demonstrate and sustain improvements in their abilities to complete a graphic organizer when accessing novel texts in each probe. Students who participated in the current study read a new informational text in each CBGO use and generalization session after the training was provided.

Total independent story-statements. The second question addressed in the current study focused on whether the high school students with SDD who participated in the current study could learn to make independent story-statements about an informational text. An independent story-statement was defined as an independent retell of a fact related to a story-grammar concept described in an informational text. After participants indicated they were done listening to the text on the computer and completing the CBGO, the researcher initiated the independent probe with a general prompt (e.g., “[participant’s name], tell me everything you remember about the story you just read”).

Data from the current study did not establish a functional relation between the systematic instruction and the participants’ abilities to independent retell facts from informational texts. Tony was the only participant who demonstrated an increase in his total independent story-statements scores after receiving the systematic instruction. The remaining three participants’ scores on this dependent measure remained low with minimal variability in each phase of the current study. Using the evaluation criteria for interpreting PND suggested in Scruggs and Mastropieri (1998), data from the current study suggested the systematic instruction had little to no observable effectiveness with three of the four high school participants with SDD on this dependent variable.

This finding is consistent with earlier research that has reported students with SDD made larger gains on comprehension measures when given some level of support (e.g., Hudson & Browder, 2014; Hudson et al., 2014). For example, Hudson et al. (2014) trained peer mentors to implement a modified system of least prompts to support students

with moderate ID while answering comprehension questions. The researchers then scored participants' responses to comprehension questions based on the level of support that was offered. The researchers reported participants made larger gains on the number of prompted responses they provided than the number of independent responses. Given the differences in scores on the independent and guided story-statement measures in this current study, it is possible the participants' underperformance on the independent story-statements measure was due to a poor understanding of the researcher's expectations. Unlike the guided comprehension probes, the researcher provided a general prompt during the independent comprehension probes. The researcher's use of a general prompt may have left the participants uncertain about what information they were expected to recall. Therefore, the participants might have benefited from a more specific prompt that explicitly instructed them to retell the facts they extracted from the text to fill out the CBGO. Similarly, it is possible the participants might have benefited from receiving corrective feedback immediately after the independent comprehension probe, rather than after it and two guided comprehension probes were completed during the training sessions. It was observed by the researcher that participants were quick to learn the overall procedures of the independent and guided comprehension probes. The participants also realized questions to which they provided the correct answer were not repeated during the second comprehension probe. However, the improved awareness of the procedures did not correlate with increased responding during the independent comprehension probe. Related research suggests teaching a self-monitoring strategy may help students with SDD be more aware of their performance. For example, Hudson and

Browder (2014) trained participants with moderate ID to use a self-monitoring sheet to document the number of independent correct responses they made during a shared story-reading activity. While the self-monitoring instruction was only part of a larger intervention, data from their study did indicate participants' correct responding to questions improved. Related research has also trained peers to implement an intervention with students with SDD (e.g., Hudson et al., 2014). Research has reported peers can serve as an effective tutor and source of support for students with SDD (e.g., Browder et al., 2014). While the current study found participants might have benefited from the structure provided with the explicit prompts that told them what facts to recall, it is also possible participants may have been motivated to respond if they received encouragement and/or feedback from peers.

Total guided story-statements. The third question addressed in the current study focused on whether the high school students with SDD who participated in the current study could learn to make guided story-statements about informational texts. A guided story-statement was defined as a guided retell of a key fact directly related to a story-grammar concept described in a text, provided in response to a specific question. The researcher asked a total of eight specific questions during the first guided comprehension probe. Each specific question instructed the participant to retell a key fact related to the story-grammar concept described in the informational texts (see Table 3 in Chapter 3). After the independent comprehension probe was completed, the researcher conducted the first guided comprehension probe.

The findings of the current study established a functional relation between the systematic instruction and the participants' abilities to retell key facts from informational texts with the guidance of specific questions after receiving the systematic instruction. While the improvements were not necessarily immediate, the participants' total guided story-statements scores progressively increased in the later sessions of the CBGO use phase. The aggregate mean guided story-statements score for the four participants jumped to 48% in the CBGO use phase from 5% in the baseline phase. Interpreted another way, the average number of guided story-statements made by participants improved from less than one at baseline to four or more at CBGO use. In fact, all four participants provided at least four guided-story statements in three of the last four sessions in the CBGO use phase. Tony provided six to eight guided story-statements in the final two sessions in the CBGO use phase. On average participants most frequently retold the people (98%), location (94%), and time (83%) described in the informational texts. However, participants also retold the event (40%) and outcome (38%) covered in the texts with greater consistency in the latter sessions of the CBGO use phase. The aggregate PND was calculated at 95% indicating there was little overlap in data between the CBGO use phase and baseline phase. Moreover, participants continued to provide correct guided story-statements to retell the people (83%), location (100%), and time (75%) in the generalization sessions using texts that did not present facts in the same structure as the ones used in earlier phases of the study. Using the evaluation criteria for interpreting PND suggested in Scruggs and Mastropieri (1998), the findings of the current study

indicated the systematic instruction was effective with all four high school participants with SDD on this dependent variable.

Guided story-statements with materials displayed. The third question also focused on whether these same participants could learn to make guided story-statements about an informational text when materials were displayed. Materials were the CBGO and a paper-based version of the informational text displayed to participants at the onset of the same session, before beginning the independent and guided comprehension probes. After the first guided comprehension probe was completed, the researcher conducted the second comprehension probe with materials available to participants. However, the researcher only asked the specific questions to which the participants did not provide the correct guided story-statement during the first guided comprehension probe. Therefore, the second comprehension probe only measured the number of guided story-statements made by participants out of the specific questions that were not initially correctly retold. The number of specific questions asked during the second comprehension probe ranged from zero to eight.

The findings of the study established a functional relation between the systematic instruction and the participants' total guided story-statements with materials displayed scores. Although baseline data were relatively high for two participants (Jen, Cathy), all four participants demonstrated mean increases between the baseline and CBGO use phases. In fact, participants' total guided story-statements scores were at or near 100% for the majority of sessions offered in the CBGO use phase. This result indicated participants in the current study were able to correctly retell almost all of the story-

grammar concepts described in the texts during the two guided comprehension probes. The aggregate PND for all participants was calculated at 92% indicating there was little overlap in data between the CBGO use phase and the baseline phase. Moreover, data collected for Mary, Cathy, and Tony remained high and above baseline at generalization when accessing novel texts that did not present facts using the same structured template. Two of the three data points collected in the generalization condition were above baseline. Using the evaluation criteria for interpreting PND suggested in Scruggs and Mastropieri (1998), the findings indicated the systematic instruction was effective with all four high school participants with SDD on this dependent variable.

The current study contributes to the large body of literature demonstrating the effectiveness of a modified system of least prompts to promote students' with SDD comprehension levels of texts. The findings of the current study are consistent with related research showing the number of questions correctly answered by students with SDD increased when supported with a modified system of least prompts (e.g., Browder et al., 2013; Hudson et al., 2014; Mims, Hudson, et al., 2012; Wood et al., 2015). Prior research has reported students with SDD most often answered what, where, or who questions, although not necessarily in that ranking order, after reading or listening to a text read aloud (Browder et al., 2013; Hudson et al., 2014; Wood et al., 2015). In contrast, students with moderate and severe developmental disabilities in Mims, Hudson, et al. (2012) most frequently answered where, when, and why questions. The current study taught students to retell facts from texts related to similar story-grammar concepts, but for social studies content (i.e., event, location, time, people, details, outcome). Similar

to three of the aforementioned studies (Browder et al., 2013; Hudson et al., 2014; Wood et al., 2015), two of the three specific questions to which students in the current study most often retold the correct facts without materials displayed were the people ($M = 98\%$) and location ($M = 94\%$) described in the book. However, like Mims, Hudson, et al. (2012), the other most frequently retold fact without materials displayed as a story-grammar concept was the time ($M = 83\%$).

