December 2017

The Effects of Distributed Trials on Behaviors of Students with Significant Disability

Mona Nasir-Tucktuck

University of Nevada, Las Vegas, mona.tucktuck@unlv.edu

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This dissertation prepared by

Mona Nasir-Tucktuck

entitled

The Effects of Distributed Trials on the Behaviors of Students with Significant Disability

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

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

Joshua Baker, Ph.D.
Examination Committee Chair

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

Cori More, Ph.D.
Examination Committee Member

Tracy Spies, Ph.D.
Examination Committee Member

Randall Boone, Ph.D.
Graduate College Faculty Representative
ABSTRACT
THE EFFECTS OF DISTRIBUTED TRIALS ON BEHAVIORS OF STUDENTS WITH SIGNIFICANT DISABILITY

By
Mona Nasir-Tucktuck

Dr. Josh Baker, Examination Committee Chair
Assistant Professor of Special Education
University of Nevada, Las Vegas

Teaching academic instruction to students with significant cognitive disability (SCD) has been done with success over the past years (Browder, Mims, Spooner, Ahlgrim-Delzell, & Lee, 2008; Hudson & Test, 2011; Mims, Hudson, & Browder, 2012). However, research is scarce and further instructional strategies are needed to help align the standard-based curriculum for this population of students (Browder, Ahlgrim-Delzell, Flowers, & Baker, 2012). The academic inclusion of students with SCD has been a topic of interest for researchers over the past few decades. In 1997, research on teaching academics to students with SCD was scarce (Nietupski, Hamre-Nietupski, Curtin, Shrikanth, 1997). The individuals with disabilities education act (IDEA) was reauthorized in 1997, to require that all students with disabilities to have access to the general curriculum (IDEA, 1997). In 2001, No Child Left Behind was passed (NCLB, 2001), which made sure that all students are successful and held the schools accountable for the success of all students. These movements have prompted many researchers to investigate different instructional strategies to deliver instruction better and more specifically, academic instruction such as reading (Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2005), math (Browder, Spooner, Ahlgrim-Delzell, Harris, & Wakeman, 2007), and science (Courtade, Spooner, & Browder, 2007) to students with SCD. With the passing of Every Student Succeeds
Act (ESSA, 2015), the importance of teaching academic instruction to students with SCD is still eminent.

Based on the findings from the research, systematic prompting (Mims, Hudson, & Browder, 2012) and embedded instruction (Jimenez & Kamei, 2015) have been used as effective instructional strategies for students with SCD. The research also strongly suggests the use of shared stories to deliver academic instruction to students with SCD is also very effective (Hudson, et al., 2015; Mims, et al., 2012; Spooner et al. 2014). This study added to the research by using systematic prompting to teach pivotal skills distributed in an adapted literature shared reading book, and examined the effects of this intervention on the acquisition of skills, listening comprehension, and behaviors of students with SCD.

This study provided further support to the existing literature, and also provided another instructional strategy for teachers to use when working with students with SCD. A single subject multiple probe baseline design across participants was used and results suggest the occurrence of a functional relationship between the independent and each of the dependent variables. The results of the study discussed the effects of the independent variable on pivotal skill acquisition and listening comprehension, as well as assessed the effects of this intervention on the ability of the students to generalize the dependent variables over time and across settings. The social validity of this intervention was also assessed through a survey sent out to the teachers, parents, and students.
ACKNOWLEDGEMENTS

I offer my thanks and appreciation to Dr. Josh Baker for his dedication, support, and encouraging spirit throughout this dissertation and my doctoral studies. I feel very honored and privileged to have had the opportunity to be your advisee and learn from your expertise. I would also like to thank Dr. Cori More and Dr. Tracy Spies for always having an open door for communication and providing feedback and guidance throughout my doctoral studies and this dissertation. You have been a pivotal part of my UNLV village- I appreciate everything! Many thanks to Dr. Randy Boone for his feedback on this dissertation.

I would like to thank my UNLV family of instructors and colleagues who have supported me, guided me, worked with me, and studied alongside of me. I will cherish these times always. Lastly, a huge thank you to Stephanie and Ryan for their help collecting interrater data for my dissertation. I am lucky to have you not only as colleagues, but as friends. I look forward to a future of working and collaborating with you!

Thanks and love to my friends who have seen me through my studies. You were each a source of strength and optimism to me. Your encouragement and support were instrumental in getting me through. I appreciate all your help, and value you and your friendship!

Last but not least, I want to thank my immediate family. I know that this would not have been possible if it had not been for you encouraging me along the way, believing in me, and being my biggest cheerleaders. Thank you!
DEDICATION

This dissertation is dedicated to my mother and my two sons, Ramzi and Faris.

Mama- Thank you for teaching me that no dream is too big.
Thank you for always being a great example in perseverance and strength.

Ramzi and Faris- Remember nothing is impossible. Never settle- always aim high and reach higher. You two are the reason I persevered through this!
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CHAPTER 1

Introduction

The federal government has taken an active role in protecting the rights of individuals with disabilities in education. Specifically, the Individuals with Disabilities Education Act (IDEA), passed in 1975 (IDEA, 1975), set out to include students with disabilities in public education. In 1997, IDEA was reauthorized to require that all students with disabilities have access to the general curriculum (IDEA, 1997). The IDEA was reauthorized again in 2004, this time demanding more accountability from the states and school districts, through collecting data on student performance in the general education curriculum (IDEA, 2004). Even federal general education mandates, such as the Every Student Succeeds Act (ESSA, 2015), holds schools and districts accountable for the outcomes and inclusion of all students.

As a result of these laws, students with significant cognitive disability (SCD) are expected to spend more time accessing the general education curriculum. The term SCD is an umbrella term that includes students with autism spectrum disorders (ASD), intellectual disability, and developmental disability. Students with SCD meet the IDEA definition for students who qualify for alternative assessments (IDEA, 2004). Students qualifying for alternative assessments, such as students with SCD, have cognitive abilities that prevent them from taking standardized, state and end of the year assessments.

The evolution of academic inclusion of students with SCD has been a topic of interest for researchers over the past few decades leading to investigations of various instructional strategies to better deliver instruction for students with SCD and, more specifically, academic instruction such as reading (Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzine, 2006), math (Browder, Spooner, Ahlgrim-Delzell, Harris, & Wakeman, 2008), and science (Courtade,
Spooner, & Browder, 2007). Although teaching academics to students with SCD has been beneficial over the past years (Browder, Mims, Spooner, Ahlgrim-Delzell, & Lee, 2008; Hudson & Test, 2011; Mims, Hudson, & Browder, 2012), research is still scarce, and further instructional strategies are needed to help align the standard-based curriculum for this population of students (Browder, Ahlgrim-Delzell, Flowers, & Baker, 2012; Nietupski, Hamre-Nietupski, Curtin, & Shrikanth, 1997). Typically, the principles of Applied Behavior Analysis (ABA) are embedded in this emerging literature base.

**Applied Behavior Analysis**

The emergence of ABA has been significant for teaching students with SCD. Applied Behavior Analysis was derived from study of the relationship between the stimulus and response (Watson, 1913) and the theory about respondent and operant conditioning (Skinner, 1957). In his classical research, Skinner tested his theory on animals by manipulating stimuli to encourage the occurrence of a desired behavior (Skinner, 1957). This approach has become the backbone of many academic, social, and behavioral interventions for students with SCD (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Wong et al., 2015).

Discrete trial training (DTT), an intervention that is commonly used for teaching new skills to students with SCD, is based on ABA principles, and many include successive repetition of the desired skill (i.e., Mass trials). Discrete trial training follows a four-step procedure that includes: (a) therapist delivering the discriminative stimulus (i.e., directive); (b) student emitting the behavior; (c) therapist delivering the reinforcement and prompting, when necessary; and (d) therapist closing the trial and moving on to the next (Delprato, 2001). While highly successful in helping students acquire and practice new skills, DTT is described by many as rigid and structured (Steege, Mace, Perry, & Longenecker, 2007), which may increase the occurrence of
undesired behaviors (Bryson et al., 2007; Delprato, 2001; Koegel, Bimba, & Schreibman, 1996).

In recent years, other instructional strategies have emerged for presenting discrete trials to the learner. These strategies rely on the traditional discrete trials routine, but the trials are distributed and embedded within the instruction (Jimenez & Kamei, 2015) as opposed to being presented successively in mass trials. The trials are delivered randomly throughout the lesson or day (Jimenez & Kamei, 2015). Researchers refer to conducting distributed trials in an inclusive setting as embedded instruction (EI; Jimenez & Kamei, 2015), whereas it is referred to as distributing trials when used in a self-contained setting.

Over the past decades, trials have been successfully embedded in science, math, and literacy lessons to deliver academic instruction to students with SCD (Collins, Evans, Creech-Galloway, Karl, & Miller, 2007; Jimenez, Browder, Spooner, & DiBiase, 2012; Majdalani, Wilder, Greif, Mathisen, & Saini, 2014; Sigafoos et al., 2006). Such instruction has been delivered in a general education classroom and embedded in a lesson. It has also been taught in the special education classroom by distributing the discrete trials in a lesson or over a period of time (e.g., 30 minutes).

**Instructional Strategies**

Over the past 10 years, research has found that various instructional strategies based on ABA principles have been used successfully with students with SCD to teach academics (Browder, Mims et al., 2008; Hudson & Test, 2011; Mims et al., 2012). These strategies have allowed students with SCD to successfully access the general curriculum in various academic content areas (i.e., literacy, math, and science). In the following section, some of different instructional strategies used with students with SCD will be discussed.
Systematic Instruction

Systematic instruction (SI) is a set of procedures that are used to get the desired behavioral outcomes, use data to show experimental control between the independent and dependent variables, define skills in terms that are observable and measurable, and teach skills that are socially significant and can be generalized to different settings and times, and across different people (Spooner, Algrim-Delzell, Kemp-Inman, & Wood, 2014). Researchers have used components of SI, such as task analysis, prompting hierarchy, and embedded instruction, to deliver instruction successfully to students with SCD (Browder, Lee, & Mims, 2011; Courtade, Lingo, & Whitney, 2013; Hudson, Browder, & Jimenez, 2014; Mims et al., 2012; Spooner et al., 2014).

Task analysis. Task analysis is defined as breaking down a complex skill or behavior into smaller teachable steps of a chained response (Cooper, Heron, & Heward, 2007). Task analysis is used frequently to help teach a skill to students by breaking down a complex cast into smaller teachable tasks. (Browder et al., 2011; Mims et al., 2012). For example, Browder et al. (2011) examined the effects of shared story reading with prompting on the listening comprehension and engagement of three elementary students who had severe multiple disabilities. The researchers used a seven-step task analysis to teach the components of the comprehension and engagement questions following a shared story reading. Further, frequency recording was used to record students’ completion of the steps of the task analysis. In another study, Spooner et al. (2014) used a task analysis to deliver instruction to students with SCD on how to use an iPad to engage in shared reading. Specifically, the students were prompted to use the steps of the task analysis to independently navigate their way on the iPad and answer the
comprehension questions. The students were successful in following the steps of the task analysis, especially when the intervention was paired with least to most prompting.

**Prompting.** One of the instructional strategies used commonly with systematic instruction is a prompting hierarchy. This strategy uses a system hierarchy prompts to deliver cues to the students during instructional sessions, rather than only one type of prompt (Hudson et al., 2014). Hudson and colleagues (2014) explored the effects of a peer-delivered least-prompts intervention on the comprehension and correct responding of students with intellectual disabilities. During the intervention, the peers used a hierarchy of least to most prompts when a student could not give the desired answer. For example, if a student gave no response, the peer would follow up with error correction procedure and move on. The peer also prompted the student to point to the response board and ask for help if no response was made within 4 seconds of the discriminative stimulus. In another study, Mims and colleagues (2012) examined the effects of a modified system of least intrusive prompts on the text-dependent listening comprehension of adapted grade-level biographies for four middle-school students with intellectual disabilities.

**Embedded instruction.** Jameson, McDonnell, Johnson, Reisen, and Polychronis (2007) described embedded instructions as “a strategy that can be used to provide students with developmental disabilities systematic instruction within the typical routines of general education classrooms” (p. 24), adding that “Embedded instruction allows the teacher to systematically control all the instructional procedures” (p. 24).

This instructional strategy relies on the traditional discrete trial routine of mass trial, with the difference that the trials are embedded within instruction. Trials have been successfully
embedded in science, math, and literacy lessons to teach academic skills to students with SCD (Collins et al., 2007; Jimenez et al., 2012; Majdalani et al., 2014; Sigafoos et al., 2006).

The term embedded instruction is typically used when referring to an inclusive general education setting, whereby distributed trials are presented to students in the special education classroom (Jimenez & Kamei, 2015). Instruction has been delivered either setting in an embedded lesson (e.g., shared story reading) or delivered in the students’ special education classroom by distributing the trials in a lesson. Research conducted on the delivery of both instructional strategies has yielded successful results with no difference in acquisition rate of information, as acquisition rate has been random and depending on each student (Geiger et al., 2012; Majdalani et al., 2014). Collectively, task analysis, prompting, embedded instruction, and other systematic instruction strategies have been successful in teaching academics to students with SCD. They hold promise in the areas of reading, math, and science.

Academics

Researchers have used shared stories to help deliver academic content, such as reading, math, and science to students with SCD (Mims et al., 2012; Hudson, Zambone, & Brickhouse, 2016; and Smith, Spooner, & Wood). The following section will discuss the use of shared story reading to deliver academics to students.

Shared Story Reading

Shared reading has been successfully used to enhance the literacy skills of children with autism and Intellectual Disability (ID; Browder, Mims et al., 2008; Hudson & Test, 2011; Mims et al., 2012). Hudson and Test (2011) conducted a systematic review of the literature on shared story reading (also known as a read-aloud, repeated storybook reading, story-based lesson, and
literacy-based lesson) and found that the use of shared stories is an evidence-based practice for students with intellectual disabilities.