The current study also adds to the existing literature supporting the efficacy for the use of graphic organizers to improve students' with SDD abilities to recall facts about a text (e.g., Douglas et al., 2009; Douglas et al., 2011; Mims, Hudson, et al., 2012). The current study offered another demonstration for how to use a modified system of least prompts to teach students with SDD how to complete a graphic organizer (e.g., Mims, Hudson, et al., 2012; Zakas, 2011). However, the current study also taught these students how to use a graphic organizer using response-prompting strategies (i.e., verbal, verbal-gestural prompts) and models in order to answer the specific questions. The additional strategies were included in order to strengthen the validity of the overall training. Unlike the related research, the current study collected data on the students' abilities to complete the CBGO, make independent story-statements, and provide guided story-statements made with and without materials displayed. One of the related studies reported data in graphs on the number of questions correctly answered by students with mild and moderate ID (Douglas et al., 2011); however the noted study did not report data in graphs on the number of graphic organizer parts completed by these same students (Douglas et al., 2011). Mims, Hudson, et al. (2012) reported the number of questions students with

moderate and severe developmental disabilities answered increased, but did not specifically report whether increases were made on the sequencing questions and the graphic organizer. Zakas (2011) reported increases in students' with ASD recall of facts while completing the graphic organizer. The findings of the current study offered a positive correlation between the number of CBGO parts completed and the number of guided story-statements made without materials displayed after the CBGO was completed. Data also revealed a positive correlation between the number of CBGO parts completed and number of guided story-statements provided with materials displayed. However, the current study did not offer an analysis on the students' abilities to provide the same key facts in response to specific questions when assessed without materials displayed and then assessed again with materials displayed. Specific questions to which students in the current study answered correctly during the first guided comprehension probe were not repeated during the second comprehension probe. However, the current study did provide evidence the students were able to provide story-statements about all story-grammar concepts described in the texts with increased accuracy after the systematic instruction was provided.

The current study also adds to the literature evidence students with SDD benefit from instruction on how to answer specific questions (e.g., Browder et al., 2013; Hudson & Browder, 2014; Mims, Hudson, et al., 2012; Zakas, 2011). Similar to earlier research, systematic instruction was provided on the concepts presented in the specific questions during the two guided comprehension probes (Browder et al., 2013; Hudson & Browder, 2014). One related study provided explicit instruction on the rules for answering wh-

question words (Hudson & Browder, 2014). However, the current study also used response-prompting strategies and models to teach students with SDD how to use the CBGO to answer questions. Training also included explicit instruction and models for how to answer questions when materials were not displayed. Before the described training was provided, the researcher observed students in the current study to frequently make errors determining which facts from the texts were associated with the story-grammar concepts presented in the specific questions. For example, the students would state the fact associated with the people after being asked to retell the location described in the text. Students also demonstrated an understanding of the story-grammar concepts presented in the questions, but a difficulty applying this awareness when reading the informational texts. For example, students often provided a time of day (e.g., 10 o'clock) in response to being asked to retell the time, meaning the target historical date. Additionally, students were observed to be reluctant to answer certain specific questions for story-grammar concepts that consisted of more than one word (i.e., event, outcome). However, the number of errors made by participants decreased after training on story-grammar concepts presented in the specific questions was offered. The number of guided story-statements made in response to specific questions also progressively increased. Moreover, the consistency in which specific questions were correctly answered improved. Hudson et al. (2014) also reported the number of wh-question errors by participants with moderate ID in their study decreased after training on the related vocabulary was provided.

The current study also contributes to the literature base an analysis on the extent participants with SDD are able to retell key facts from a text after independently completing a CBGO. Unlike one of the earlier studies (Douglas et al., 2009), participants in the current study completed the CBGO without any support materials displayed or feedback from the researcher. Past research has shown the number of independent correct responses made by participants with SDD about a text increased when supported with a modified system of least prompts (e.g., Browder et al., 2013; Hudson & Browder, 2014; Hudson et al., 2014; Mims, Hudson, et al., 2012; Wood et al., 2015). Spooner et al. (2015) showed participants with severe disabilities were able to generalize emergent and comprehension skills learned during a training session when assessed during a shared story-reading activity without any support. The current study adds to the literature evidence that students with SDD were able to recall facts from a text after completing a CBGO without any support (e.g., Douglas et al., 2011).

Finally, the current study contributes to the literature base evidence that students with SDD can continue to answer questions with high levels of accuracy when reading a new text in each session. Students in the current study listened to a new text in all sessions held in the baseline, CBGO use, and generalization conditions. The current study extended the prior reading research that used systematic instruction to support the comprehension levels of students with SDD during a reading-based activity when materials were used across sessions (e.g., Browder et al., 2013; Hudson et al., 2014; Spooner et al., 2014). While the related literature base offers substantial evidence for the use of systematic instruction, there was a need for research to explore whether students

with SDD could be as successful when materials were not used across multiple sessions. The use of novel materials across sessions is necessary in order to strengthen the level of evidence demonstrating students with SDD are learning. One strategy offered in the literature is to ask different questions each time a story is reread (e.g., Hudson & Browder, 2014; Spooner et al., 2014). Another possible method is to control the order in which texts are read so that none are used in consecutive sessions (e.g., Wood et al., 2015). The results of current study suggest another effective strategy is to use adapted texts that are written with the same structure.

Social validity. The researcher collected feedback from the participants and their teachers on the social significance of the current study's goals, procedures, and effectiveness. Data suggested the participants and their teacher viewed the goals of the current study favorably. Three of the four participants agreed reading was an important skill to learn. The teacher also agreed students with SDD should be exposed to texts aligned with the general curriculum. While input provided from the teacher was favorable, feedback from the participants on the procedures and effectiveness of the intervention in the current study was mixed. All four participants reported they liked learning how to complete a CBGO. However, only two reported they thought completing the CBGO was easy. Similarly, two of the four participants were uncertain about how well the CBGO helped them understand what they were reading. The mixed feelings toward the procedures and effectiveness of the systematic instruction expressed by participants may be attributed to the lack of feedback offered in sessions in the CBGO use phase. While two participants were observed to self-monitor their performance and

provide their own reinforcement during comprehension probes, the other participants may have been unaware of their progress throughout the current study. The researcher did not provide feedback to the participants until after the last session of the current study. Although speculative and unknown which participants reported the uncertainty, it is possible all participants may have responded favorably to the aforementioned items if feedback on their improvements on the task completion and total guided story-statements measures was provided. Finally, feedback on the last item indicated the majority of participants were uncertain or not interested in learning to use a graphic organizer in another class. The mixed feelings regarding the use of a graphic organizer in another class may also be attributed to the difficulties students with SDD experience generalizing skills from one context to a new one. While the participants did not report whether they had prior experiences using a graphic organizer, it was their first experience using the Read: OutLoud 6 software. Therefore, the participants may have been unfamiliar with the flexibility inherent in the structure of graphic organizers that permits them to be valuable supports across content.

Recommendations and Implications for Practice

Four unique insights are offered from the current study. First, students with SDD who participated in this study were able to independently and correctly complete the CBGO. In fact, these students learned to complete the CBGO with almost 100% accuracy rather quickly. During the third or fourth sessions held in the guided practice with feedback condition, three of the four students in the current study asked the researcher to let them independently complete the CBGO without any support. Jen politely asked the

researcher to be quiet while she worked. Additionally, the four students in the current study continued to complete the CBGO with high levels of accuracy in the generalization phase when accessing texts taken from an elementary-level social studies book in the generalization phase. The texts students read in the generalization phase did not follow the same structure and the specific keywords used to signal the introduction of specific facts were replaced with general transition words. The fact that all four students continued to correctly complete the CBGOs in the generalization condition, as well as two of them pointing out to the researcher the concepts in the texts were all mixed up, may suggest they all understood the definitions of the story-grammar concepts covered in the current study. Therefore, the findings of the current study provide evidence students with SDD are able to learn to use a CBGO as an independent reading skill.

Second, students with SDD who participated in this study were able to recall key facts from a text with the support of specific questions. Data indicated students who participated in the current study improved the number of key facts they retold in response to specific questions with and without materials displayed. These students most frequently retold the people, location, and time described in texts without materials displayed; however, they were able to retell the majority of the facts related to the remaining story-grammar concepts with materials displayed (i.e., event, first detail, second detail, third detail, outcome). Perhaps most importantly, the students in the study were observed to acknowledge which questions they correctly answered. For example, Jen, Mary, and Tony frequently self-reinforced their correct guided story-statements to specific questions when materials were not displayed with verbal praises and body

gestures. Jen was also observed to return to the text during the second guided comprehension probe with materials displayed to identify the key fact related to a story-grammar concept she forgot to extract using the CBGO.

However, the fact the majority of participants provided about four guided story-statements without materials displayed in the CBGO use phase may also suggest it was too high of an expectation to ask students to try and remember eight facts related to story-grammar concepts. Instruction may have been more effective or efficient if story-grammar concepts were taught in increments. For example, instruction could have progressively introduced new story-grammar concepts in the following three sets: (a) people, location, time; (b) event, outcome; (c) first detail, second detail, third detail. With that said, students with SDD who participated in the current study were consistently able to retell four or more facts from texts after requested using specific questions during the later sessions in the CBGO use phase. This result offers evidence students with SDD are able to answer questions about an informational text after independently completing a graphic organizer.

Third, students with SDD who participated in the current study were able to retell key facts from texts in response to specific questions after receiving instruction on how to answer questions. Similar to related research, the current study provided training on the definition of the story-grammar concepts presented in the specific questions (e.g., Hudson et al., 2014). The intervention also included instruction on the steps for using the graphic organizer to answer questions. In addition, instruction and models were offered on how to paraphrase key facts and use prior knowledge. Before training was provided, students in

the current study were frequently observed to make errors when trying to match facts from the texts with the certain story-grammar concepts presented in the specific questions. For example, the students in the study were observed to frequently mix up facts related to the people and location described in the informational texts during sessions in the baseline conditions. Similarly, the students appeared to understand the definitions of the story-grammar concepts during baseline sessions, but were uncertain how to apply this knowledge when reading the informational text. For example, students often made up a name when requested to identify the people described in the texts when the related fact was a group name (e.g., Americans, American Astronauts). They also frequently provided a time of day instead of the target date described in the text when requested to retell the time. However, the number of error students in the current study made trying to match facts to story-grammar concepts decreased after instruction was provided. The overall total number of guided story-statements made without materials displayed also increased. On average, students in the current study correctly retold more facts with each opportunity to listen to a new text. Therefore, the findings of the current study provide evidence students with SDD benefit from instruction on how to answer questions.

Fourth, students with SDD who participated in the current study were uncertain about how to independently retell facts in response to the general probe. As described beforehand, only one of the four students, Tony, demonstrated an increase in the ability to independently retell facts from informational text. With that said, the order in which Tony independently retold facts mirrored the order in which story-grammar concepts

were listed on the CBGO. Said another way, Tony retold facts in the same order he would have if he were reading them directly off the CBGO. The structure of Tony's independent story-statements may suggest he memorized the overall procedures followed during the three comprehension probes. In contrast, one student in the current study commonly responded, "I remember everything.... I know the event, people, and location." However, she rarely would retell any of the eight facts when the researcher repeated the general prompt. The remaining two students most often responded, "I don't know." Despite the hesitance of these three students to retell facts during the independent comprehension probe, they often retold several facts in response to the specific questions during the subsequent guided comprehension probe without materials displayed. Procedures may have been more effective for the students in the current study if greater structure was offered. Research suggests one way to promote students' with ID and ASD completion of a task is to train them to follow a self-monitoring checklist (e.g., Holifield, Goodman, Hazelkorn, & Heflin, 2010; Miller & Taber-Doughty, 2014; Pennington, Delano, & Scott, 2014). For example, training in the guided practice conditions could have included instruction on how to follow a blank copy of the CBGO during the independent and guided comprehension probes. Another strategy supported in the literature is to teach students with disabilities to direct their learning through goal setting (Wehmeyer, Agran, & Hughes, 1998). For example, the researcher could have taught the students during sessions in the guided practice conditions how to set goals on the number of facts they hoped to independently retell before listening to the texts on the computer. While the inclusion of additional strategies makes it difficult to discern which contribute to the

outcome, it was clear students in the current study were uncertain about how to respond to the general prompt. Therefore, the current study offers evidence students with SDD need some level of structure to help them independently construct meaning from texts.

Limitations

Several limitations of the current study are acknowledged. First, the current study included a small sample of students with SDD. It is well documented the learning characteristics of students who are assigned to AS-AAS are diverse and often unique to specific activities (Kearns et al., 2011; Towles-Reeves et al., 2009). While the participants' listening comprehension levels, IQs, and current literacy goals were described in the current study, the extent to which the findings of the current study can generalize to other students with similar learning characteristics is unknown.

Second, the researcher conducted all sessions of the study to individual participants in a special education classroom. Ultimately, instructional strategies for teaching academic content to students with SDD must be implemented in authentic classroom settings. The strategies investigated in research should be flexible and easy to incorporate into typical teaching practices. There is evidence suggesting special education teachers and peers can be trained to implement systematic instruction during a shared story-reading activity (Hudson & Test, 2011). Research has also shown students can learn academic content in a general education setting (Hudson, Browder, & Wood, 2013). However, the current study only provides evidence supporting systematic instruction on the steps for completing and using a CBGO to individual students with SDD in a special education classroom.

Third, the intervention implemented in the current study included four distinct trainings: (a) direct instruction on seven story-grammar concepts for social studies content, (b) guided practice on the steps for completing the CBGO, (c) guided practice on the steps for using the CBGO, and (d) independent practice with feedback. While the foundation of systematic instruction is the step-by-step introduction of a complex skill, such as reading or listening comprehension, the specific benefit of the individual trainings is uncertain. Since the training was offered across six consecutive sessions without intermittent probes, the findings of the current study can only be interpreted as supporting the combined use of each systematic instructional strategy to support the text-based comprehension of students with SDD.

Fourth, the current study measured the students' understanding of story-grammar concepts as the ability to complete the CBGO, independently retell key facts, and answer specific questions. While training on the definitions of the related story-grammar concepts was provided, the extent to which students knew the definitions was never assessed outside the two direct instruction sessions. It is not known whether the students who participated in the current study were able to retell, identify, or match the definitions of the story-grammar concepts. Therefore, the findings of the current study only provide evidence students with SDD were able to apply their knowledge of story-grammar concepts to complete the CBGO and answer specific questions with and without materials displayed.

Fifth, the current study trained students with SDD to use the CBGO to summarize adapted texts. All 24 informational texts were written using the same structure introduced

in Zakas (2011). Each text used in the training sessions and CBGO use phase presented facts in the same order. In addition, specific keywords were used to signal the introduction of the three details. Students who participated in the current study continued to correctly complete CBGOs and answer specific questions in the generalization phase after accessing nonadapted texts. However, the results of the current study offer the strongest evidence students with SDD complete a graphic organizer and answer specific questions after reading adapted informational texts.

Suggestions for Future Research

Future research should extend and replicate the current study. The findings of the current study contribute to research upon which it was designed (i.e., Zakas, 2011). The results of Zakas (2011) and the current study established a functional relation between the systematic instruction and participants' abilities to complete the graphic organizer. However, the current study extended the earlier study to also evaluate the benefit of the graphic organizer instruction on the participants' abilities to independently recall facts and answer comprehension questions. Future research is needed before systematic instruction on the use of graphic organizers can be identified as an evidence-based practice for supporting the text-based comprehension of students with SDD.

Future research should identify effective strategies to train special and general education teachers to integrate systematic instruction into their regular teaching practices in order to support students with SDD. The current study supports the use of systematic instruction on the steps for completing and using a graphic organizer with individual students from this population in a special education classroom. While students with SDD

are likely to receive instruction in a special education classroom, research does indicate these students can learn academics in inclusive settings (e.g., Hudson, Browder, et al., 2013). The strategic use of systematic instruction and technology may be one way to support students with SDD as they access academic texts in general and special education settings. Future research should evaluate whether these students demonstrate similar increases when a special or general education teacher provides instruction in authentic classroom settings.

Future research should also examine effective strategies to train peers to teach students with SDD independent reading skills. The existing literature provides evidence peers without disabilities can serve as an effective tutors and a powerful source of support for students with disabilities (Browder et al., 2014). Past research has trained peers to use a modified system of least prompts to support students with SDD during shared story-reading activities (e.g., Hudson et al., 2014). Given the similarities between the modified system of least prompts used in the current study and related research, future research should identify effective ways to train peers to teach students with SDD to complete and use a graphic organizer.

Future research should also investigate the effectiveness of providing instruction on important vocabulary or concepts described in texts to students with SDD. A small but growing number of studies have used systematic instruction to offer instruction on vocabulary and concepts described in texts (e.g., Browder et al., 2013; Hudson & Browder, 2014; Knight, 2010; Zakas, 2011). Similarly, research has also offered instruction on the vocabulary presented in specific questions students with SDD were

required to answer after reading a text (e.g., Browder et al., 2013; Hudson & Browder, 2014). Future research is needed to determine whether the comprehension levels of students with SDD improve when accessing texts after training on key vocabulary or concepts is provided.

Future research should investigate the effectiveness of systematic instruction to support the text-based comprehension of nonadapted texts. While the use of adapted texts with this student population is common in the literature (e.g., Hudson & Test, 2011), there is evidence students can learn content from nonadapted texts (e.g., Mucchetti, 2013; Shur & Tabor-Doughty, 2012; Wood et al., 2015). Future research is needed to determine whether students with SDD can learn to complete a graphic organizer to answer questions using nonadapted texts.

Similarly, future research is needed on the use of specific systematic instruction strategies and visual supports to support these students while accessing texts. In a review by Knight and Sartini (2015), both were identified as evidence-based practices for teaching comprehension skills to students with ASD. However, the researchers were unable to identify specific systematic strategies or visual supports as promising or established due to the diversity in their use in the related research. Therefore, future research is needed on a more focused set of strategies in order to determine which are most effective with students with SDD.