Shared reading consists of reading a story aloud to a student while delivering support for the student to interact with the reader about the story. Stories chosen for shared reading have repeated story lines, catchy phrases, repeated readings, and pictures that are paired with words. It is effective in supporting and fostering emergent literacy skills for all types of learners, including typically developing students, at-risk students, students with mild and profound disabilities, and English language learners.

**Reading.** In a 2006 review of the research on reading, Browder et al. found that the majority of the studies focused more on vocabulary. Since then, researchers have broadened their focus to include comprehension, phonics, and other emergent literacy components. For example, Mims et al. (2012) used shared stories to improve the listening comprehension skills of four students with SCD. In another study, Browder, Mims, et al. (2008) adapted three popular storybooks to include each student’s name as the main character in the story. They also used repetition of story lines to enhance the meaning of the story. The results in both cases suggested that shared reading enhanced literacy.

When using shared stories to teach literacy skills to students with SCD, the students are given opportunities to develop a variety of literacy skills, from basic text understanding to determining important details in a text (Browder, Mims, et al., 2008; Mims et al., 2012). Shared story reading allows students who may not otherwise be able to access the general curriculum to participate in an inclusive setting.

**Math.** In a meta-analysis on the literature on teaching mathematics to students with SCD Browder and colleagues (2007) found that most of the studies taught numbers and computations
(e.g., counting, calculations, or number counting) or measurement (e.g., money). Since then, studies have found that students with SCD can learn algebra (Jimenez, Courtade, & Browder, 2008). In 2016, Hudson, Zambone, and Brickhouse examined the effects of individually adapted scripted lessons, a math story read-aloud, and manipulatives on the acquisition of early numeracy skills by three participants with severe multiple disabilities, using a multiple-probe design across participants. Data on all the students indicated a change in performance level, thus suggesting that the intervention effected the results.

**Science.** Jimenez, Browder, and Courtade (2009) found that students with SCD can complete a science inquiry lesson independently. In another study, Smith, Spooner, and Wood (2012) used a multiple-probe baseline design to investigate the effectiveness of embedding computer-based science instruction (i.e., slide show) on the acquisition skills of students with ASD and intellectual disabilities and found that the students were successful in acquiring the science instruction. In 2014, Hudson et al. explored the effects of a peer-delivered least-prompts intervention and adapted fourth-grade science curriculum on the comprehension and correct responding of students with intellectual disabilities using a multiple-baseline design. The study took place in the general education classroom. The results showed that all students demonstrated an increase in performance level from baseline to intervention. Although limited, emerging research indicates students with SCD can successfully learn academics in the general education setting when provided individualized instructional supports. Universal design of learning is one approach to successfully design instruction for the success of all students.

**Universal Design of Learning/Inclusion**

Researchers have used the principles of universal design of learning (UDL) when preparing lessons for students who have SCD (Browder, Mims et al., 2008; Knight, Wood,
Spooner, Browder, & O’Brien, 2015). The roots of UDL emerged from architecture and
cognitive neuroscience. The idea behind UDL is to find ways for everyone to be able to be
included regardless of abilities. In architecture, for example, the idea of building ramps in every
building can not only be accessible to individuals with disabilities, but also to elderly people,
mothers pushing strollers, and others who cannot or do not wish to use the stairs, but would like
to enter the building. Similarly, in classrooms, the principles of UDL encourage teachers to find
new, groundbreaking ways to create lessons that can be accessible to all students regardless of
their abilities (Rose & Meyer, 2002). Although the UDL principles are often implemented in
self-contained classrooms, incorporating these principles (i.e., engagement, representation, and
expression) in lesson planning allows educators to create and implement lessons that provide
opportunities for all students to learn in an inclusive classroom regarding of their educational and
cognitive abilities.

In one study, Coyne, Pisha, Dalton, Zeph, and Smith (2012) investigated the effects of
UDL technology-based reading approach (LBD) versus traditional reading instruction on the
reading comprehension, fluency, phonemic awareness, phonics, and vocabulary development of
students with intellectual disabilities. Pre- and posttest data were collected on the two groups.
The LBD group made statistically significant higher gains than the control group in
comprehension. The analysis also yielded high practical significance on many of the subtests,
such as word attack skills, listening comprehension, and concepts about print. Using UDL to
train teachers to incorporate the principles of UDL to help enhance learning opportunities for
students with moderate to severe disabilities has been successful (Coyne et al., 2012).
Specifically, studies have found that creating UDL lessons is an easily acquired skill but that
implementing is harder, so more research is needed to find new instructional strategies that
provide students with SCD opportunities to access the general curriculum, and be included as much as possible in the general education setting.

Teaching academics to students with SCD has evolved significantly since over the past few years. Thus, the importance of including all students in academics has been strengthened through various laws that protect the academic and learning rights of all students. For example, the Every Student Succeed Act (2015) ensures that interventions are constantly explored, revised, and sought out that encourage all students to succeed and are given opportunities to do so.

**Significance**

Based on the findings of the literature review, embedding and distributing instruction have been used as effective instructional strategies for students with SCD (Collins et al., 2007; Jimenez et al., 2012; Majdalani et al., 2014; Sigafoos et al., 2006). Studies also strongly suggest that the use of shared stories to deliver academic instruction to students with SCD is very effective (Hudson et al., 2015; Mims et al., 2012; Spooner et al., 2014).

The proposed study will add to the research by distributing trials in an adapted literature book to create a shared story reading for students with SCD. The shared story will be written in a UDL format that can be used in inclusive settings. The study will examine the effects of these instructional strategies on the academic acquisition of skills and reading comprehension, while also observing and collecting data on the behaviors of the student participants during instruction. It is expected that the study will provide further support to the existing literature and in the development of another instructional strategy for teachers to use to help students with SCD learn and achieve to their fullest potential.
Purpose of the Study

The purpose of this study was to examine the effects of distributing trials instruction in a shared story reading lesson, using multimedia and UDL principles, on the acquisition of academic skills and listening comprehension of students with SCD in a special education classroom. More specifically, the study aimed to answer the following research questions:

- Does distributing trials in a shared story reading and systematic prompting improve pivotal skills acquisition of students with SCD?
- Does distributing trials in a shared story reading and systematic prompting improve the listening comprehension of students with SCD?
- Does distributing trials in a shared story reading and systematic prompting lead to a change in the frequency of appropriate and inappropriate behaviors for students with SCD?
- What effect does a distributed trial strategy have on pivotal skills acquisition and listening comprehension when generalized to a novel story for students with SCD?
- What is the social validity distributing trials in a shared story reading for teachers and students with SCD?

Subjects and Setting

Six elementary students with SCD were recruited to participate in the study. Students were chosen based on a convenience sample. Inclusionary criteria were determined for the participation of the students. The study took place in a special education self-contained classroom for students with SCD, in an elementary school, in a large school district, in the urban Southwest of the United States.
Research Design

A quantitative experimental single-subject multiple-probe design across participants was used. The researcher examined the effects of distributing trials in a shared story reading lesson on the acquisition of pivotal skills and reading comprehension of students with SCD. The study included baseline, intervention, and generalization conditions. The researcher worked directly with the students to deliver the intervention.

Delimitations of the Study

The boundaries of this study stem from the type of research design used, as outlined below. That is, in order to examine each individual student and to answer the specific research questions, a single-subject multiple-baseline design across participants was chosen. Typically, three to five participants are recommended for this type of design (Horner et al., 2005). In addition, the study took place in a large urban environment with only one school district. Therefore, the participants were chosen using a convenience sample. Another boundary that was set was that the study took place in the special education classroom and the researcher delivered the intervention to the students, and not the classroom teacher. While the students participated in the study in the special education classroom, other students were present and engaging in various individual and group activities. Therefore, there was control over the noise level in the classroom, which at times was elevated, and may have distracted the students during the intervention. The setting of the intervention and the surrounding environment, may have caused the students to have acting out behaviors during the intervention, which was considered as a possible delimitation for the study. Moreover, this may have been the first time the students had ever participated in a study; therefore, the novelty of the intervention may have influenced their behaviors.
**Definition of Terms**

**Applied Behavior Analysis (ABA):** A scientific approach to understanding behavior and how the environment influences it. ABA consists of seven principles; (a) applied, (b) behavioral, (c) analytical, (d) technological, (e) conceptually systematic, (f) generality, and (g) effective (Cooper et al., 2007).

**Autism Spectrum Disorder:** A developmental disability characterized by delays in speech (verbal and nonverbal), difficulties in social interaction, and repetitive behaviors that negatively affects a child’s life. ASD is usually apparent after the age of 3 (IDEA, 2004; Nevada Department of Education, 2016).

**Discrete Trial Training:** Teaching students using simplified instruction and breaking down the skill into smaller skills. Each attempt to teach or response is considered a trial. Every trial consists of four parts (a) the therapist giving the discriminative stimulus (i.e., the prompt), (b) the student emitting the behavior, (c) the therapist providing feedback (reinforcement), and (d) the therapist closing the trials (Steege, Mace, Perry, & Longnecker, 2007).

**Distributed Trials:** Discrete trials distributed throughout a lesson or period of time, not immediately following each other in the special education classroom. (Jimenez & Kamai, 2015)

**Embedded Instruction:** A strategy used for students with significant cognitive disabilities to provide systematic instruction in the general education classroom. The instruction is embedded in the session and delivered to the student (Jimenez & Kamei, 2015). For example, Jameson et al. (2007) successfully embedded instruction in the general education classroom and delivered it to the students during transition, breaks, and while the other students were working on independent work (Jameson et al., 2007)
**Intellectual Disability:** Significant limitations in intellectual functioning and adaptive behavior in three domains: (a) conceptual domain (i.e., language, reading, math, reasoning, and memory), (b) social domain (i.e., empathy, social judgment, interpersonal relationships and communication), and (c) practical domain (i.e., self-management) (American Association on Intellectual & Developmental Disabilities, 2013; American Psychiatric Association, 2013).

**Mass Trials:** A set number of discrete trials delivered systematically following each other in a short amount of times. Jameson et al. (2007) conducted one-to-one mass instruction that was delivered based on the content of the special education classroom. The trials were embedded in the instruction, but unlike distributed trials they were delivered to the student close together without breaks (Jameson et al., 2007).

**Pivotal Behaviors:** “Behaviors that are central to wide areas of functioning. Positive change in the behaviors should have positive effects on others”. Once a pivotal behavior is learned it generalizes to other behaviors. (Koegel, Koegel, & McNerney, 2001).

**Shared Stories:** An evidence-based practice, also known as a read-aloud, whereby adults read a story with students and use the text to engage students in books and delivering instruction. Hudson, Browder, & Jimenez, (2014); and Mims, Browder, & Hudson (2012) used shared storied to deliver instruction to students with SCD in science and literacy, respectively.

**Significant Cognitive Disabilities:** A disability that significantly impacts intellectual functioning, adaptive behavior, and the ability to achieve at grade level. Include students with autism, multiple disabilities, traumatic brain injury, and intellectual disabilities (NAAC.CAST.org, 2016).

**System of Least Prompts:** Use of a prompting hierarchy rather than only one type of prompt to provide assistance to a student during an instructional trial. For example, if the student emits an
incorrect response or does not respond within the amount of time allotted, a prompt is given to help the student answer the question. In least-to-most prompt, the least amount of assistance is given at first and then gradually increased if the student still requires support (i.e., verbal, gesturing, modeling, and physical; Browder et al., 2011; Hudson et al., 2014).

**Task Analysis:** Used to break down complex tasks into smaller, simpler, and more teachable tasks. These tasks are sequentially ordered (Alberto & Troutman, 2012; Cooper et al., 2007).
CHAPTER 2

Literature Review

This section presents a literature review for the three strands selected for this dissertation. The first strand is shared story reading. The literature review includes studies on reading/literacy, math, and science. The second strand is embedded instruction. It includes studies on embedded instruction in the general education setting and in distributed trials in the special education classroom. The third strand is the use of universal designs for learning (UDL) in the preparation of instructional curricula for students with significant cognitive disabilities (SCD). Selection criteria are discussed, as well as the inclusion and exclusion criteria for the studies selected.

Shared Story Reading

Shared stories have been used to teach literacy skills by allowing students to access the general curriculum (Browder, Mims et al., 2008; Hudson & Test, 2011; Mims et al., 2012). A shared reading consists of reading a story aloud to a student while delivering support for the student to interact with the reader about the story. Shared stories often include repeated story lines, catchy phrases, repeated readings, and pictures paired with words. They have been found to be effective in supporting and fostering emergent literacy skills for typically developing students, at-risk students, students with mild and profound disabilities, as well as English language learners.

Teaching language arts to student with SCD can be a challenge. However, shared stories have been used successfully as an evidence-based practice to increase the literacy skills of students with ID. That is, teachers have successfully adapted text and created shared stories to teach academic skills to students with moderate to severe disabilities in the special education and
the general education classrooms. This strand will review shared stories, how they are used, and their social validity.

**Selection criteria.** For this strand, a systematic search through the following computerized data were conducted, including Education Resources Information Center (ERIC), EBSCO, Academic Search Premier, Academic Search Main Edition, Education Full Text, PsycINFO, PsycARTICLES, MainFile, MasterFile Premier, Primary Search, and Google Scholar. The following descriptors were used: *Shared reading, shared story reading, read-aloud, autism, intellectual disability, developmental disability, cognitive disability, mental retardation, severe disability, moderate disability.* The search included peer-reviewed journals from 2011-2016. Hudson and Test (2011) conducted a systematic literature review about shared story readings for the years 1975-2011. The current study used the same descriptors and search criteria to extend Hudson and Test’s work. The studies reviewed included the following topics: shared story reading in the general education classroom, K-12-age students with an intellectual disability, K-12-age students with autism, K-12-age students with moderate to severe disabilities, shared story readings in the special education or self-contained room. Studies that did not include academic learning or working directly with students (i.e., professional development training), or that did not use shared story reading as an independent variable were excluded. Studies about students with learning disabilities, emotional and behavioral disabilities, social skills training, and articles that were not peer-reviewed were also excluded from this review. Of a total of 16 manuscripts initially found, only 9 met the selection criteria.