Finally, future research should identify effective strategies to support students with SDD during academic instruction, while also limiting the use of the same materials across sessions. Past research has strengthened the level of evidence demonstrating these

students are able to comprehend texts by requiring them to answer novel texts and questions in each session (e.g., Hudson & Browder, 2014). Research has also controlled procedures so texts could not be used in consecutive sessions (e.g., Wood et al., 2015). The current study provided evidence the use of texts that were adapted to present facts in the same structure is another method to support these students' academic learning. Future research is needed to determine whether students with SDD can comprehend academic content when instruction is provided using new materials in each session.

Summary

Legislation has placed a daunting challenge on teachers to demonstrate their students with SDD are accessing and achieving in academic instruction aligned to the general curriculum. Most students with SDD are reported to be nonreaders or have rudimentary literacy skills at best (Kearns et al., 2011; Towles-Reeves et al., 2009). In addition, the texts used in some core content areas are argued to be more difficult for students to understand than others (Berkeley & Riccomini, 2013; Saenz & Fuchs, 2002). Research suggests one way to promote access to texts for this student population is to focus on listening comprehension skills (Browder, Gibbs, et al., 2009). For example, teachers may have these students participate in a shared story-reading activity (e.g., Hudson et al., 2014; Mims, Hudson, et al., 2012) or listen to electronic texts on a computer (e.g., Douglas et al., 2009; Knight, 2010; Wood, 2014). However, teachers must also be empowered with effective strategies to teach independent comprehension skills once access to texts is achieved. Teaching students with SDD to use technology is one way to help them engage with texts with greater independence. Students may listen

to texts using text-to-speech software and then extract key information from the texts using a graphic organizer. There is a need for research to identify effective strategies to implement these strategies in authentic classrooms settings.

The current study found all four students with SDD demonstrated mean increases in their abilities to complete the Computer-Based Graphic Organizer (CBGO) in order to summarize informational text. All four students also demonstrated mean increases in the number of guided story-statements provided in response to questions when materials were and were not displayed after completing the CBGO. Therefore, the systematic instruction appeared to be an effective method to teach students with SDD to complete the CBGO and answer questions related to informational texts.

The current study adds to the large literature base supporting the use of systematic instruction to build the text-based comprehension levels of students with SDD. Moreover, the current study contributes to the small number of studies demonstrating systematic instruction can be used to teach these students an independent reading skill. Last, the current study adds to the small number of studies indicating systematic instruction can improve the abilities of students to answer comprehension questions after independently completing a graphic organizer.

Appendix A

IRB Approval Letter, Parent Consent Form, and Student Assent Form



Office of Research Integrity and Assurance

Research Hall, 4400 University Drive, MS 6D5, Fairfax, Virginia 22030
Phone: 703-993-5445; Fax: 703-993-9590

DATE: March 30, 2015

TO: Anya Evmenova
FROM: George Mason University IRB

Project Title: [671887-2] A comparison of strategies to promote comprehension of text for students with moderate intellectual disabilities.

SUBMISSION TYPE: Amendment/Modification

ACTION: APPROVED
APPROVAL DATE: March 30, 2015
EXPIRATION DATE: October 28, 2015
REVIEW TYPE: Expedited Review

Thank you for your submission of Amendment/Modification materials for this project. The George Mason University IRB has APPROVED your submission. This submission has received Expedited Review based on applicable federal regulations.

Please remember that all research must be conducted as described in the submitted materials.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by the IRB prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to the Office of Research Integrity & Assurance (ORIA). Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed (if applicable).

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to the ORIA.

The anniversary date of this study is October 28, 2015. This project requires continuing review by this committee on an annual basis. You may not collect data beyond this date without prior IRB approval. A continuing review form must be completed and submitted to the ORIA at least 30 days prior to the anniversary date or upon completion of this project. Prior to the anniversary date, the ORIA will send you a reminder regarding continuing review procedures.

Parent Permission for Participation in Research: Informed Consent

Project Title: Reading Comprehension

RESEARCH PROCEDURES

This project is being conducted to see if learning to complete a graphic organizer on the computer improves the comprehension levels of high school students with developmental disabilities.

With your permission, the researcher asks to be able to work with your student at his or her school during normal school hours. Participation in this project will require your student to work with the researcher a minimum of three times a week, for approximately 15-25 minutes a session, over a period of about eight weeks.

The researcher also asks for permission to video record sessions. Sessions will be recorded for two reasons. First, video recordings will be reviewed to measure the extent instructional sessions were used as planned. Second, video recording will be reviewed to promote the accuracy in which your student's performance during comprehension probes is scored. Additionally, the researcher asks for permission to access some information in your student's education portfolio. Specific information will be (a) diagnosis (es), (b) IQ scores, (c) most recent educational goals in reading, and (d) most recent performance on reading assessments. Please know that all data will be kept confidential and your student's name will be replaced with a pseudonym in all written reports. Educational information will be collected in order to offer context in any written reports about the student population served in your student's unique academic program.

RISKS

There are no foreseeable risks for participating in this project.

BENEFITS

Although there are no direct benefits for participating in this study, your student will receive additional instruction in independent reading skills.

CONFIDENTIALITY

All video recordings and student data will be kept confidential. After collected and reviewed, all identifiable information associated with your student will be replaced with codes and pseudonyms. Additionally, no identifiable information will be disclosed in any written reports. During the project, all student data will be stored in a locked office at George Mason University. Only persons directly involved in the project will have access to student data. Five years following the completion of the project all student data will be destroyed.

PARTICIPATION

Participation in this project is completely voluntary and you may elect to withdraw your student at any time, for any reason. There is no penalty if you decide not to participate in this project or to withdraw at a later date. Additionally, there are no costs associated with this project.

CONTACT

Alex Britt, a Doctoral Candidate at George Mason University, will complete this project under the guidance of Dr. Anya Evmenova. Dr. Evmenova will serve as the Principal Investigator and may be reached at 703-993-5256 or aevmenov@gmu.edu should you have any questions or concerns relevant to this project.

Additionally, Mr. Britt may be reached at 703-585-1403 or abritt3@gmu.edu. You may also contact the GMU Office of Research Integrity & Assurance at 703-993-4121 if you have any questions, concerns, or comments regarding your student's rights as a participant in this project. This project has been reviewed according to George Mason University procedures governing your student's participation in this research.

CONSENT

I have read this form and ...

☐ AGREE to have my student participate in the study

☐ Do NOT AGREE to have my student participate in the study

I give permission to the researcher to access my student's education portfolio for the purposes described above. I understand all student data will be kept confidential.

☐ Yes

☐ No

I consent to the video recording of my student during sessions. I understand that all video recordings of my student will be kept confidential.

☐ Yes

☐ No

Signature

Name (print)

Date of Signature

Student Permission for Participation in Research: Student Assent Form

Project Title: Comprehension Strategies

PROCEDURES

1. I want to teach you how to fill out and use a graphic organizer.
2. The graphic organizer may help you read better.
3. I would like to work with you a couple days at week over the next couple of months while you are at school.
4. We will be reading short stories about U.S. history.

PARTICIPATION

1. If you are not interested, you may say NO.
2. If you decide later on that you aren't having fun, you may say STOP at any time.
3. Nothing bad will happen to you if you decide to say No or Stop.

ASSENT

1. Would you like to try to learn to use a graphic organizer?

_____ Yes _____ No

2. Can I video record lessons to help me remember all your hard work?

_____ Yes _____ No

Your Name

Your Signature

Date

Appendix B

Sample Informational Texts

Title: Technology in America

In the early-1900s, many Americans started to use new technology. There are many types of technology. Technology may be a radio, car, or refrigerator. In America, technology helped change the way Americans lived. First, Americans listened to the radio. Americans listened to important news on the radio. Americans also listened to music on the radio. Second, Americans drove cars to go places. Americans drove cars to get to places faster. Americans drove cars to get to places far away, too. Third, Americans put their food in refrigerators. Americans used refrigerators to keep food safe to eat for many weeks. Technology made life a lot easier for many Americans.

Title: Modern Civil Rights Movement

In the 1950s and 1960s, African Americans worked hard for equal rights. Equal rights means everyone can do the same activities. In America, African Americans were not allowed to do the same activities as white people. African Americans sat in different seats at places like the movie theater. They also went to different schools. First, African Americans stopped riding the bus. African Americans did not want to be told where to sit. They wanted to sit in any seat on the bus. Second, African Americans sat in the seats that were only for white people at restaurants. They wanted to sit wherever they wanted. Third, African Americans marched in the streets. Millions of people came together to march. African Americans showed they would not be treated badly anymore. From this work, African Americans won equal rights.

Appendix C

Screen Shot of Informational Text and Computer-Based Graphic Organizer (CBGO)

The screenshot shows a software interface for a Computer-Based Graphic Organizer (CBGO). The title bar reads "American Revolution.djs". Below the title bar is a toolbar with various icons for editing and navigation. The main window is divided into two sections: a text area on the left and a hierarchical organizer on the right.

Title: The American Revolution

In 1775, the American Colonies went to war. A war is when two countries or territories fight against each other. In the American Colonies, the Americans fought against a country called England. Many soldiers from America and England fought in the war. First, England was winning. The soldiers from England won many of the first battles in the war. Second, the Americans won a battle in New York. Then soldiers from other countries joined the war to help the Americans. Third, the Americans won the war. The soldiers from England agreed to stop fighting in the war. Many soldiers from America other countries died in the war. After the war, Americans won their freedom.

Hierarchical Organizer:

- American Revolution
 - Event
 - American Colonies went to war.
 - Location
 - In the American Colonies,
 - Time
 - "1775,"
 - People
 - American Soldiers,
 - First Detail
 - First, English Soldiers were winning.
 - Second Detail
 - Second, the American Soldiers won a battle
 - Third Detail
 - Third, the American Soldiers won the war.
 - Outcome
 - "After the war, Americans won their freedom."
 - Unassigned Notes

Appendix D

Vocabulary Card and Script

EVENT

Event is an incident that happens in the past

Script for EVENT

Teacher (T): Let's learn a story-grammar concept for history.

Part 1:

T: My turn first. Listen. What is an EVENT? An EVENT is an incident that happens in the past.

T: Let do it together. Point to the definition of EVENT on the T-chart with me as I say it out loud.

T: (Point to definition on T-Chart). An EVENT is an incident that happens in the past.

Student (S): (point to "An incident that happens in the past" on T-chart).

T: Yes, An EVENT is an incident that happens in the past. (Give student high five or hand gesture so removes hand from T-chart).

T: Okay, now it's your turn. Point to the definition on the T-chart for EVENT.

S: (Student point to "An incident that happens in the past" on T-chart).

USE "MY TURN – TOGETHER– YOUR TURN" TO CORRECT ERRORS. REPEAT UNTIL FIRM (I.E., STUDENTS CAN POINT TO DEFINITION INDEPENDENTLY).

Part 2:

T: I'm going to name some things from history. You tell me "EVENT" or "Not an EVENT" using "thumbs up/down" (provide model). Thumbs up (provide model) means it is an "EVENT" and thumbs down (provide model) means it is "Not an EVENT". Ready?

T: "Presidential Election"

S: Thumbs up

T: Yes, that is an EVENT (model thumbs up).

T: What about, "A man walks on the moon"

S: Thumbs up

T: Yes, that is an EVENT (model thumbs up).

T: What about, "video game"

S: Thumbs down

T: Yes, that is not an EVENT (model thumbs down).

T: What about, "President Obama"

S: Thumbs down

T: Yes, that is not an EVENT (model thumbs down).

T: What about, "The telephone was created"

S: Thumbs up

T: Yes, that is an EVENT (model thumbs up).

USE "MY TURN – TOGETHER– YOUR TURN" TO CORRECT ERRORS. (1) SAY: [GIVEN EXAMPLE] IT IS/IS NOT A [STORY-GRAMMAR CONCEPT] BECAUSE IT IS/IS NOT [REPEAT DEFINITION]; (2) ANSWER TOGETHER (SAY: LETS ANSWER TOGETHER, [SAY EXAMPLE GIVEN] IS [SAY AND MODEL CORRECT ANSWER]); (3) INSTRUCT STUDENT TO ANSWER (SAY: YOUR TURN. IS [SAY EXAMPLE GIVEN] AN EVENT (MODEL THUMBS UP) OR NOT AN EVENT (MODEL THUMBS DOWN). REPEAT UNTIL FIRM (I.E., STUDENTS CAN IDENTIFY CORRECT ANSWER INDEPENDENTLY).

Part 3:

T: (Provide verbal praise). Okay, one last time. Your turn. Point to the definition of EVENT on the T-chart.

S: (point to "an incident that happens in the past" on T-chart).

USE "MY TURN – TOGETHER– YOUR TURN" FROM PART 1 TO CORRECT ERRORS. REPEAT UNTIL FIRM (I.E., STUDENTS CAN POINT TO DEFINITION INDEPENDENTLY).

References

- Alberto, P. A., Waugh, R. E., Fredrick, L. D., & Davis, D. H. (2013). Sight word literacy: A functional-based approach for identification and comprehension of individual words and connected text. *Education and Training in Autism and Developmental Disabilities, 48*, 332-350.
- Allor, J. H., Mathes, P. G., Roberts, J. K., Jones, F. G., & Champlin, T. M. (2010). Teaching students with moderate intellectual disabilities to read: An experimental examination of a comprehensive reading intervention. *Education and Training in Autism and Developmental Disabilities, 45*(1), 3-22.
- American Association on Intellectual and Developmental Disabilities. (n.d.). *Frequently asked questions on intellectual disabilities*. Retrieved from <http://aaidd.org/intellectual-disability/definition/faqs-on-intellectual-disability#.Vd8s8bS4mb8>
- Ayres, K. M., Lowrey, K. A., Douglas, K. H., & Sievers, C. (2011). I can identify Saturn but I can't brush my teeth: What happens when the curricular focus for students with severe disabilities shifts. *Education and Training in Autism and Developmental Disabilities, 46*(1), 11-21.
- Ayres, K. M., Lowrey, K. A., Douglas, K. H., & Sievers, C. (2012). The question still remains: What happens when the curricular focus for students with severe disabilities shifts? A reply to Courtade, Spooner, Browder, and Jimenez (2012). *Education and Training in Autism and Developmental Disabilities, 47*(1), 14-22.
- Berkeley, S., & Riccomini, P. J. (2013). QRAC-the-code: A comprehension monitoring strategy for middle school social studies textbooks. *Journal of Learning Disabilities, 46*(2), 154-165. doi:10.1177/0022219411409412
- Bethune, K. S., & Wood, C. L. (2013). Effects of wh-questions graphic organizers on reading comprehension skills of students with autism spectrum disorders. *Education and Training in Autism and Developmental Disabilities, 48*(2), 236-244.
- Boon, R. T., Fore, C., Blankenship, T., & Chalk, J. (2007). Technology-based practices in social studies instruction for students with high-incidence disabilities: A review of literature. *Journal of Special Education Technology, 22*(4), 41-56.

- Bos, C. S., & Anders, P. L. (1992). Using interactive teaching and learning strategies to promote text comprehension and content learning for students with learning disabilities. *International Journal of Disability, Development, and Education*, 39(3), 225-223. doi:10.1080/0156655920390305
- Botts, D. C., Losardo, A. S., Tillery, C. Y., & Werts, M. G. (2014). A comparison of activity-based intervention and embedded direct instruction when teaching emergent literacy skills. *Journal of Special Education*, 48(2), 120-134. doi:10.1177/0022466912449652
- Browder, D. M., Ahlgrim-Delzell, L., Courtade, G., Gibbs, S. L., & Flowers, C. (2008). Evaluation of the effectiveness of an early literacy program for students with significant developmental disabilities. *Exceptional Children*, 75(1), 33-52.
- Browder, D. M., Ahlgrim-Delzell, L., Flowers, C., & Baker, J. (2012). An evaluation of a multicomponent early literacy program for students with severe developmental disabilities. *Remedial and Special Education*, 33(4), 237-246. doi:10.1177/0741932510387305
- Browder, D. M., Ahlgrim-Delzell, L., Spooner, F., Mims, P. J., Baker, J. N. (2009). Using time delay to teach literacy to students with severe developmental disabilities. *Exceptional Children*, 75(3), 343-364. doi:10.1177/001440290907500305
- Browder, D. M., Gibbs, S., Ahlgrim-Delzell, L., Courtade, G. R., Mraz, M., & Flowers, C. (2009). Literacy for students with severe developmental disabilities: What should we teach and what should we hope to achieve? *Remedial and Special Education*, 30(5), 269-282. doi:10.1177/0741932508315054
- Browder, D. M., Hudson, M. E., & Wood, A. L. (2013). Teaching students with moderate intellectual disability who are emergent readers to comprehend passages of text. *Exceptionality: A Special Education Journal*, 21(4), 191-206. doi:10.1080/09362835.2013.802236
- Browder, D. M., Lee, A., & Mims, P. (2011). Using shared stories and individual response modes to promote comprehension and engagement in literacy for students with multiple, severe disabilities. *Education and Training in Autism and Developmental Disabilities*, 46(3), 339-351.
- Browder, D. M., Mims, P. J., Spooner, F., Ahlgrim-Delzell, L., & Lee, A. (2008). Teaching elementary students with multiple disabilities to participate in shared stories. *Research and Practice for Persons with Severe Disabilities*, 33(1), 3-12. doi:10.2511/rpsd.33.1-2.3