**Literature review.** Hudson and Test (2011) conducted a systematic review of shared story reading (also known as read-aloud, repeated storybook reading, story-based lesson, and
literacy-based lesson) to determine if shared stories were an evidence-based practice for students with intellectual disabilities.

Hudson and Test (2011) used the 20 quality indicators suggested by Horner et al. (2005) to determine which studies conducted between 1975 and 2011 were evidence-based as a means to promote literacy. The criteria for inclusion in their review required that studies (a) were experimental and published in a peer-reviewed journal or dissertation, (b) included students with extensive needs for support, (c) used shared stories as part of the independent variable, and (d) included a literacy component as a dependent variable.

Hudson and Test (2011) found 13 studies. Three were eliminated because not all the criteria matched the requirements set forth by the researchers. The 10 remaining studies were evaluated using the 20 quality indicators based on Horner et al. (2005). None of the studies met all 20 indicators; however, 6 studies met 19 out of the 20.

Of those six studies that have been done, all but one were conducted by a research team from one university. Implications for future practice recommends more research on using shared stories with students with profound disabilities that incorporate all 20 indicators.

**Literacy/reading.** Mims and colleagues (2012) examined the effects of a modified system of least intrusive prompts on the text-dependent listening comprehension of adapted grade-level biographies on four middle-school students with intellectual disabilities, using a multiple-probe baseline design. One of the four students had verbal language; the remaining three students communicated using pictures and objects. Three out of the four students could read sight words; one student did not recognize words. All the students had difficulties following verbal directions.

Baseline, intervention, generalization, and maintenance took place in a multipurpose room located across from the special education room where the participating students spent most
of their days. During baseline, the interventionist read aloud the biography to the students. At selected points, the interventionist asked one of 11 comprehension questions used in the intervention. If the student answered correctly, the interventionist marked it with a “+.” If the student responded incorrectly or made no response, the interventionist marked “_” and continued reading. During baseline, each biography was read completely and the students were each given an opportunity to answer all the comprehension questions. No praise or feedback was given for incorrect or correct responses. General praise was given for participating and for work behaviors, however.

During the intervention phase, the interventionist started with the same procedures as in baseline. However, she also introduced as system of least intrusive prompts when the students were probed and asked the 11 comprehension questions. If the response was correct, the interventionist marked it as an independent correct response and verbally praised the student. If the response was incorrect or no response was given within 4 seconds, the interventionist introduced increasingly intrusive prompts until the student emitted the correct response. Then a chart was introduced and the students were taught to listen to a wh-question being asked and what the answer entailed. The rule of what to look for when each question was asked was included on the chart. A graphic organizer was also used during the intervention to help students organize their thoughts. For one participant who struggled to show a change in level during intervention, mass trials were conducted on how to answer comprehension questions before the read-alouds were administered.

Maintenance data were collected two weeks after the intervention was completed. The conditions for the maintenance phase were similar to the conditions in the baseline phase. Finally, generalization was measured by introducing new biographies. The mean of the
unprompted correct responses was compared to the mean during baseline when new biographies were introduced. The data suggested that all students improved their listening comprehension. In addition, they were able to maintain and generalize the information learned two weeks after the intervention and to new biographies.

The small number of participants was one of the limitations for the study. Another limitation was that a member of the research team conducted the study – it is important to involve teachers in research studies to bridge the gap between research and practice. The one-on-one instruction was yet another limitation. The researchers suggest that while one-on-one instruction is effective, small group instruction has many benefits, including allowing students to learn from each other in a group setting. Finally, the use of different settings for intervention than for baseline, generalization, and maintenance was also a limitation.

Browder and colleagues (2011) used a multiple-probe baseline design to examine the effects of shared stories with prompting on the listening comprehension and engagement of three elementary students who had severe multiple disabilities. All three students were selected upon the recommendations of the teacher based on the criteria set by the researchers prior to starting the study: The students had a severe intellectual disability along with a physical or sensory disability. The students were expected to reply to nonsymbolic communication. The teachers worked with the students in a one-on-one instructional format. The shared story lesson typically took about 30 minutes and was conducted three times per week.

A task analysis was created consisting of seven steps. Frequency recording was used to tally correct and incorrect completion of the steps of the task analysis. The other dependent variable was whether the students were engaged in the literacy activity or not. Comprehension and level of engagement were measured for each student. The teachers were given a script to
follow during the baseline assessment in order to make sure that the evaluation across all students remained consistent. The script adhered to all the steps of the task analysis. Students did not receive any feedback regardless of the responses they gave. Following the baseline assessment, the students were purposefully given the target skills based on their method of communication. During the intervention phase, the teachers also had a script to follow. However, it was more detailed and included the hierarchy of prompts to follow as well as ways the teacher could respond when students gave an independent correct response. The feedback was also conducted in a manner to encourage and increase engagement. A prompting hierarchy was described for each student. Before moving to a different level of prompting, the teacher was instructed to wait 5 seconds prior. Each student had two books to use and was able to pick the book they wanted to start with. The second book was used for generalization of the skills.

All three students’ correct responses to the comprehension questions as well as engagement steps showed an increase from baseline to the intervention phase, thus suggesting experimental control between the independent and dependent variables. All students were also able to maintain the skills learned over a period of 10 days to one month after the last intervention was conducted. Students also generalized the skills to the second book that was written for them. These findings are particularly noteworthy given that the students had severe multiple disabilities. However, although the results were promising, the study did have limitations. Some of these limitations included that (a) the instruction and intervention were performed in a one-on-one manner; (b) the replication of the response was not done because of the different abilities styles; and (c) the study was conducted in the self-contained setting that the students regularly learned in. Therefore, replicating the study in an inclusive setting was recommended.
Spooner et al. (2014) used systematic instruction paired with an iPad to teach literacy skills using shared stories to students with four elementary students with autism and improve their listening comprehension skills. All the student participants were nonverbal. A single-case multiple-probe across participant design was used. Two dependent variables were measured during the intervention. The first dependent variable was the independent correct responses for steps in the task analysis. The task analysis included early literacy and comprehension from the book read and the iPad. The students received prompts as needed to answer the questions correctly. The second dependent variable was the unprompted correct responses on the comprehension questions. Zero-second time delay was used to teach the skills during the first intervention and any time the student got a response that was below the baseline points. The number of correct and unprompted responses were tallied and graphed.

The intervention began by reading one of the shared stories in a one-to-one format. The books were randomly selected. During baseline when a new book was selected, the student was given the book and the iPad, which served as sound output. Students were given the initial instruction for each step in the task analysis, but were not given any prompting, error correcting, or feedback. However, they did receive reinforcement for their on-task behaviors. During the intervention phase, the same procedures were followed as during baseline; however, the students were now given prompts in the form of least to most. The students were given a new book every four to five days. The interventionist started by giving the students a zero-second time delay to teach the initial task analysis; then the following days, the student was given a 4-second time delay to respond. The students were taught how to access all the nine steps of the task analysis, which helped them independently access the story on the iPad and answer the comprehension questions. The students were prompted to answer the comprehension question presented at the
end of the story. Each story had six comprehension questions, but only one was randomly chosen for each session. A 4-second response time was added when probing for the comprehension questions. The number of independent and unprompted correct responses and task analysis steps completion was counted. Booster sessions in the form of massed trials were added for a student who needed extra one-on-one help. Maintenance followed the same procedures as baseline. Generalization was assessed throughout because of the random assignment of the books read.

The intervention appeared to positively affect student performance on the task analysis and listening comprehension from baseline to the intervention phase. All students made slow but steady progress. The authors suggest that using the iPad and the voice-activated prompt is a cost effective way to help students use shared stories more frequently and independently. Although the results are promising, there were some limitations to this study. First, typically students with autism are motivated with the use of multimedia devices. Because all the participants had autism, it is not clear how the study will generalize to other students with different abilities. Another limitation was that one of the participants had a double diagnosis of autism and a mild intellectual disability. This student had higher IQ than the other students, although he received all his instruction in the classroom. His baseline scores were higher than the rest, but his performance was similar to that of the other participants in terms of skill acquisition and sustaining attention, which suggests that this intervention may be generalized across different levels and types of disabilities. Further limitations to the study included the setting. The interventionist in the self-contained classroom did the study; it is recommended that the study be replicated with the classroom teacher and in inclusive settings to examine the effects of the intervention.
Hudson and Browder (2014) used a multiple-probe baseline design to examine the effects of peer-delivered least prompts and adapted grade-level shared readings on the listening comprehension of three students with moderate intellectual disability. The study took place in multiple settings: The first setting was the general education classroom; during literacy hour the 35 fifth-grade students all sat in groups of 4 or 5. The peer tutors worked with the target students and delivered the prompts. The second setting was the special education classroom; the researcher delivered the preteaching instructions (i.e., wh-questions and asking for help), baseline conditions, and ongoing probes. And the last setting was the library; the peer tutors were trained by the researcher using a manual and role play. The primary dependent variable was the number of prompted correct responses; the secondary independent variable was the independent correct responses. Generalization prompts were also recorded using frequency counts. Social validity data were collected from the peers and the teachers regarding the feasibility of the study and social attitudes.

During preteaching, the special education teacher taught the participating students about wh-questions. They were given a prompt board that included visual cues about how to answer a wh-question. The students were also taught to ask for help when needed. Prior to baseline, the peer tutors were trained by being given a training manual and then engaging in role-playing with the researcher to ensure that the procedures for working as peer tutors were carried out as determined by the researcher. The general education teacher also was trained by the researcher on how to deliver least-prompts intervention by modeling the procedure for delivering prompts and recording data. The researcher also provided feedback to the teacher based on the delivery of the prompts steps. Because the teacher did not have a scripted text, the researcher color-coded the text based to highlight what the teacher needed to emphasize, reread, and respond to. After
the preteaching, baseline data were collected. The students were probed on each one of the chapters randomly, but each student was probed a minimum of five times before starting the intervention.

Baseline was completed in the special education room. The researcher started by reviewing the vocabulary words with the students and then began reading the chapter. The researcher asked comprehension questions and waited 4 seconds for the students to respond. When the students asked for help, the next least prompt was delivered. The students received verbal praise for their work behaviors and a reward after each session. During intervention, the students were in the general education classroom with the peer tutors. The procedures for the intervention were the same as for the baseline. However, after reading the shared story, the tutors asked the students if they needed any help. If the students answered incorrectly or did not respond within 4 seconds, the tutors pointed to the help prompt on the response boards. Generalization prompts were collected every week. One generalization question was asked after each chapter.

Results showed a functional relationship between the dependent and independent variables (i.e., prompted correct responses and the peer-delivered intervention). Students’ number of independent correct responses also improved. This study differed from previous studies that involved shared readings and prompting in that the first two prompts directed the student back to the text to reread the text to get the response prior to giving the correct response. The students showed great improvement in their ability to generalize the intervention to different settings.

While the inclusion of the target students with their peers in the general education classroom was very natural and successful, the researchers pointed to the following limitations of
the study: (a) the researcher was always present during the study and was never faded. Therefore, the fidelity of the peers implementing the study without the presence of the researcher was unclear, (b) the peers measured the intervention measured the baseline probes, (c) data were not collected on the correct responses of the target students during regular discussion in the classroom. Therefore, the possibility that some of the students may have learned and generalized the answers from the responses of their peers cannot be ruled out, (d) the only strategy used to evaluate listening comprehension was wh-questions, and (e) carrying out the intervention required a huge time commitment. However, although the time invested was high, the results were very promising and encouraging.

Courtade and colleagues (2013) examined the ability of two teachers, special and general education, to design and implement adapted, grade-level read-aloud by following a 12-step task analysis to create the story and 10 steps to implement the lesson, using a multiple-probe baseline design. They also assessed the outcomes of applying the story based lesson on increasing academic engagement for students with intellectual disabilities, autism, and fragile X syndrome in the general education classroom.

The study took place in three general education classrooms (A, B, C). The general education teacher in each classroom led the read-aloud. In classrooms A and B, the teacher took turns with the students to read the adapted text by reading either sentences or passages. In Classrooms B and C, the special education teacher or paraprofessional helped the general education teacher to work with the students when they broke off into their small groups. Each pair of teacher recruited one student.

The dependent variables were the teachers’ implementation of the steps in the task analysis to adapt the test and their implementation of the task analysis to increase the
engagement of the students during the lesson. Student participation was measured as academic engagement time. The first dependent variable, the task analysis for adapting the shared reading, was completed by the special education teachers and was measured by the number of steps competed correctly by the teacher during adapting the reading. The second dependent variable measured the number of steps implemented by the teacher during the read-aloud. Frequency recording was used to tally the number of steps completed in the two independent variables. Academic engagement time was measured by recording the duration of the time the student was engaged and followed along in the read-aloud activity.

Prior to baseline, both teacher pairs received training in working with students with intellectual disabilities. The training did not include anything specific regarding the intervention, but focused on how to access the general curriculum, data collection, monitoring progress, and behavior support. During baseline, the teachers were asked to implement a read-aloud as they normally would. The special education teachers were asked to adapt the text as they typically would. During intervention, the teachers participated in a 90-minute workshop, during which the teacher pair were trained on age-appropriate literature and implementation of story-based lessons. The special education teachers also received instruction on how to use a task analysis to adapt books and comprehension questions. They first watched video clips of the general education teacher implementing the story-based lessons and were then asked to use the task analysis to create two story-based books. Observers scored the teachers based on completing the task analysis steps and executing the lesson based on the 10-step lesson implementation in the general education classroom. Three observers collected concurrent data and compared them for interrater agreement.
The results suggested that teachers can reliably create adapted read-alouds and implement them successfully in the general education classroom. Results also suggested that using a read-aloud increased students’ academic engagement time from baseline to intervention in the general education classroom. Although, Students 1 and 2 were more engaged during the intervention than Student 3, Student 3 received a lesser amount of intervention than the other students. He was part of a large group that sat on the floor during the intervention and was not often redirected. This was one of the limitations of the study. Another limitation was the length of the intervention conditions. The third classroom entered intervention towards the end of the school year and was, therefore, cut shorter than the other two classrooms. Extraneous variables such as the relationship between the general and special education teacher may have also influenced the results of the study and, therefore, acted as a limitation. The researchers suggest that further research and replication of studies similar to this one is needed. Regardless of the limitations, the study added to the literature on shared readings and its role as an evidence-based practice for students with intellectual disabilities and autism.

Whalon, Martinez, Shannon, Butcher, and Hanline (2015) investigated the impact of Reading to Engage Children with Autism in Language and Learning (RECALL) on unprompted correct responses and verbal and nonverbal initiation of four young children with autism using a multiple-baseline design. The study also investigated the level of support and level of prompting required.

The students were selected based on teacher recommendations. Once consent was signed, the researchers were able to obtain school records to gather information about the diagnosis and academic, cognitive, and behavioral strengths and needs of the participants in the study. All four students were young males 4-5 years old. All had a diagnosis of ASD and were receiving
services in a self-contained special education preschool classroom. The teachers also selected four same-age peers who received special education services under developmental delay. The peers were selected because they were able to demonstrate positive social behavior and responded readily responded to questions. Their role was to serve as interactive reading partners and social models to the participating students.

The intervention took place three days a week in the students’ classroom or in a room adjacent to the classroom. The intervention involved the student participant, a peer, and the interventionist. The dependent variables were student responses as well as verbal and nonverbal initiations. Responses were recorded if a correct verbal or nonverbal response was emitted within 5 seconds of the discriminative stimulus. The responses were coded as prompted or independent responses. Prompted responses were coded based on the hierarchy of the prompt used. Incorrect or modeled responses were coded when the student did not emit the correct response or did not respond to modeling. Prior to beginning the study, the teachers were trained by the interventionist on how to use RECALL through direct instruction and role-plays. To pass required 80% correct or more on the procedural integrity checklist.

During the baseline phase, books were read for three days to the students. The interventionist then asked one of the scripted questions using one RECALL prompt. However, the interventionist did not implement any RECALL instructional procedures. The books were age-appropriate and contained the same number of words on each page and the same number of pages as the other books. The books contained pictures that illustrated the narrative and opportunities to ask identification questions – every page listed a question. If the student answered correctly, the interventionist confirmed the correct response; if the student answered incorrectly, the interventionist stated the correct answer.
During intervention, RECALL support was provided. That is, when the student responded incorrectly, the interventionist delivered the next prompt based on the hierarchy of prompts. The students were also prompted to initiate by the interventionist delivering an initiation prompt or initiation pause at least three times per reading. During maintenance, the RECALL prompts were removed. The number of incorrect or no responses decreased immediately following the implementation of the intervention. Over time, the level of prompt also decreased, and correct responding increased.

The results of the study suggested that RECALL is an effective strategy for teaching literacy for students with autism. However, although all students made progress during the intervention, the results varied for each student. Another limitation is that although the number of student initiations increased during RECALL, so did the length of the session. Another limitation is the accommodations for the students, which may have had an effect on the results of the study. Lastly, the small number of students is a limitation to generalization. Nevertheless, the data suggest that the use of systematic instruction together with visual aids is a successful way to incorporate and allow students with autism to participate in a shared reading in the classroom.

Math. Hudson et al. (2015) examined the effects of individually adapted scripted lessons, a math story read-aloud, and manipulatives on the acquisition of early numeracy skills for three participants with severe multiple disabilities in a self-contained education classroom.

The study took place in a special education classroom of an elementary school. The training took place in the kitchen area of the classroom at the end of the school day. Baseline, ongoing probes, and the intervention all took place on a small table. Partitions were put up to reduce the noise level in the room and avoid distracting the students from the activities going on in other parts of the room. All materials needed for the study were placed within reach.
A multiple-probe design across participants was used to determine the existence of a functional relationship between the systematic instructional package and the acquisition of early numeracy skills. The participants all entered the intervention at different times and based on predetermined conditions. Responses were collected using frequency recording. Independent correct responses were recorded using a “+.” Incorrect correct responses were marked with a “-.” If the participant paused for more than 15 seconds before coming up with a response or kept counting the answer, it was marked incorrect. If the student paused for 15 seconds after reaching the correct response, the answer was marked correct.

Prior to the intervention, the special education teacher was trained for two hours, during which the criteria for administering the study with the student were reviewed and training was provided as needed. The teacher was given a script on how to administer the systematic instruction and the procedures were reviewed. During baseline, a script was provided to assess early numeracy skills based on the specific skills targeted per student. The script was provided and the students were asked for a response. The responses were then recorded accordingly. No feedback was given; however, the students were praised for their performance.

During intervention, the assessment manual was adapted to meet every student’s individual needs. The special education teacher taught the lesson to one student or a group of two. Every lesson had 12 early numeracy skills objectives embedded and was taught 3-4 times per week. The students started a new lesson every week. The teacher began by reading the story and used systematic prompting and feedback to teach the embedded objectives. Detailed descriptions of how to deliver prompts were provided for every lesson. Constant time delay was used at the beginning of each lesson to review number recognition. When starting out, the teacher gave a 0-second time delay and provided the answer immediately after delivering the
discriminative stimulus. However, following the first round, the teacher delivered a 10- to 15-second delay before delivering the correct response.

Data collected from all students indicated a change in level for all students, suggesting that the existence of a functional relationship between the independent and dependent variables and, therefore, that the intervention was effective for numeracy acquisition. A possible explanation for why the students were successful, was that three evidence-based practices were used to deliver the instruction. Although the results of the study were promising, several limitations need to be considered: (a) one of the participants only had two data points in her intervention phase, (b) the large amount of time it took to plan and carry out the study, and (c) the study was conducted in a special education classroom only. The researchers suggest replicating the study in the general education classroom and possibly also in a group setting.

**Science.** Hudson and colleagues (2014) explored the effects of a peer-delivered least-prompts intervention and adapted fourth-grade science curriculum on the comprehension and correct responding of three –upper-elementary students with intellectual disabilities, using a single-subject multiple-baseline design. Two of the students used verbal speech to communicate, whereas the third communicated using yes and no responses through eye gazing. Peer tutors were fourth-grade students who were selected because they met the criteria set by the researchers. In addition to the participants and the peers, all from the fourth-grade, were invited to complete an attitude survey.

The study took place in the general education classroom. When the participating students in the class were working independently at their desks or in small groups, the peer tutoring took place. The student participants returned to the general education classroom for science instruction later in the day. The pretraining of the peer tutors, baseline, and the intermittent probe
sessions were conducted in the special education room. Prior to starting the baseline, the peer tutors received training – in groups and individually – including an explanation of the purpose of the study and their roles as peer tutors. They were also given a manual that included an example peer script, a sheet with possible responses, and prompts they could use. A procedural fidelity checklist was used, and to pass required making no more than one error during two consecutive sessions. Also prior to collecting baseline data, the target students were taught in the special education room to verbally ask for help or point to a response board that was created for each student and to use a self-monitoring sheet. For monitoring self-help, the researchers put an “X” next to every time the student asked for help. After six boxes were filled with an “X,” the student received a student-selected reinforcer.

Following pretraining and peer training, the target students started baseline. The baseline probes were randomly selected science lessons. Baseline probing occurred in the special education room. Once at least five data points were collected and a clear trend was established, intervention began. Before the peer tutors began the adapted read-aloud materials in a one-on-one training format, they reviewed the response board and how to ask for help. Following the reading, the peer tutors asked a series of comprehension questions using a hierarchy of least-to-most prompts when a student could not correctly give the answer. If a student gave no response, the tutor followed up with an error-correction procedure and moved on. The peer also prompted the participants by pointing to the response board and asking for help, if no response was made within 4 seconds of the discriminative stimulus. Intermittent baseline probes were given during the intervention and were used as generalization probes. The conditions and procedures were the same as the baseline probe sessions.
The results indicated that all students showed an increase in level from baseline to intervention. The study contributes to the research on peer-delivered instruction as well as the literature on shared stories, adapted grade-level readings, and using a system of least prompts to enhance learning and comprehension. The social validity of the study was also high. Teachers found that the students made academic gains and progress using the adapted readings and that they would use the intervention again in their classrooms and recommend it to others. The peers also enjoyed participating in the study.

However, despite the successful results of the study, some limitations apply. First, the researcher recorded the responses of the students during the intervention, however the peers had to make a quick decision on the response. This may have affected the fidelity of the responses. Second, the data were only collected during the morning sessions. However, in the afternoon sessions the teacher did ask the students the same comprehension questions, but there was no one able to collect data on their responses. Third, the researcher did the baseline and intermittent probe sessions and the peers completed the intervention, the different people interacting with the students, may have had an effect on the results of the study. However, despite these limitations, the study added to the research on shared story readings for students with moderate to severe intellectual disabilities.

**Embedded Systematic Instruction for Students with SCD**

Studies have strongly suggested that children with autism, intellectual disability, and/or developmental disability experience success with skill acquisition when instruction is delivered in the general education setting, alongside their peers (Reisen et al., 2003; Jimenez et al., 2012). Embedded instruction (EI) is a strategy used to provide systematic instruction in the general education classroom for students with autism, intellectual disabilities, and developmental
disabilities (Jameson et al., 2007; Jimenez & Kamei, 2015). Trials have been successfully embedded in a science, math, and literacy lessons to teach academic skills to these groups of students (Collins et al., 2007; Jimenez et al., 2012; Majdalani et al., 2014; Sigafoos et al., 2006). This strand will explore embedded instruction and distributed trials in a lesson for students with moderate to severe disabilities.

**Selection criteria.** For this strand literature review, a systematic search was conducted of the following computerized data: Education Resources Information Center (ERIC), EBSCO, Academic Search Premier, Academic Search Main Edition, Education Full Text, PsycINFO, PsycARTICLES, MainFile, MasterFile Premier, Primary Search, and Google Scholar. The following descriptors were used: *embedded instruction, distributed trials, incidental teaching, autism, intellectual disability, developmental disability, cognitive disability, mental retardation, severe disability, moderate disability, academic skills, and functional skills.* The literature search included peer-reviewed journals from the years 1975-2016 (1975 was the year the Individuals with Disabilities Education Act [IDEA] was enacted). The studies reviewed addressed the following topics: embedded instruction in the general education classroom, K-12-age students with an intellectual disability, K-12-age students with autism, K-12-age students with moderate to severe disabilities, distributed trials in the special education or self-contained room. Studies about early childhood, or preschool students, students with learning disabilities, emotional and behavioral disabilities, social skills training, not peer-reviewed, and only about mass discrete trials treatment were excluded from the review. Twenty-four manuscripts were found; however, only 11 were selected because they met the criteria for inclusion.

**Literature review.** In a multiple-probe design across participants study, Johnson and McDonnell (2004) extended the research on embedded instruction as an effective strategy for
teaching children with developmental disabilities in the general education classes by examining: (a) the ability of students to acquire skills through embedded instruction; (b) the ability of general education teachers to deliver instruction for all students, including students with developmental disabilities, in the general education room; and (c) the social validity of embedded instruction for general education classroom teachers with regard to delivering instruction to all students in their classroom.

Three students with developmental disabilities were the participants in the study. The target skill was selected based on the students’ IEP goals. Embedded instruction was planned only for the selected target skills, and was delivered in the periods and time of day when a given content area was being taught. The teachers were trained on how to deliver the embedded instruction prior to beginning the intervention. The researcher met with the teachers and guided them through the specific steps for delivering embedded instruction, including time delay, error correction, and how to collect data for the targeted skills. The teachers were also given a script of the embedded instruction with a timeline of how and when to deliver the instruction. The percentage of the correct responses was the dependent measure. The target skills were operationally defined and then collected in students’ special education classrooms. Fidelity probes were also collected, and the percentages of correct fidelity steps completed were calculated. At the end of the study, a Likert-scale questionnaire was given to the teachers to determine their perspectives with regard to the embedded instruction and the procedures of the study.

During baseline, the general education teacher probed the students 10 times during the targeted period during breaks in the classrooms. During each trial, the teacher presented the
discriminative stimulus, asked the students the corresponding question, and then waited for the student to respond. No feedback was provided regardless of response.

During the embedded instruction condition, teacher presented the embedded instruction to the student at the same time as the rest of the class, using constant time delay and reinforcement to teach the target skills. The teacher also arranged the environment to make sure the task presented itself to the student and waited for the tasks to occur naturally in the environment. Again, the students were probed 10 times during a session.

The results suggest a functional relationship between embedded instruction and students’ acquisition of the targeted skills. Thus, two of the three students were able to acquire the skills, thus suggesting that embedded instruction is an effective instructional tool for teaching students with developmental disabilities. Although the third student initially made some gains, his scores worsened after the 11th session. The deterioration of his scores coincided with a weakening of his health. The study found that general education teachers could easily learn and successfully implement embedded instruction in the general education classrooms. Besides, they seemed motivated and willing to implement the embedded instruction instructional strategy. The small number of participants, the narrow range of skills taught to the students, and the lack of generalization probing are possible limitations of the study.