- Browder, D. M., & Spooner, F. (2006). *Teaching language arts, math, and science to students with significant cognitive disabilities*. Baltimore, MD: Paul H. Brookes Publishing Co.
- Browder, D. M., & Spooner, F. (Eds.). (2014). *More language arts, math, and science for students with significant cognitive disabilities*. Baltimore, MD: Paul H. Brookes Publishing Co.
- Browder, D., Spooner, F., Ahlgrim-Delzell, L., Flowers, C., Algozzine, B., & Karvonen, M. (2003). A content analysis of the curricular philosophies reflected in states' alternate assessment performance indicators. *Research and Practice for Persons with Severe Disabilities*, 28(4), 165-181. doi:10.2511/rpsd.28.4.165
- Browder, D. M., Spooner, F., Wakeman, S., Trela, K., & Baker, J. N. (2006). Aligning instruction with academic content standards: Finding the link. *Research and Practice for Persons with Severe Disabilities*, 31(4), 309-321. doi:10.1177/154079690603100404
- Browder, D. M., Trela, K., & Jimenez, B. (2007). Training teachers to follow a task analysis to engage middle school students with moderate and severe developmental disabilities in grade-appropriate literature. *Focus on Autism and Other Developmental Disabilities*, 22(4), 206-219. doi:10.1177/10883576070220040301
- Browder, D. M., Wakeman, S. Y., Spooner, F., Ahlgrim-Delzell, L., & Algozzine, B. (2006). Research on reading instruction for individuals with significant cognitive disabilities. *Exceptional Children*, 72(4), 392-408. doi:10.1177/001440290607200401
- Browder, D. M., Wood, L., Thompson, J., & Ribuffo, C. (2014). *Evidence-based practices for students with severe disabilities* (Document No. IC-3). Gainesville, FL: University of Florida, Collaboration for Effective Educator, Development, Accountability and Reform Center. Retrieved from <http://ceedar.education.ufl.edu/tools/innovation-configurations/>
- Brown, L., Branston, M. B., Hamre-Nietupski, S., Pumpian, I., Certo, N., & Gruenewald, L. (1979). A strategy for developing chronological-age-appropriate and functional curricular content for severely handicapped adolescents and young adults. *Journal of Special Education*, 13(1), 81-90. doi:10.1177/002246697901300113
- Brown, L., Wilcox, B., Sontag, E., Vincent, B., Dodd, N., & Gruenewald, I. (2004). Toward the realization of the least restrictive environments for severely handicapped students. *Research and Practice for Persons with Severe Disabilities*, 29(1), 2-8. doi:10.2511/rpsd.29.1.2

- Campbell, J. M., & Herzinger, C. V. (2010). Statistics and single subject research methodology. In D. L. Gast (Ed.), *Single subject research methodology in behavioral sciences* (pp. 417-453). New York, NY: Routledge.
- Carter, E. W. (2011). Supporting peer relationships. In M. E. Snell & F. Brown (Eds.), *Instruction of students with severe disabilities* (pp. 431-460). Upper Saddle River, NJ: Pearson Education, Inc.
- Celik, S., & Vuran, S. (2014). Comparison of direct instruction and simultaneous prompting procedure on teaching concepts to individuals with intellectual disability. *Education and Training in Autism and Developmental Disabilities*, 49(1), 127-144.
- Chiang, H. M., & Lin, Y. H. (2007). Reading comprehension instruction for students with autism spectrum disorders: A review of literature. *Focus on Autism and Other Developmental Disabilities*, 22(4), 259-267. doi:10.1177/10883576070220040801
- Ciullo, S., & Reutebuch, C. (2013). Computer-based graphic organizers for students with LD: A systematic review of literature. *Learning Disabilities Research and Practice*, 28(4), 196-210. doi:10.1111/ldrp.12017
- Collins, B. C. (2007). Teaching students with moderate and severe disabilities: Systematic instruction. In B. C. Collins (Ed.), *Moderate and severe disabilities: A foundational approach* (pp. 118-145). Upper Saddle River, NJ: Pearson Education, Inc.
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). Upper Saddle River, NJ: Pearson Education, Inc.
- Courtade, G. R., Lingo, A. M., & Whitney, T. (2013). Using story-based lessons to increase academic engaged time in general education classes for students with moderate intellectual disability and autism. *Rural Special Education Quarterly*, 32(4), 3-14. doi:10.2511/rpsd.32.1.43
- Courtade, G., Spooner, F., & Browder, D. (2007). A review of studies with students with significant cognitive disabilities that link to science standards. *Research and Practice for Persons with Severe Disabilities*, 32(1), 43-49. doi:10.2511/rpsd.32.1.43
- Courtade, G., Spooner, F., Browder, D., & Jimenez, B. (2012). Seven reasons to promote standards-based instruction for students with severe disabilities: A reply to Ayres, Lowrey, Douglas, and Sievers (2011). *Education and Training in Autism and Developmental Disabilities*, 47(1), 3-13.

- Coyne, P., Pisha, B., Dalton, B, Zeph, L. A., & Smith, N. C. (2012). Literacy by design: A universal design for learning approach for students with significant intellectual disabilities. *Remedial and Special Education, 33*(3), 162-172.
doi:10.1177/0741932510381651
- Creech-Galloway, C., Collins, B. C., Knight, V., & Bausch, M. (2013). Using a simultaneous prompting procedure with an iPad to teach the Pythagorean theorem to adolescents with moderate intellectual disability. *Research and Practice for Persons with Severe Disabilities, 38*(4), 222-232.
doi:10.1177/154079691303800402
- Dexter, D. D., & Hughes, C. A. (2011). Graphic organizers and students with learning disabilities: A meta-analysis. *Learning Disability Quarterly, 34*(1), 51-72.
doi:10.1177/073194871103400104
- DiCecco, V. M., & Gleason, M. M. (2002). Using graphic organizers to attain relational knowledge from expository text. *Journal of Learning Disabilities, 35*(4), 306-320.
doi:10.1177/00222194020350040201
- Douglas, K. H., Ayres, K. M., Langone, J., Bell, V., & Meade, C. (2009). Expanding literacy for learners with intellectual disabilities: The role of supported eText. *Journal of Special Education Technology, 24*(3), 35-44.
- Douglas, K. H., Ayers, K. M., Langone, J., & Bramlett, V. B. (2011). The effectiveness of electronic text and pictorial graphic organizers to improve comprehension related to functional skills. *Journal of Special Education Technology, 26*(1), 43-56.
- Downing, J. E. (2005). *Teaching literacy to students with significant disabilities*. Thousand Oaks, CA: Corwin Press. doi:10.4135/9781483328973
- Englert, C. S., & Mariage, T. V. (1991). Making students partners in the comprehension process: Organizer the reading POSSE. *Learning Disability Quarterly, 14*(2), 123-138. doi:10.2307/1510519
- Erickson, K., Hanser, G., Hatch, P., & Sanders, E. (2009, June). *Research-based practices for creating access to the general curriculum in reading and literacy for students with significant intellectual disabilities*. Washington, DC: Council of Chief State School Officers. Retrieved from http://www.ccsso.org/Resources/Publications/Research-based_Practices_for_Creating_Access_to_the_General_Curriculum_in_Reading_and_Literacy_for_Students_with_Significant_Intellectual_Disabilities.html
- Flores, M. M., & Ganz, J. B. (2007). Effectiveness of direct instruction for teaching statement inference, use of facts, and analogies to students with developmental

- disabilities and reading delays. *Focus on Autism and Other Developmental Disabilities*, 22(4), 244-151. doi:10.1177/10883576070220040601
- Flores, M. M., & Ganz, J. B. (2009). Effects of direct instruction on the reading comprehension of students with autism and developmental disabilities. *Education and Training in Developmental Disabilities*, 44(1), 39-53.
- Flores, M. M., Nelson, C., Hinton, V., Franklin, T. M., Strozier, S. D., Terry, L., & Franlin, S. (2013). Teaching reading comprehension and language skills to students with autism spectrum disorders and developmental disabilities using direct instruction. *Education and Training in Autism and Developmental Disabilities*, 48(1), 41-48.
- Gajria, M., Jitendra, A. K., Sood, S., & Sacks, G. (2007). Improving comprehension of expository text in students with LD: A research synthesis. *Journal of Learning Disabilities*, 40(3), 210-225. doi:10.1177/00222194070400030301
- Gast, D. L. (2010). *Single subject research methodology in behavioral sciences*. New York, NY: Routledge.
- Gast, D. L., & Ledford, J. (2010). Multiple baseline and multiple probe designs. In D. L. Gast (Ed.), *Single subject research methodology in behavioral sciences* (pp. 276-328). New York, NY: Routledge.
- Gast, D. L., & Spriggs, A. D. (2010). Visual analysis of graphic data. In D. L. Gast (Ed.), *Single subject research methodology in behavioral sciences* (pp. 199-233). New York, NY: Routledge.
- Gersten, R., Fuchs, L. S., Compton, D., Coyne, M., Greenwood, C., & Innocenti, M. S. (2005). Quality indicators for group experimental and quasi-experimental research in special education. *Exceptional Children*, 71(2), 149-164. doi:10.1177/001440290507100202
- Gersten, R., Woodward, J., & Darch, G. (1986). Direct instruction: A research-based approach to curriculum design and teaching. *Exceptional Children*, 53(1), 17-31.
- Hall, T., Meyer, A., & Strangman, N. (2005). UDL implementation: Examples using best practices and curriculum enhancements. In D. H. Rose, A. Meyer, & C. Hitchcock (Eds.), *The universally designed classroom: Accessible curriculum and digital technology* (pp.149-197). Cambridge, MA: Harvard Education Press.
- Hardman, M. L., & Nagle, K. (2004). Public policy: From access to accountability in special education. In A. M. Sorrells, H. J. Rieth, & P. T. Sindelar (Eds.), *Critical issues in special education: Access, diversity, and accountability* (pp. 277-292). New York, NY: Pearson Education, Inc.