Johnson, McDonnell, Holzwarth, and Hunter (2004) used a multiple-baseline design to examine the effects of embedding science probes within instruction for three students with developmental disabilities in the general education classroom. Two general education teachers and one special education paraprofessional participated in the study. The target behaviors were chosen based on the level of functional performance and educational needs of each participant. The dependent measures measured the number of correct responses, the rate for acquisition, the
number of times of presentation of intervention, and the perceptions of the participating teachers and paraprofessional regarding embedded instruction. During baseline, the students were probed three times, then weekly, on the target behaviors.

During the intervention phase, the teacher or the paraprofessional would give the stimulus and then immediately model the correct response with a 0-second time delay. The students were expected to model the teacher’s response within a preset amount of time (e.g., 4 seconds) of the instructional stimulus. If the target behavior was not emitted, the teacher or paraprofessional would say “no,” and then use prompting to guide the student through the correct response. Once the correct response was emitted, the students received their reinforcement. In the second step of the intervention, the students were expected to respond within 4 seconds of the instructional stimulus. The teachers would also prompt the students using least-to-most prompts. Social reinforcement was delivered following the occurrence of the target behavior. Once the targeted skills were mastered, maintenance probes were set up at least two times per week. For the maintenance phase, the teachers and paraprofessionals embedded the instruction similarly to Step 2.

The results of the study suggested that all the students were able to acquire the instructional target through the use of the embedded instruction. Although maintenance data were not collected for two of the three students because the school year ended, the data indicate that they would have had no problem maintaining the behaviors acquired. The setting in which the intervention was delivered differed across students. The satisfaction of the teachers and paraprofessionals in the intervention was high. All three instructors found embedded instruction to be a useful and valuable instructional strategy. Although the study suggested that embedded instruction is a valuable tool for teaching students with intellectual disabilities, it is subject to
several limitations: (a) the number of participants was small; (b) the skills taught to the students were discrete trial type of skills that did not require complex behavior chaining; and (c) generalization probes were not carried out.

In a similar study, Polychronis et al. (2004) used an alternating-treatments design to compare an instructional strategy with trials embedded and distributed across 30 minutes of instruction versus the same number of trials distributed across 120 minutes of instruction with four students who had developmental disabilities. The study took place in two schools in an urban setting. The schools and participants were chosen using a convenience sample. The students selected participated in the general education classroom for at least two hours per day the teachers and researchers believed they could benefit from having embedded instruction in that setting.

Prior to the intervention, three probes were conducted with each of the students in a naturalistic setting. The general education teachers provided the intervention with all the students at the same time as the rest of the general education class (e.g., during math, learning center time, and geography). The teachers were encouraged to present at least three trials in a 30-minute period – more if possible. If they presented more than three trials in 30 minutes, they were encouraged to present the same number of trials during the 120-minute instruction phase. During the 120-minute phase, the teachers were encouraged to present the sets of instruction over 20 minutes and not to exceed a 40-minute break between each set.

Both instructional time periods were effective for skill acquisition. However, two of the students met the instructional goal fast during the 30-minute period. This may have occurred because the 120 minutes may have been too long. The alternating of the two durations may have
also impacted that the students. For example, if the information had been presented daily over 120 minutes, the students might have been able to achieve better during the 120 minutes.

Jameson and colleagues (2007) also compared the effectiveness of one-to-one embedded instruction in the general education classroom and one-to-one massed practice instruction in a special education class with four middle-school students with developmental disabilities. The study took place in one of the general education classroom that the students attended, as well as in the special education classroom. The instructional targets were selected based on the grade-level requirements of the general education classes in which the students were enrolled. The dependent variable measured the percentage of correct responses of skill acquisition. The stimuli were randomly presented. The same number of probes was offered in each condition.

The embedded instruction was provided on a 3x5” index card and presented during transitions or breaks based on the content of the lesson in the general education room. The special education teacher and the paraprofessional both followed specific procedural instructions. A minimum of three trials were presented; however, the same number of trials were provided during the one-to-one mass instruction to make sure that it is equivalent to the embedded instruction. The one-to-one mass instruction was delivered based on the content of the special education classroom. It also was given close together without breaks.

The results suggested that embedded instruction is an effective instructional strategy for students with developmental disabilities included in the general education classroom. However, no specific intervention was preferred among the students. Finally, the study confirmed previous findings about the ability of special education teachers and paraprofessionals, with minimal training, to faithfully implement embedded instructional interventions in the general education classroom. Limitations of the study include: (a) the small number of participants, which makes it
difficult to generalize the findings; (b) the instructional strategies required discrete responses and not the use of more complex behaviors; and (c) the types of errors in each instructional condition were not recorded, so it is not known if they differed or not.

Collins et al. (2007) conducted an adapted alternating-treatments design across participants study that extended the research of McDonnell et al. (2006) by comparing the effects of three instructional strategies on the acquisition and maintenance of two types of sight words functional and core content with four participating students with intellectual disabilities by using: (a) direct discrete trials in the special education room, (b) direct distributed trials in the general education classroom, and (c) embedded instruction in the general education classroom.

In the elementary school, the special education teacher conducted the three interventions in both the special education and general education settings. The middle and high school teachers trained instructional assistants and peers to help them carry out the intervention. The direct instruction took place in the resource room in a one-to-one setting in the elementary and high school, and a one-to-two in the middle school. All the distributed trials took place in the general education classroom – in a science classroom for the elementary school, math for the middle school, and U.S. history in the high school. In the special education classroom, the teacher conducted the trials at a table separate from the other students. In the general education room, the students sat together with their peers and the instructors sat close to them in order to probe for the trials.

Prior to beginning the intervention, the teachers did a screening for the functional and core sight words that the students need to know. The students were quizzed to determine which words they did not know, and the words on which the students received zero correct were used for the intervention, grouped in three sets balancing difficulty of the words. Three baseline
probes were completed with each student. Once intervention began, probe sessions were completed across all three sets of words. The elementary and high school did four probes trials for a total of 24 trials per session. The middle school conducted two trials for a total of 12 trials per session. Correct and incorrect responses were noted. Only the correct responses were counted. During the mass discrete trial phase, the elementary and secondary teachers completed four trials per word, for a total of 8 trials per session. The middle school teacher worked with both students at the same time, and probed each student twice (i.e., two probes per trials per student, for a total of 8 trials per session).

The results indicated that the students differed little in how they acquired the targeted skills using the three independent variables. Thus, they were able to meet criterion on both functional and content words regardless of the format of instruction. This suggests that all students were able to meet criterion on sight words within any of the instructional setting. Some of the limitations to consider in this study are the small number of participants and sight words used for target behaviors.

Middle school. In a similar study, Smith, Spooner, and Wood (2012) used a multiple-probe baseline design to investigate the effectiveness of embedding computer-based science instruction (i.e., slide show) to students with ASD and intellectual disability on their skills acquisition. Participants were three middle school-age students.

The participants were selected using convenience sampling. The students were pre-trained in a one-to one format to use an iPad in the special education classroom. The students were also probed on the science prior knowledge in the special education classroom. Generalization probes were conducted in the inclusive general education room. In the general
education room, the participants sat in groups of four with their peers without disabilities. The intervention occurred in the inclusive science classroom.

The intervention included Keynote software and iPads. The interventionist accompanied the students to the general education classroom. The independent variable was the computer-based slideshow presentation. Students were shown slides about the nine science terms, grouped in units of three. The dependent variable was the number of correct responses. Similar to discrete trial data collection, only the correct responses of the terms and their application were counted. Responses were counted as correct when selected independently by the student within 5 seconds of receiving the discriminative stimulus. Pretraining sessions made sure that all the students were familiar with how to use the software and the iPads to access the necessary information.

During baseline, the students were quizzed 18 times on 9 different terms. Pictures would flash across the screen of the iPad and the discriminative stimulus (SD) would say, “what is this a picture of?” Four different terms would be presented on the screen, with only one being the correct one. The responses were marked as correct if the student selected the correct response within 5 seconds; if the correct answer was selected but only after 5 seconds had elapsed, the answer was marked incorrect. No feedback was given to the students; instead at every third trial, they were praised for participating. Once the first student started showing a steady change in level, the next student was quizzed to make sure that the other students were not affected by the intervention implemented with the first students, and that the data were still the same as in baseline. Afterwards, they started with the intervention.

During the intervention phase, similar to the probes phase, the students were probed. However, this time, they received instruction on three science terms and their application using a computer based slideshow. Twelve slides were shown – that is, every term was shown four
times. Unlike the probe phase, the students received feedback after each trial. If a student selected the correct response, the computer highlighted that response and moved to the next trial. If an incorrect response was selected, the computer highlighted the correct response. Once the correct response was touched, the computer moved to the next trial. When students met the set criterion for mastery, they moved to the next unit. One week after mastery, the students were probed for maintenance. Students were also probed for generalization by working through a science worksheet given typically in the general education classroom.

The results of the study showed that there was a functional relationship between the independent and the dependent variables. That is, the students were all able to make gains during the intervention and to maintain the new skills over time and generalize them into different settings. The study suggests that embedded computer-based assisted instruction (CIA) is an effective way to teach students with ASD. The teachers, student participants, and students without disabilities agreed that CIA was appropriate and effective. Despite these successful results, however, some limitations were present. The first limitation was that the instructional strategy included technology, embedded instruction, explicit instruction, and peers, making it impossible to determine which component caused the change in the behavior. Another limitation was the technology itself: (a) the slideshow presentation took a long time to build, and (b) the hyperlinks were difficult to program like they were in the Keynote. Even though they could be programmed using PowerPoint, it did not transfer well onto the iPad. This meant that anyone who touched the slide could cause it to count and move to the next; and lastly, (c) the PowerPoints were unable to sync the Keynote onto the iPad. When it transferred over to the iPad, it was mixed up. These latter points emphasize the importance of carefully researching software
before incorporating it into a study. Overall, however, the study showed great gains and the embedded instruction was effectively used to teach students with ASD.

In a middle school setting, Jimenez and colleagues (2012) examined the effects of peer-mediated embedded instruction using time delay on the correct science responses and the use of a KWHL (i.e., What I Know) chart by five students with intellectual disability during an inclusive science lesson. The study also examined the effects of the intervention on the social attitudes and the grade point average of the general education peers in the classroom.

Six 11-year-old sixth-graders were selected to be peer tutors based on preset criteria. They were trained for one hour prior to starting the intervention. Five students with intellectual disability from the middle school were selected to participate in the study. All five students met the preset criteria: (a) have an identification of intellectual disability, (b) have a clear response mode, (c) can define 20 or more picture symbols, (d) are able to identify at least 10 sight words, (e) are enrolled in grades 6-8, and (f) have a good attendance record. Also, a middle school general education science teacher, who used inquiry science and was willing to help include five students with ID in her classroom, was selected. Finally, a special education teacher was selected to provide mass trial science vocabulary training for the students as needed.

For the first dependent variable, correct science responses, the student were probed two-three times per week. It was conducted in the general education classroom and measured students’ correct independent responses. The responses included two science words, two science pictures, two science/picture matches, and two concept statements per unit. The students were asked to match the word with the picture. The cards were rotated to establish generalization.

For the second dependent variable, KWHL chart responses, a KWHL chart was used to self-monitor science behavior during a lesson. This variable was measured during baseline and
again during the lesson, by the peers, who tallied and counted the number of correct KWHL steps carried out independently by the students. The third dependent variable was students’ attitude towards the intervention. This was completed in the form of a 5-point Likert scale questionnaire, which the students completed during baseline and postintervention. In addition, the students also participated in a focus group discussion. Anecdotal notes were recorded and reviewed by a second observer. Teacher feasibility was the final dependent variable measured. Both the general education and special education teachers were involved in a survey about their likelihood of continuing in the intervention after the study, their willingness to share the strategies with colleagues, and their opinions on the intervention.

Once the participants were selected, the general education peer training workshop took place. Specifically, the peers learned to (a) embed a minimum of three learning trials per science response and (b) embed trials to self-monitor behaviors during KWHL chart. The training also allowed for guided practice during which the students practiced constant time-delay using materials from the intervention. The peers also used a checklist to monitor the trials embedded and given to the students. Fidelity was measured, and all met the required 100% fidelity except for one student, who served as a substitute peer. The general education teacher and the special education teacher met with the lead researcher for a 20-minute consultation. Baseline probes followed the procedures in the students’ science response section.

Baseline data were collected at least once on the vocabulary words. Baseline was also established to determine the students’ ability to use the KWHL chart in the inclusive science classroom. No feedback was provided during baseline, and the data were graphed and visually inspected about each trial. Both general education peers and the students with ID took a peer attitude survey prior to and post intervention. The intervention included training the students
using time delay on science response training and peer-mediated embedded instruction on the 
use of a KWHL chart. The teacher prompted the students by giving a verbal prompt and pointing 
to the chart. The peers used a 0-second time delay for the first two days, which allowed them to 
model the behavior to the students with disability. After the first two days of no delay, the peers 
allowed the students a 5-second time delay to give them a chance to self-monitor their use of the 
KWHL with only the prompts from the teacher.

The students were placed in groups of four or five, each with a student with ID and a peer 
tutor. The peers embedded the designated number of the science vocabulary and concept 
statements in the inquiry science lesson. The peers used a constant time delay, starting with a 0-
second delay and then going to 5-second delays. They used the same time delay with the KWHL 
chart also. The peers also self-monitored embedding teaching trials by using a checklist, which 
also served as a prompt to embed the instruction promptly. If a student needed additional 
support, the special education teacher followed up and used a mass trial format of instruction to 
help the student master the skills.

The students showed growth in the number of independent correct responses and concept 
statements from baseline to intervention. Also, on the KWHL chart the students had more 
correct, independent responses during intervention than during baseline. The survey showed an 
increase in mean scores from baseline to intervention among peers and students with ID. The 
survey scores served as social validity for the study. Further, in a 25-minute focus group 
following the intervention, the six general education peers indicated that they wanted to continue 
with the instruction strategies with the student with ID and that they had grown both socially and 
academically from the experience. In a survey following the intervention, the teachers indicated
that the intervention was socially important, successful, and easy to implement. All the students’ grades remained steady – some even increased following the intervention.

Although the students showed gain and accessed the curriculum in the general education classroom, the study has several limitations. First was the small number of participants. Second, when answering the comprehension questions, the students could choose between one correct response and two incorrect responses, giving them a 33.3% chance of randomly selecting the correct response. Increasing the percentage to 25% would be a possible solution to the limitation. Third, the embedded instruction was not done alone, but together with the special education teacher’s instruction. Fourth, one student acquired the information at baseline without receiving the intervention. The high percentage of randomly guessing the answer (i.e., 33.3%) may have contributed to this.

To determine the effectiveness of embedded instruction for student with intellectual disabilities in inclusive settings, Jimenez and Kamei (2015) conducted a systematic literature review of articles published between January 1975 and January 2013 targeting teaching academic skills to students with ID. The authors completed a comprehensive electronic search that found studies and reviews about students with ID and the use of instructional strategies such as embedded instruction, systematic instruction, time delay, and distributed trials. Studies were coded and evaluated based on preset criteria: (a) used a single-subject design, (b) was published in a peer-reviewed journal, (c) used embedded instruction to teach grade-level appropriate academic skills, (d) involved at least one student with ID (i.e., IQ of 55 and below), and (e) met the quality indicators identified by Horner et al. (2005).

Based on the criteria, 11 studies were selected for the systemic review. The study also analyzed the instructional method used to embed the instruction, who embedded the instruction,
where the embedded instruction occurred, type of school, academic content, and location of the study. Embedded instruction was identified as evidence-based practice designed to deliver academic instruction for students with ID.

**Distributed trials.** Similar to embedded instruction, distributed trials involved presenting instruction in the form of discrete trial training distributed along the duration of a lesson, book, or day. However, while embedded instruction refers to trials in the general education classroom, distributed trials are conducted in the special education classroom (Jimenez & Kamei, 2015).

The following studies explored the effects of using distributed trials with children with ASD in the special education classroom.

Sigafoos et al. (2006) used a single-subject, alternating-treatments design (i.e., ABABA) across behaviors to compare the effects of embedded instruction and discrete trial training on the self-injurious behaviors, correct responding, and mood levels of a 12-year-old boy with autism. The study was conducted in the student’s school, both inside the classroom and outside.

The participant was nonverbal, had no formal means of communication, and exhibited self-injurious behavior daily, which lasted from a few minutes to a few hours. According to observation data, he occasionally reached out and touched objects, but even so, there was no clear indication that he was interested in the object.

Interval recording data were used to measure the student’s behaviors for both independent variables – discrete trials and embedded instruction. The student had 2-5 sessions per day, one or two days per week. Every session lasted for 5 minutes and was divided into ten 30-second intervals. Percentages were calculated for correct responses, occurrences of self-injurious behaviors, and levels of mood in each phase of the intervention. The mean for each of the dependent variables were calculated and compared to the mean under the other intervention
phase. Interrater data were also recorded for all three dependent variables and compared for agreement. The percentage for agreement on self-injury was always 100%. Percentages of agreement for correct responding and mood ranged from 90-100%, with a mean of 99%.

The first independent variable, the discrete trials, was conducted at the participant’s table while he was seated in the self-contained classroom. It consisted of imitation trial and receptive labeling trials. During the imitation trials the teacher would say, “Brendan, look at me” to get his attention, then, “Do this.” If the student emitted the behavior within 10 seconds, he received a social reinforcer such as a pat on the back. During the receptive labeling phase, the teacher would get the student’s attention, show him two objects, and then ask him to point to a specific object. The teacher would prompt the student until he got the response, using a least-to-most prompt sequence. A new discrete trial was presented every 10 seconds. The discrete trials phase lasted approximately 4 minutes.

The second independent variable, embedded instruction, was conducted at the student’s table during a music activity, on the swing in the corner of the classroom, or outside the classroom in front of the school on a footpath. During the embedded instruction phase, opportunities to respond were integrated into each of the three activities. For example, for the swinging activity, the student was placed on the swing and given a push. Every 30 seconds, the teacher stopped the swing and waited for the student to sign “more.” The teacher would prompt him to sign more using least to most starting with verbal prompts.

The results of the study suggested that the embedded instruction intervention was more effective, with less self-injurious behaviors, more correct responses, and higher mood levels for the student. However, although the data indicate that the embedded instruction was more effective for the student during the correct response phase, one limitation to the study was that
the behaviors targeted in each condition were different, which suggests that the discrete trial phase was more difficult and less preferred for the student than those measured in the embedded instruction phase. Another limitation was that the number of sessions per day varied, which may indicate that the scheduling of the different sessions could have influenced the results. Also, only one participant was used in the study and thirty-two 5-minute sessions only over a short period of time, which suggests a need for replication to explore external validity of the study.

In a related study, Geiger et al. (2012) used an alternating-treatments design to compare the effects of traditional discrete trials and embedded discrete trials to teach receptive skills to two 4-year-old students with autism. Based on the results of the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP), the students demonstrated verbal skills that were lower than those of their typical peers.

The intervention took place in a self-contained setting. The first independent variable, the traditional discrete trials, was conducted with both students at their desks. The students were asked to point to the discriminative stimulus (SD). The second independent variable was conducted at the table for one of the students, and at the desk for the other. The dependent variable, correct responses, was defined as touching the correct response within 3 seconds of the discriminative stimulus (SD). Incorrect responses were determined as touching the wrong picture or not touching the picture within 3 seconds of the SD.

Frequency data were collected, and the percentage of correct responses was calculated. Duration data were collected from the time the intervention started until the reinforcer was done. Following the closing of the trial. Data were also collected on the students’ affect during the interventions. Behavioral data were classified as positive affect (i.e., smiling, clapping, laughing, and making positive statement about the intervention) and negative affect (i.e., yelling, crying,
and making negative statements about the intervention). The students were also asked to touch a picture that describes their preferred method of learning during a trial. Data were collected to determine the preferred treatment for each student. Finally, interrater data were collected and compared for agreement.

During baseline, the students were probed using discrete trial training (DTT) only. The students were presented with the SD, then given a 3 second wait time. The students did not receive any prompts during baseline. The order of the two interventions was randomly assigned; however, when one intervention was selected, the other was immediately assigned next. During the DTT phase, the instructor would give the SD, wait 3 seconds, then prompt the student by restating the SD and prompting the student by pointing. Once students gave the correct response, they were praised and received an edible reinforcer. During the embedded instruction phase (EI), the two students had different settings, for Sawyer, the EI phase was conducted in the exact same setting as the DTT phase. Sawyer was given a Thomas the Tank Engine train to play with for 10 seconds; he was then presented with three different picture cards, each attached to a train track and given the SD (i.e., point to ____). Similar to the DTT phase, a 3-second wait time was provided before prompting by pointing to the correct picture. Sawyer worked to earn all 10 track pieces and the train. For the other student, Ben, this phase was conducted in another area of the room, using a “Jump to It” game. The experimenter would give the SD (e.g., jump to ____ ) and wait 3 seconds for Ben to emit the behavior. If Ben didn’t emit the behavior, the experimenter would point to the desired picture and wait for Ben to jump to it before giving feedback or reinforcement.

The students’ acquisition between both interventions varied and did not indicate that a specific model was a better fit for both. The duration of the sessions for each intervention was
also not indicative that one intervention took less time than the other across students. However, when reviewing the results of the negative affect during the intervention, the students engaged in higher negative affect behaviors during the DTT phase than during EI. The results of the study showed that both participants made gains during the intervention, thus suggesting that embedded instruction is an effective hybrid of DTT and naturalistic teaching, and can be effectively used. The students selected the cards that described embedded instruction as “fun” or “play” and the DTT as “work.” The tangible reinforcers used with Ben were not functionally relevant to the target behavior. With Sawyer, the reinforcers were different in both interventions, which may suggest that one reinforcer was more preferred over the other.

The higher monetary cost of the embedded instruction was considered a limitation. However, the researchers suggested that the cost and speed of the interventions are justified when used with students who have negative affect. That is, the use of EI can help encourage students who may be frustrated and show little social validity when using the traditional DTT. Embedding discrete trials in a lesson may increase the positive affect and decrease the likelihood of the occurrence of negative behaviors and attempts to escape from the lesson, thus allowing for better acquisition of the targeted skills and behaviors.

Parallel to the previous studies, Majdalani et al. (2014) compared the effects and usefulness of mass discrete trials, distributed trials, and interspersals to teach expressive labeling on six children with ASD, ages 4-5 years old. The participants had expressive labeling of at least 100 words, used 3- to 4-word sentences to speak, and could vocally respond to a question. The study took place in a room at a therapy center or in the bedroom of the participating students. The primary dependent variable (DV) was the percentage of correct tacting responses when the cutout picture of a country was presented. The researchers used an alternating-treatments design
embedded in two multiple baselines across participants to examine a functional relationship between the independent and dependent variables.

Mass discrete trials, distributed trials, and task interspersal were three independent variables (IV) that were compared together. Random assignment of IV was used to determine which intervention would be carried out first and the order to follow. The number of interventions per day was consistent among all three IVs (i.e., every student received the same type and number of interventions per week). The three interventions were presented with a 1-minute break between each, during which the student was given a preferred object as a reinforcer for completing the previous intervention trials.

During baseline, the researcher asked the student the question, “What country is this?” If the student did not respond within 5 seconds, they moved on to the next trial without any feedback. During intervention phase, during the teaching trials, the researcher asked the question again and then gave the student social reinforcement based on a fix-ratio schedule. The prompt schedule was delayed as the student learned the skill. If the student did not respond, the researcher would say “No, that not___,” and proceed with the last prompt used. During the mass trial phase, all the trials were presented at the same time, within 1 or 2 seconds of each other, and with no trials from other lessons in between.

During the distributed trials, the trials were delivered in a similar manner as the mass trials, except there was a 10-second delay between each trial. Finally, during the task interspersal, the trials were delivered in the same manner as the mass and distributed trials, except that they were separated by three previously mastered trials, presented 10 seconds apart from each other. To ensure mastery, three follow-up sessions were presented one, two, and three
weeks, respectively, after the intervention. The trials were presented in the same conditions as baseline.

The results of the study indicated that five of the six students reached mastery using the mass trial intervention, and one student reached mastery using distributed trials. During the maintenance probes, the intervention or condition that produced the best results varied among the students. Overall, the results suggested that mass trials were the most successful intervention for teaching tactual skills for students with moderate to severe disabilities.

**Universal Design for Learning (UDL)**

Universal design for learning (UDL) is a framework for improving teaching and learning to allow all students to access instruction and participate in the general curriculum. The three components of ULD are engagement, representations, and expression (Knight et al., 2015). Very few studies have been completed on using UDL to enhance learning for students with moderate to severe disabilities, and the need for more studies is evident. However, based on the few studies that have been conducted, and with theories that support the use of UDL in the classroom, it is important to examine UDL as a tool to explore for working with students with disabilities, and especially moderate to severe disabilities. This strand will explore the role of UDL when delivering instruction to students with ASD and ID.

**Selection criteria.** For this strand of the literature review, a systematic search through the following computerized data were conducted: Education Resources Information Center (ERIC), EBSCO, Academic Search Premier, Academic Search Main Edition, Education Full Text, PsycINFO, PsycARTICLES, MainFile, MasterFile Premier, Primary Search, and Google Scholar. The following descriptors were used: *universal design for learning (UDL), autism,*
intellectual disability, developmental disability, cognitive disability, mental retardation, severe disability, moderate disability.

The literature search included peer-reviewed journals from 1975-2016 (1975 was the year that IDEA was enacted). The studies reviewed included the following topics: UDL in the general education classroom, K-12-age students with an intellectual disability, K-12-age students with autism, and K-12-age students with moderate to severe disabilities. The review excluded empirical studies that did not include academic learning or working directly with students (i.e., professional development training). Studies about students with learning disabilities, emotional and behavioral disabilities, social skills training, and studies that were not peered-reviewed, were also excluded from this review. Fourteen manuscripts were found; however only 5 manuscripts were selected based on the criteria.

**Literature reviews.** Stock, Davies, and Wehmeyer (2004) investigated the effects of using Internet-based multimedia on creating independence for students with intellectual disabilities while completing assessments online by providing audio and visual supports. Students in high school and attending transition programs were recruited to participate in the study. A total of 22 participants, 13 males and 9 females, ages 18-21, participated. All the students had an intellectual disability. The students were required to sign an informed consent form and return it before starting the study. The participants received compensation for their participation in the study.

A quantitative $t$-test within-subject design was used to determine the effects of the independent variable (i.e., online assessment) on the dependent variable (i.e., test scores). During the pilot, a form was developed that included detailed information about the coding of the responses provided by the participants. The observers were trained in how to decode the
responses and how to collect the data. If a student asked a question about how to record a response, the coders noted a prompt. However, if the student asked a question about the type of response to give, the coders simply redirected the student to select the best possible response. Data were analyzed using SPSS to determine if the results of the $t$-test showed statistical significance.

The participants were divided into two groups and trained on how to take tests using two methods (i.e., written and online). Once students mastered giving a response (regardless of correct or incorrect), the intervention was administered. Three students were not able to meet the mastery criteria of the pretest and consequently their data were not included in the results. Two tests were put together; Test A and Test B. Every test consisted of similar types of questions but differed slightly in content. Students were randomly assigned to each group and also to the test they would complete first.