- Holifield, C., Goodman, J., Hazelkorn, M., & Heflin, L. J. (2010). Using self-monitoring to increase attending to task and academic accuracy in children with autism. *Focus on Autism and Other Developmental Disabilities*, 25(4), 230-238. doi:10.1177/1088357610380137
- Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practices in special education. *Exceptional Children*, 71(2), 165-180. doi:10.1177/001440290507100203
- Hua, Y. H., Hendrickson, J. M., Therrien, W. J., Woods-Groves, S., Ries, P. S., & Shaw, J. J. (2012). Effects of combined reading and question generation on reading fluency and comprehension of three young adults with autism and intellectual disability. *Focus on Autism and Other Developmental Disabilities*, 27(3), 135-146. doi:10.1177/1088357612448421
- Hudson, M. E., & Browder, D. M. (2014). Improving listening comprehension responses for students with moderate intellectual disabilities during literacy class. *Research and Practice for Persons with Severe Disabilities*, 39(1), 11-29. doi:10.1177/1540796914534634
- Hudson, M. E., Browder, D. M., & Jimenez, B. A. (2014). Effects of a peer-delivered system of least prompts intervention and adapted science read-alouds on listening comprehension for participants with moderate intellectual disabilities. *Education and Training in Autism and Developmental Disabilities*, 49(1), 60-77.
- Hudson, M. E., Browder, D., & Wakeman, S. (2013a). Helping students with moderate and severe intellectual disability access grade-level text. *Teaching Exceptional Children*, 45(3), 14-23.
- Hudson, M. E., Browder, D. M., & Wood, L. A. (2013b). Review of experimental research on academic learning by students with moderate and severe intellectual disability in general education. *Research and Practice for Persons with Severe Disabilities*, 38(1), 17-29. doi:10.2511/027494813807046926
- Hudson, M. E., & Test, D. W. (2011). Evaluating the evidence base of shared story reading to promote literacy for students with extensive support needs. *Research and Practice for Persons with Severe Disabilities*, 36(1-2), 34-45. doi:10.2511/rpsd.36.1-2.34
- Individuals with Disabilities Education Improvement Act of 2004, PL 108-466, 20 U.S.C. § 1400, H.R. 1350.

- Ives, B. (2007). Graphic organizers applied to secondary algebra instruction for students with learning disorders. *Learning Disabilities Research and Practice*, 22(2), 110-118. doi:10.1111/j.1540-5826.2007.00235.x
- Jimenez, B. A., Browder, D. M., & Courtade, G. R. (2009). An exploratory study of self-directed science concept learning by students with moderate intellectual disabilities. *Research and Practice for Persons with Severe Disabilities*, 34(2), 33-46. doi:10.2511/rpsd.34.2.33
- Jimenez, B. A., & Kemmery, M. (2013). Building the early numeracy skills of students with moderate intellectual disability. *Education and Training in Autism and Developmental Disabilities*, 48(4), 479-490.
- Jorgensen, C. M., Fischer-Mueller, J., & Prud'homme, H. (2014). Promoting learning in general education for all students. In D. M. Browder & F. Spooner (Eds.), *More language arts, math, and science for students with severe disabilities* (pp. 255-274). Baltimore, MD: Paul H. Brookes Publishing Co.
- Kearns, J., Kleinert, H., Harrison, B., Sheppard-Jones, K., Hall, M., & Jones, M. (2010). *What does "college and career ready" mean for students with significant cognitive disabilities?* Lexington, KY: University of Kentucky.
- Kearns, J. F., Towles-Reeves, E., Kleinert, H. L., Kleinert, J. O., & Thomas, M. K. (2011). Characteristics and implications for students participating in alternate assessments based on alternate academic achievement standards. *The Journal of Special Education*, 45(1), 3-14. doi:10.1177/0022466909344223
- Kim, H., Vaughn, S., Wanzek, V. J., & Wei, S. (2004). Graphic organizers and their effects on the reading comprehension of students with LD: A synthesis of research. *Journal of Learning Disabilities*, 37(2), 105-118. doi:10.1177/00222194040370020201
- Knight, V. F. (2010). *Effects of supported electronic text and explicit instruction on science comprehension by students with autism spectrum disorders* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global database. (UMI No. 2422667)
- Knight, V. F., & Sartini, E. (2015). A comprehensive literature review of comprehension strategies in core content areas for students with autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 45(5), 1213-1229. doi:10.1007/s10803-014-2280-x
- Knight, V. F., Smith, B. R., Spooner, F., & Browder, D. M. (2012). Using explicit instruction to teach science descriptors to students with autism spectrum

- disorders. *Journal of Autism and Developmental Disorders*, 42(3), 378-389. doi:10.1007/s10803-011-1258-1
- Knight, V. F., Spooner, F., Browder, D. M., Smith, B. R., & Wood, C. L. (2013). Using systematic instruction and graphic organizers to teach science to students with autism spectrum disorders and intellectual disability. *Focus on Autism and Other Developmental Disabilities*, 28(2), 115-126. doi:10.1177/1088357612475301
- Knight, V. F., Wood, C. L., Spooner, F., Browder, D. M., & O'Brien, C. P. (2015). An exploratory study using science eTexts with students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 30(2), 86-99. doi:10.1177/1088357614559214
- Kratochwill, T. R., Hitchcock, J. H., Horner, R. H., Levin, J. R., Odom, S. L., Rindskopf, D. M., & Shadish, W. R. (2013). Single-case intervention research design standards. *Remedial and Special Education*, 34(1), 26-38. doi:10.1177/0741932512452794
- Mastropieri, M. A., & Peters, E. E. (1987). Increasing prose recall of learning disabled and reading disabled students via spatial organizers. *The Journal of Educational Research*, 80(5), 272-276. doi:10.1080/00220671.1987.10885766
- Mastropieri, M. A., & Scruggs, T. E. (1997). Best practices in promoting reading comprehension in students with learning disabilities: 1976 to 1996. *Remedial and Special Education*, 18(4), 198-213. doi:10.1177/074193259701800402
- Miller, B. T., Krockover, G. H., & Doughty, T. (2013). Using iPads to teach inquiry science to students with moderate to severe intellectual disability: A pilot study. *Journal of Research in Science Teaching*, 50(8), 887-911. doi:10.1002/tea.21091
- Miller, B., & Taber-Doughty, T. (2014). Self-monitoring checklist for inquiry problem-solving: Functional problem-solving methods for students with intellectual disability. *Education and Training in Autism and Developmental Disabilities*, 49(4), 555-567.
- Mims, P. J. (2009). *The effects of the system of least prompts on teaching comprehension skills during a shared story to students with significant intellectual disabilities* (Doctoral dissertation). Available ProQuest Dissertations and Theses Global database. (UMI No. 3360430)
- Mims, P. J., Browder, D. M., Baker, J. N., Lee, A., & Spooner, F. (2009). Increasing comprehension of students with significant intellectual disabilities and visual impairments during shared stories. *Education and Training in Developmental Disabilities*, 44(3), 409-420.