The data from the SPSS yielded a $p>0.001$, suggesting that statistically significant differences in the number of prompts needed to complete the tests. That is, they required fewer prompts to complete the online than the written test. Error rates were very low on both tests, but the total error rate on the written test was higher than the online test. However, no statistical significance was found in the number of errors made in completing either test. The findings of this study suggested that youth with ID can independently complete online assessment tests using self-directed multimedia instruction. However, the small number of participants is a limitation to the generality of the findings.

Comparably, Coyne and colleagues (2012) investigated the effects of UDL technology-based reading approach (LBD) vs. traditional reading instruction on the reading comprehension, fluency, phonemic awareness, phonics, and vocabulary developments of students with
intellectual disabilities. In the study, the researchers recruited nine teachers who agreed to be participants in the study. The researchers met with the teachers and administrators, and observed the students in their classrooms before they identified 23 students who were eligible to participate in the study based on the inclusionary criteria determined by the researchers. Specifically, the inclusion criteria required students to have significantly below-average intellectual functioning and discrepancies in two or more adaptive skills areas. The students were also required to be receiving reading instruction in one of the classrooms of the participating teachers.

Data were collected on 16 students who communicated verbally in English. In every classroom, there were 2-3 participating students except for one classroom where there was only one student. The students were diagnosed with a variety of intellectual disabilities conditions (i.e., multiple disabilities, autism, fragile X syndrome, Down Syndrome, Prader-Willi Syndrome, and developmental disability). Physical and communication challenges were also present among the participants. Each of the students was randomly assigned to one of the groups (control or experimental). The experimental group received the LBD instruction in reading, while the control group received the traditional reading approach.

An ANCOVA was used to analyze the data. Pre- and posttest data were collected at the end of the year (October) and again at the end of the year (May), respectively, on 11 quantitative measures in reading and language. The teachers received a full-day workshop on evidence-based literacy practices. The LBD received an additional day of training on how to teach the software to the students. The teachers got to try out the software and also plan on how to use it in their classrooms with their students. All the students in both LBD and the control classrooms participated in a 90-minute literacy block from October through May. The LBD students
received 20-30 minutes of context-based reading instruction per day. Weekly observation was conducted in the LBD classrooms. Technical and instructional support was provided to the teachers as needed.

During the first couple of months of the intervention, the teachers modeled to the students how to use the reading software. After two to three months, the students were observed navigating their way through the reading software independently. Observation data collected on the students in the LBD classrooms suggested that the students were eager to read using the program and play the games on the computer. Observers observed these students for 45 minutes per week. The control classroom continued with their traditional approach to teaching reading. The control teachers were also observed once a month for 45 minutes to confirm that they were teaching the components of reading instruction. The researcher who observed the classroom used a checklist to determine which skills were being taught at the time of observation.

The results of the ANCOVA showed statistical significance between the posttest scores of both groups during the passage comprehension. That is, the LBD group made higher statistically significant gains than the control group. The analysis also yielded high practical significance on many of the subtests such as word attack skills, listening comprehension, and concepts about print. These results add to the research on LBD and suggest the use of LBD when teaching literacy and reading to students with intellectual disabilities is successful and effective.

Although the results of the LBD were promising, some limitation are worth noting: (a) the small number of participants, (b) the reliance of the researchers on the school assessment of the students’ sub-average performance and the existence of differences in the pretest scores of both groups, (c) the irregular reporting from the teachers regarding the software use, and (d) the fact that the pre-post standardized reading achievement required verbal skills. Despite these
limitations, however, the results suggested that software and technology can offer additional support to students with ID when working on reading.

In another study, Browder, Mims et al. (2008) examined methods for planning and carrying out shared stories using the principles of UDL (i.e., representation, expression, and engagement) for students with multiple disabilities. The students received academic instruction in a self-contained special education classroom; however, they were included with their typical peers in music class, specials, and at lunchtime.

The self-contained classroom included nine students with multiple disabilities. The students worked together with the teacher and two paraprofessionals on personal care, routines, therapies, and medical needs. The teacher also focused on teaching the students literacy. To be included in the study, the students had to meet the following criteria: (a) demonstrate few to no responses during literacy lessons, (b) have inconsistent use of augmentative and alternative communication (AAC), and (c) find it difficult to interpret intentionality of nonsymbolic communication such as movements and sounds. Three students, one female (7 years) and two males (7 and 10 years), were selected and were identified as having a profound intellectual disability (i.e., IQ of < 20). All the students had a physical disability and used a wheelchair. Two had a single switch and one student had a head switch. All three students received physical, occupational, and speech therapy.

Three popular children’s books were adapted to include the student’s first name as the main character in the story. A task analysis was created to work with the students to encourage responding and promote comprehension. The task analysis also helped to measure the dependent variable, which was students’ independent correct responses during the 16 steps of the task analysis. Responses were recoded using frequency recording and graphed. Incorrect responses
were recorded separately. Because the level of engagement was very low, an incorrect response, even though it was not graphed, was still considered a response that measured improvement in engagement. The responses were noted as (+) for correct, (R) for reaction, (NR) for no response, and (-) for incorrect. A multiple baseline across participants was used to determine the existence of a functional relationship between the dependent and independent variables.

During baseline, the interventionist presented each of the students with two of the three books and asked them to select the book they wanted to start with. (The interventionist selected a book if no response was made.) This was the first step of the task analysis. The interventionist continued to read the story with animation, following the steps of the task analysis, but with no prompting. The responses of the students were recorded. During the intervention phase, the interventionist followed the same task analysis but used the three components of UDL (i.e., representation, expression, and engagement) to improve the use of the task analysis. For example, for representation, the interventionist thought about better ways to present the specific step to the students. For expression, the interventionists considered how to make it easier for the student to respond. And last, for engagement, the interventionist discussed how to fade the prompts and encourage the student to respond without teacher assistance and be more engaged. The interventionist discussed how and what needed to be individualized so each student would achieve better on the task analysis. The interventionist used least to most prompts to increase student response.

All students increased in their independent responses, thus suggesting a functional relationship between the dependent and independent variables. When visually inspecting the data, all students had a change in level from the baseline to the intervention phase. Once the intervention was applied, the level of engagement and the number of correct responses increased.
Although the results of the study are encouraging, some limitations to the study are worth noting. First, the instruction was delivered in a one-on-one setting. This is not an ideal setting for a general education classroom. It is worthwhile to investigate if this format can be successful in a small group. Second, the AAC devices that were needed were not available during the time of the study. This may have been a variable that affected the results of the study. Third, the study was conducted in a self-contained classroom. Fourth, a member of the research team carried out the intervention. In the future, when possible, having the teacher carry out the study may prevent the occurrence of confounding variables. Fifth, the study did not include all the members of the IEP team. Finally, maintenance was not conducted due to time constraints. However, despite the limitations, this study added to the literature of shared reading and UDL for students with profound disabilities.

In a similar study, Knight et al. (2015) investigated the practicality of using Book Builder (BB) in science with adapting e-books for middle school students with ASD. The participants, four students had to meet the following inclusion criteria to be part of the study: (a) have a diagnosis of ASD, (b) be eligible for alternative assessment, (c) have sufficient vision and hearing to use a computer, (d) demonstrate basic skills to use a computer, (e) be able to give vocal verbal responses, and (f) have low comprehension scores. A special education teacher also participated in the study. All students attended a middle school and were receiving instruction in a special education resource room. The students spent most of their day in the resource setting, but rotated to different resource rooms for core classes. The intervention was conducted by a graduate student, who was working under a grant. The second and third observers, who collected data on the independent and dependent variables, were doctoral students, who worked on the same project.
The experimental design was a multiple-probe design across participants embedded within and ABCD design. The dependent variable was the number of correct responses. The e-books included questions that measured three vocabulary, three comprehension, and one application questions. The questions were marked as correct when the student selected the correct response from among four options. The correct responses were marked with a “1” and the incorrect were marked with a “0” and graphed accordingly.

Prior to the baseline condition, the students were trained to use the supports in Book Builder, such as text-to-speech and illustrations. When they reached 90%-100% proficiency during the training, the students entered the baseline condition. Training sessions lasted for 15 minutes. During baseline, the students were only given text-to-speech and illustrations. Each session lasted about 10 minutes. The number of correct responses was recorded. Before the intervention began, the students were trained on how to use the embedded coaches and work definition finder using BB. The students were trained individually. The researcher was available to demonstrate and answer questions when needed. Once the students reached a proficiency of 90-100%, the students entered the intervention condition.

The students were prompted to use the supports of BB if they did not respond within 10 seconds of the discriminative stimulus. There were three phases of intervention. During each phase, a component was added to make the independent variable (IV) different. During the first phase the students were exposed to the BB and its text-to-speech capabilities. During the second phase, the students were still exposed to the BB e-texts, but it was done differently than the previous phase. That is, the coaches were modified to give explicit prompting and the pictures were altered to offer an example and a non-example of the responses. The sessions during Phase Two lasted approximately 15-20 minutes. During the third phase of the intervention, the two
previous conditions of the IV were kept; however, one more component was added – the coaches explained why one was used as an example and why one was not example.

The data revealed that all four students made gained in level from the baseline condition to intervention. Also, three of the four students made gains from baseline to intervention when components were added to the independent variable. Social validity was measured by asking the special education teacher, the general education teacher, and the four participating students about the study. This survey measured the second dependent variable; namely, the feasibility of the BB and e-texts for teaching students with ASD when working on science instruction. Results indicated that the teachers found the study beneficial and practical. The students also enjoyed participating in the study.

Despite its contribution to the research on science instruction for students with ASD, the study is subject to the following limitations: (a) some of the students started making progress in Phase One; however, because error correction and reinforcement were not given during that phase, it may have affected the results; and (b) the study took place in a resource room; more inclusive research is recommended in the future.

Rivera, Spooner, Wood, and Hicks (2013) explored the use of multimedia instruction on shared stories for students with intellectual disabilities. Although this study is not directly an UDL-based study, it was added to the literature review because there were so few studies to begin with and because it fits the categories that are being researched. The authors merged shared story readings with multimedia instruction to compare the effects of this intervention on the vocabulary acquisition of English language learners (ELLs) with an intellectual disability on English and Spanish vocabulary words. The students received the shared story intervention in both English and Spanish.
The researchers recruited two Mexican-American students, who met the inclusionary criteria required for the study. The criteria requested that the students (a) be of Hispanic origin; (b) be in an elementary school setting (i.e., K-5); (c) have an intellectual disability with an IQ of 55 or below; (d) be classified as ELL; (e) receive special education services; (f) have limited vocabulary; and (g) have verbal language that can be understood by others when they verbally communicate. The two students selected, one female and one male, were both 9 years old, had IQs below 55, spoke Spanish in the home but were bilingual and able to speak both English and Spanish.

The intervention took place in the students’ special education classroom. The students were in the same self-contained classroom. The classroom included a teacher, a paraprofessional, and five students. The interventionist had a small space in the classroom to conduct the intervention with both students. The intervention lasted 7-11 minutes every day over a period of two weeks. A single-subject, alternating-treatments design with baseline was used to examine the effect of the two instructional strategies (i.e., English and Spanish shared stories) on the English vocabulary words acquired. The study aimed to examine which intervention yielded faster acquisition rates, as well more words acquired for each student. The study also measured the number of words successfully generalized as measured using a pre- and posttest.

Before the intervention began, a pretest was carried out. Using PowerPoint to show slides of 100 words, the interventionist asked “What is this?” in both English and Spanish. The interventionist discarded any words that the students recognized or knew. Thirty words were selected, 15 for each language. Every multimedia book used five words, for a total of three books per Language, and a total of six books overall. During baseline condition, the interventionist used the same PowerPoint slides and probed all 30 words with the students. The interventionist
gave 4-second response time before marking the word incorrect. Frequency count was used to mark the correct and incorrect responses in all conditions.

After baseline, the interventionist went through all the words for the slides and asked the students to repeat the words. Following preteaching, the students began the intervention phase. Here the interventionist read the title and then asked the students to predict what the story was going to be about. The interventionist then proceeded to read the story in which the vocabulary words had been embedded. When the target vocabulary word appeared in the slide, a chime went off to indicate that the word is a target vocabulary word. The interventionist used a controlling prompt and a 0-second delay to teach the word. The interventionist continued reading and used the same method to identify the target vocabulary within the shared story. After the first reading was completed, the following readings were done using the same procedures, except for the use of a 4-second delay when giving the prompt for the vocabulary word. If the student did not know the word, the interventionist reverted to the controlling prompt and the 0-second delay used in the first reading until student could emit the correct response within 4 seconds. In the last round, the target words were taken away and the words were embedded in the story and blended in with the others. When the interventionist got to one of the words, the students were asked “What is this?” If they failed to respond within 4 seconds, the students were prompted to look at the pictures and try to figure out the word. If still no response or an incorrect response was emitted, the controlling prompt was given and the 0-second delay was used again. For generalization, a posttest, with similar conditions to the pretest, was administered.

The results of the study suggested that the students made progress in their vocabulary word acquisition from baseline to intervention. However, although both students made progress in both strategies, one student favored the English instruction, while the other preferred the
Spanish instruction. The students were both able to generalize the vocabulary words and there was growth in the scores obtained for the pretest to the posttest condition. Also, the students can maintain the words they had learned. The teacher and paraprofessional expressed satisfaction with the procedures and the outcome of the study, agreeing that the skills learned during the study were important and the procedures were easy to implement.