- Mims, P. J., Hudson, M. E., & Browder, D. M. (2012). Using read-alouds of grade-level biographies and systematic prompting to promote comprehension for students with moderate and severe developmental disabilities. *Focus on Autism and Other Developmental Disabilities*, 27(2), 67-80. doi:10.1177/1088357612446859
- Mims, P. J., Lee, A., Browder, D. M., Zakas, T. L., & Flynn, S. (2012). Effects of a treatment package to facilitate English/language arts learning for middle school students with moderate to severe disabilities. *Education and Training in Autism and Developmental Disabilities*, 47(4), 414-425.
- Morgan, M. F., Cuskelly, M., & Moni, K. B. (2011). Broadening the conceptualization of literacy in the lives of adults with intellectual disability. *Research and Practice for Persons with Severe Disabilities*, 36(3-4), 112-120. doi:10.2511/027494811800824516
- Mucchetti, C. A. (2013). Adapted shared reading at school for minimally verbal students with autism. *Autism*, 17(3), 358-372. doi:10.1177/1362361312470495
- National Reading Panel. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implication for reading instruction: Reports of the sub-groups* (NIH Pub. No. 00-4754). Washington, DC: National Institute of Child Health and Human Development. Retrieved from <http://www.nichd.nih.gov/publications/pubs/nrp/documents/report.pdf>
- Nietupski, J., Hamre-Nietupski, S., Curtain, S., & Shrikanth, K. (1997). A review of curricular research in severe disabilities from 1976 to 1995 in six selected journals. *Journal of Special Education*, 31(1), 36-55. doi:10.1177/002246699703100104
- No Child Left Behind Act of 2001, 20 U.S.C. § 6301 *et seq.* (2006).
- Pennington, R., Delano, M., & Scott, R. (2014). Improving the cover-letter writing skills of individuals with intellectual disabilities. *Journal of Applied Behavior Analysis*, 47(1), 204-208. doi:10.1002/jaba.96
- Reichow, B. (2011). Development, procedures, and application of the evaluative method for determining evidence-based practices in autism. In B. Reichow, P. Doehring, D. V. Cicchetti, & F. R. Volkmar (Eds.), *Evidence-based practices and treatments for children with autism* (pp. 25-39). New York, NY: Springer. doi:10. 1007/978-1-4419-6975-0_2
- Roberts, C. A., Leko, M. M., & Wilkerson, K. L. (2013). New directions in reading instruction for adolescents with significant cognitive disabilities. *Remedial and Special Education*, 34(5), 305-317. doi:10.1177/0741932513485447

- Ryndak, D. L., Taub, D., Jorgensen, C. M., Gonsier-Gerdin, J., Arndt, K., Ruppert, A. L., . . . Allcock, H. (2014). Policy and the impact on placement, involvement, and progress in general education: Critical issues that require rectification. *Research and Practice for Persons with Severe Disabilities*, 39(1), 65-74. doi:10.1177/1540796914533942
- Saenz, L. M., & Fuchs, L. S. (2002). Examining the reading difficulty of secondary students with learning disabilities: Expository versus narrative text. *Remedial and Special Education*, 23(1), 31-41. doi:10.1177/074193250202300105
- Schenning, H., Knight, V., & Spooner, F. (2013). Effects of structure inquiry and graphic organizers on social studies comprehension by students with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 7(4), 526-540. doi:10.1016/j.rasd.2012.12.007
- Scruggs, T. E., & Mastropieri, M. A. (1998). Summarizing single-subject research. *Behavior Modification*, 22(3), 221-242. doi:10.1177/01454455980223001
- Scruggs, T. E., Mastropieri, M. A., & Casto, G. (1987). The quantitative synthesis of single-subject research: Methodology and validation. *Remedial and Special Education*, 8(2), 24-33. doi:10.1177/074193258700800206
- Shurr, J., & Bouck, E. C. (2013). Research on curriculum for students with moderate and severe intellectual disabilities: A systematic review. *Education and Training in Autism and Developmental Disabilities*, 48(1), 76-87.
- Shurr, J., & Tabor-Doughty, T. (2012). Increasing comprehension for middle school students with moderate intellectual disability on age-appropriate texts. *Education and Training in Autism and Developmental Disabilities*, 47(3), 359-372.
- Snell, M. E. (1997). Teaching children and young adults with mental retardation in school programs: Current research. *Behavior Change*, 14(2), 1-33.
- Spooner, F., Ahlgrim-Delzell, L., Kemp-Inman, A., & Wood, L. A. (2014). Using an iPad2 with systematic instruction to teach shared stories for elementary-aged students with autism. *Research and Practice for Persons with Severe Disabilities*, 39(1), 30-46. doi:10.1177/1540796914534631
- Spooner, F., Kemp-Inman, A., Ahlgrim-Delzell, L., Wood, L., & Davis, L. L. (2015). Generalization of literacy skills through portable technology for students with severe disabilities. *Research and Practice for Persons with Severe Disabilities*, 40(1), 52-70. doi:10.1177/1540796915586190

- Spooner, F., Knight, V. F., Browder, D. M., & Smith, B. R. (2012). Evidence-based practice for teaching academics to students with severe disabilities. *Remedial and Special Education, 33*(6), 374- 387. doi:10.1177/0741932511421634
- Spooner, F., Rivera, C. J., Browder, D. M., Baker, J. N., & Salas, S. (2009). Teaching emergent literacy skills using cultural contextual story-based lessons. *Research and Practice for Persons with Severe Disabilities, 34*(3-4), 102-112. doi:10.2511/rpsd.34.3-4.102
- Stetter, M. E., & Hughes, M. T. (2011). Computer assisted instruction to promote comprehension in students with learning disabilities. *International Journal of Special Education, 26*(1), 88-100.
- Thompson, J. L., Bethune, K. S., Wood, C., & Pugalee, D. K. (2014). Teaching grade-aligned math, In D. M. Browder & F. Spooner (Eds.), *More language arts, math, and science for students with severe disabilities* (pp. 169-194). Baltimore, MD: Paul H. Brooks Publishing Co.
- Towles-Reeves, E., Kearns, J., Kleinert, H., & Kleinert, J. (2009). An analysis of the learning characteristics of students taking alternate assessments based on alternate achievement standards. *The Journal of Special Education, 42*(4), 241-254. doi:10.1177/0022466907313451
- Vaughn, S., & Edmonds, M. (2006). Reading comprehension for older readers. *Intervention in School and Clinic, 41*(3), 131-137. doi:10.1177/10534512060410030101
- Wade, E., Boon, R. T., & Spencer, V. G. (2010). Use of *Kidspiration* software to enhance the reading comprehension of story grammar components for elementary-age students with specific learning disabilities. *Learning Disabilities: A Contemporary Journal, 8*(2), 31-41.
- Watson, S. M. R., Gable, R. A., Gear, S. B., & Hughes, K. C. (2012). Evidence-based strategies for improving the reading comprehension of secondary students: Implications for students with learning disabilities. *Learning Disabilities Research and Practice, 27*(2), 79-89. doi:10.1111/j.1540-5826.2012.00353.x
- Wehmeyer, M. L. (2006). Universal design for learning, access to the general curriculum and students with mild mental retardation. *Exceptionality: A Special Education Journal, 14*(4), 225-245. doi: 10.1207/ s15327035ex1404_4
- Wehmeyer, M. L., Agran, M., & Hughes, C. (1998). *Teaching self-determination to students with disabilities: Basic skills for successful training*. Baltimore, MD: Paul H. Brooks Publishing Co., Inc.

- Wood, A. L. (2014). *Effects of systematic instruction on listening comprehension of science e-Texts for students with moderate intellectual disability* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global database. (UMI No. 3625063)
- Wood, L., Browder, D. M., & Flynn, L. (2015). Teaching students with intellectual disability to use a self-questioning strategy to comprehend social studies text for an inclusive setting. *Research and Practice for Persons with Severe Disabilities*, 40, 1-19. doi:10.1177/1540796915592155
- Wood, L., Browder, D. M., & Mraz, M. (2014). Passage comprehension and read-alouds. In D. M. Browder & F. Spooner (Eds.), *More language arts, math, and science for students with significant cognitive disabilities* (pp. 63-84). Baltimore, MD: Paul H. Brookes Publishing Co.
- Wolery, M., Ault, M. J., & Doyle, P. M. (1992). *Teaching students with moderate to severe disabilities: Use of response prompting strategies*. New York, NY: Longman.
- Yell, M. L., Drasgow, E., Bradley, R., & Justesen, T. (2004). Contemporary legal issues in special education. In A. M. Sorrells, H. J. Rieth, & P. T. Sindelar (Eds.), *Critical issues in special education: Access, diversity, and accountability* (pp. 16-37). New York, NY: Pearson Education, Inc.
- Zakas, T. L. (2011). *Teaching social studies content to students with autism using a graphic organizer intervention* (Doctoral dissertation). Available from ProQuest Dissertations and Theses Global database. (UMI No. 3457964)
- Zakas, T. L., Browder, D. M., Ahlgrim-Delzell, & Heafner, T. (2013). Teaching social studies content to students with autism using a graphic organizer intervention. *Research in Autism Spectrum Disorders*, 7, 1075-1086. doi:10.1016/j.rasd.2013.06.001

Biography

Alexander P. Britt received his Bachelor of Business Administration from Belmont University in 2007. He was employed as a teacher in Fairfax County for three years and received his Master of Education from George Mason University in 2012. He is currently employed as an Autism Teacher in Alexandria City.