Although the results were successful, there are some limitations to the study: (a) the study was done with only two students. This small number makes it unable to generalize the findings to other Hispanic ELL students with intellectual disabilities, (b) lack of generalization training, (c) no mastery criterion set or predetermined, (d) the possibility that the researcher may have had an effect on the data because he was of Hispanic origin, and (e) the intervention was not carried out by the classroom teacher. However, in spite of these limitations, the study added to the research on teaching children using multimedia, shared stories, and embedded instruction.
CHAPTER 3

Method

The purpose of this dissertation was to examine the effects of distributing trials instruction in a shared story reading lesson on the acquisition of pivotal skills and listening comprehension of students with significant cognitive disability (SCD) in the special education classroom. More specifically, the study aimed to answer the following research questions:

1. Does distributing trials in a shared story reading and systematic prompting improve the pivotal skill acquisition of students with SCD?
2. Does distributing trials in a shared story reading and systematic prompting improve the listening comprehension of students with SCD?
3. Does distributing trials in a shared story reading and systematic prompting lead to a change in the frequency of appropriate and inappropriate behaviors for students with SCD?
4. What effect does distributing trials have on pivotal skill acquisition and listening comprehension, when generalized to a novel story for students with SCD?
5. What is the social validity of distributing trials in a shared story reading for teachers and students with SCD?

Participants

Students. Six elementary level (K-2) students with SCD participated in the study. The classroom teacher, through convenience sampling, recruited the students. The criteria for inclusion in the study was the student: (a) has a significant cognitive disability; (b) has a good attendance record (i.e., attend school 5 days per week); (c) was able to sit quietly in close proximity to instructor, listen to the story, and answer questions when asked; (d) was able to stay
on task for 10 minutes at a time; (e) was able to wait for the prompt before giving a response; (f) was able to follow one-step directions; and (g) demonstrated motor and verbal imitation skills.

The following were the criteria for exclusion from the study the student: (a) had a mild cognitive disability, (b) was absent at least one day per week, and (c) was a beginning English language learner (ELL). The following is a short description of each of the participants. Pseudonyms were used for all the six participants.

**Eli.** Eli is a first grader who has an autism spectrum disorder (ASD) diagnosis. Eli spends all his time in the special education classroom. Eli has expressive language, but it is emerging. Based on research notes observed during the intervention, Eli has difficulty transitioning to new activities.

**Zander.** Zander, is also a first grader, who has an ASD diagnosis. He is sometimes pulled into the general education room for a short time. Zander has good expressive language, but is an emerging reader. He could identify letters and knew the sounds.

**Ellen.** Ellen is a kindergartener who had a Traumatic Brain Injury (TBI) diagnosis when she was 11 months. When she turned 3 years old, this diagnosis was changed to ASD. However, during this study, when Ellen was 6 years old, it was changed back to TBI. Ellen had good expressive verbal skills. Ellen was highly distractible. She often would say that she was sad, however, the teacher believed it was an attention seeking behavior. Ellen was an emerging reader. She could identify letters and knew the sounds.

**Bob.** Bob was another student in kindergarten who was diagnosed with ASD. He had good expressive verbal language. Bob seemed to enjoy social attention from teachers and from other guests in the classroom. Bob was an emerging reader. He could identify letters and knew the sounds.
*Fran and Daniel.* Fran and Daniel were 2nd graders. Fran had a significant cognitive disability. She was in the special education classroom all day. However, Daniel was spending some of his time in the general education classroom. Daniel had very good expressive and reading skills. Fran had good reading skills, however, both students had difficulty with comprehension.

Following student selection, parents were contacted with a letter explaining the study and the procedures. Parents were encouraged to ask questions with regards to the study and were informed that the researcher will meet with them at the school any time they would like to go over procedures, questions, or concerns. Once the parents decided that they would like to give consent for their child to participate in the study, they signed the consent forms. (See appendices A & B for Parent Permission Form, and Student Ascent form)

**Researchers.** The principal researcher was a doctoral candidate. She had taught for three years in a special education setting. She worked directly with the students during this study during the baseline, intervention, generalization, and maintenance phases. Also, two interrater observers, both doctoral students, who had taught for a minimum of three years in a special education setting, and worked with students who have SCD, collected procedural fidelity and reliability data during the baseline, intervention, generalization, and maintenance phases. Together, both interraters observed the researcher a minimum of 37.9% of the time and recorded procedural fidelity and reliability data. Following interrater data collection, data were compared to the researcher’s data, to determine if the researcher followed all the steps in the procedures as necessary.

**Setting**
The study took place in an elementary school in the urban southwest, inside of the special education classroom. The study occurred at the same time every day of the week. This helped minimize external variables affecting the results of the study (i.e., students tired after lunch, end of the day, or morning transition). The researcher worked with each student independently in a quiet area in the classroom, for 8-10 minutes each day. During the time of the intervention the students were either working in small groups with the classroom teacher, finishing up classwork, or engaging in a preferred activity. The researcher worked with each student separately in the computer area, located in one corner of the room. The computer area was isolated a bit from the rest of the classroom and separated by bookshelves. When the interraters came to observe the intervention, they sat a couple feet away and took procedural fidelity data and reliability data.

Materials and Equipment

Adapted shared story books. An age-appropriate children’s literacy book, If you give mouse a cookie, by Laura Numeroff, was adapted and modified to meet the needs of each participating student. The researcher adapted the storybook by modifying the script, adding pictures that are relevant to the vocabulary in the text, and added an audio recording of the text. Once the book was adapted, a literacy specialist reviewed it to ensure that it was properly adapted. Once the book was adapted and ready, a pivotal skill, (i.e., what is the ending sound), and one comprehension question were distributed after each page. “Wh” questions were used. The book was completed before the baseline phase begins. A copy of the book was purchased for each of the participants.

Data sheets. The researcher used data sheets to record the number of correct responses in each of the intervention conditions. The dependent variables were charted on a frequency chart. A chart was used for each of the behaviors measured (i.e., one for the pivotal skills, and one for
the comprehension questions). Anecdotal data were also taken on the behaviors observed during the intervention.

**Tangible reinforcers.** A reinforcement assessment was conducted with the students prior to starting baseline procedures. The student was given a group of tangible reinforcers (e.g., age appropriate toy such as a toy car, noise maker, or stress ball) and the researcher observed the students while they used the different reinforcers and recorded the duration and frequency of time they pick up and use a given reinforcer. Once the reinforcement assessment was complete, the researcher recorded five or six items that were established to be reinforcing to the students. The researcher used these items interchangeably during the intervention to avoid satiation. These reinforcers were used during the intervention stage after the student successfully sat during the shared readings and answered all the questions. The reinforcers are not contingent on correct responding of the questions, but only on completing the task of attentively listening to the story and answering the 10 questions.

**Experimental Design**

An experimental single-subject multiple-probe design across participants was used. The study included a baseline, intervention, and generalization phase. Intermittent baseline probes were given during the intervention to the students who had not yet begun the intervention. Probes were also used during generalization. The conditions and procedures were the same as the baseline probes sessions.

**Response Definitions and Recording Procedures**

The dependent variables in this study included the: (a) number of unprompted correct responses occurring during the pivotal skill acquisition, (b) number of independent correct
responses occurring of the comprehension questions, and (c) frequency of the interfering behaviors occurring within a session.

The researcher also kept a daily research log to document specific situations that occurred during the intervention phase, but only if they pertained to the study. For example, if the student was absent, if the classroom environment changed for some reason, if a substitute teacher was present. Such data helped explain some of the possible confounding variables that may have influenced the results of the study.

**Pivotal skill acquisition (Q1).** Frequency data were collected every time the student emitted a correct response that was not prompted and within 4 seconds of the discriminative stimulus (SD). For example, if the student was provided a discriminative stimulus such “what is the ending sound?” and the student answered correctly within 4 seconds, the answer was recorded as one correct response. The dependent variables were operationally defined and pinpointed what the behavior does and does not look like (i.e., the student said the sound “T” and not the letter name for T, when asked to say the ending sound). Prompts were provided to the student during intervention using a least-to-most prompting hierarchy, if the student did not emit the correct response within 4 seconds from receiving the discriminative stimulus. For this study, the pivotal skill that the students worked on was the ending sounds of consonant-vowel-consonant (CVC) words. The common core standards for English Language Arts instruction (ELA) state the ending sound of a CVC word as a foundational skill (Common Core Standards Initiative, 2010). When considering the definition of pivotal skill as being a skill that is used to build other skills upon (Koegel, Koegel, & McNerney, 2001), then it may be strongly suggested that the ending sound of a CVC word is a foundational skill and also a pivotal skill in literacy instruction.
**Listening comprehension (Q2).** Frequency data were collected every time the student emitted a correct response that was not prompted and within 4 seconds of the discriminative stimulus (SD). For example, if the child was provided a question such as, “Who did the boy give the cookie to?”, the student pointed to the picture of the “mouse.” The dependent variables were operationally defined (i.e., say or point to “mouse” within 4 seconds of the SD, no prompts are provided), and pinpoint what the behavior does not look like (i.e., pointing to another picture, or to no picture within 4 seconds of giving the SD. If an incorrect or no response was made during intervention, the students were prompted using a least-to-most prompting hierarchy, by going back to the text and rereading it).

**Appropriate/inappropriate behaviors (Q3).** The researcher operationally defined appropriate and inappropriate behaviors. The researcher took notes and kept a research journal of the appropriate and inappropriate behaviors that occurred during the intervention. The researcher recorded the occurrence of various behaviors during the intervention, baseline, and while the student was not working with the researcher. The researcher used these observational notes to suggest the change behaviors and levels of engagement of the students during the intervention.

**Generalization measures (Q4).** During the generalization phase, frequency data were collected every time the student emitted a correct response that was not prompted and within 4 seconds of the discriminative stimulus (SD). If no response was emitted within 4 seconds or an incorrect response was given, no prompts was provided, and the researcher moved on to the next question. Prompts were not provided to the student during the generalization phase.

**Procedure**

**General Procedure**
The students participated in the study five days a week from 10:00-11:00, in the special education classroom. The student answered 10 pivotal skills questions and 10 comprehension questions. After the students read one page in the book, the students answered one distributed pivotal skills and one comprehension question. Once data were recorded for the trials, then the next page was read, and the next questions was asked, as so forth. Every reading session took an average of 8-10 minutes per student.

**Pre-Baseline Phase**

**Determining target behaviors.** The classroom teacher determined the students’ target behaviors based on pivotal skills that the student needed to acquire. The students were all going to be learning to say the ending sound of CVC words next, therefore, this skill was selected for all the participants as their pivotal skill. The researcher prepared the adapted books, and distributed the pivotal and comprehension probes within the book.

**Training the interrater observers.** Prior to beginning the data collection phase, the researcher trained the interraters on the procedures of baseline and intervention. The researcher also trained the interraters on the response definitions and data recording procedures of the dependent variables. The researcher worked with the observers on how to rate the students’ responses, including what is considered correct, incorrect, and prompted responses. The interraters were given a list of the procedures and a frequency data collection sheet. The researcher practiced with interraters through role play, to make sure that the data collection procedures were clear. Once the observers were trained and 100% consistent with the data measurement procedures, the baseline phase began.

**Baseline**
The participants completed five probes during baseline. There was no random assignment to baseline, because all the students participated in the baseline probes at the same time. Prior to beginning each baseline probe, the students were given two preferred items and asked to select one desired item to work for with the researcher. Following the tangible reinforcer selection, the researcher started the story reading to the student, and ask the questions distributed within the text. If the student answered correctly, the researcher recorded it as “C” (i.e., correct). But provided no feedback. If the student did not respond or responded incorrectly, the researcher recorded as “I” (i.e., incorrect), or “N” (i.e., No Response), and provided no reinforcement or correction. The students received reinforcement in the form of verbal praise for participating during baseline and received the desired item for a couple of minutes following the session.

It was important that the student be given the same number of opportunities to respond during baseline and during the intervention phase. Baseline data were collected during the exact time as data during the intervention stage. All the student had five baseline points collected, and the student with the most stable baseline data was selected to begin the intervention. Once the first student completed five days in intervention, or reached mastery (i.e., 100% on three consecutive days), the next student with the most stable baseline data were chosen to begin the intervention. While Student A was in intervention, the other students continued to participate in baseline probes every third session, to ensure that they have not been influenced by the intervention taking place with Student A.

**Intervention**

Prior to starting the intervention, the researcher created the adapted shared storybook using PowerPoint. The researcher chose PowerPoint because it could be easily shared with the teacher, and could be accessed on most computers. Also, creating the book in PowerPoint was
not difficult and did not require much technological skills. The researcher distributed the skills that the students were working on (see appendices F & G for list of comprehension questions and CVC words). Once the discriminative was given, the student was given 4-seconds to respond. If the student emitted the correct response or did not respond within 4 seconds, the researcher delivered a prompt. The prompts were delivered using a least-to-most system. If the student did not emit the correct response within 4 seconds, the researcher administered a first-level prompt, which consisted of rereading the sentence and asking the student the question again. If the student still did not respond after 4 seconds or emits an incorrect answer, a second-level prompt was administered. This time, the researcher reread more specifically the sentence and modeled the response, by briefly pointing to it, and then ask the student to point to the correct response. If the student still did not emit the correct response after 4 seconds, the researcher administered a third-level prompt, which was a physical prompt, by guiding the student’s hand to the answer. The trial always ended with the student saying the correct response, because research suggests that when students end a trial with the correct response, the students will acquire the skill better (Barbetta, Heron, & Heward, 1993). The student had the opportunity to respond to each skill 10 times during an instructional setting, but the trials were distributed throughout the reading, with one pivotal skill trial and one comprehension question on each page. The student received social reinforcement after every correct response and a tangible reinforcement of choice after the completion of the reading session. All behaviors were recorded. The researcher used event recording to chart the frequency of occurrence of each of the dependent variables. The interrater observer collected data along with the researcher. Both data sets were measured and compared for inter-reliability. Both the researcher and the interrater followed the task analysis provided in Table 1 to ensure procedural fidelity.
Table 1

*Task Analysis of Procedure*

<table>
<thead>
<tr>
<th>Researcher Prompt</th>
<th>Student Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Let the student know that the reading lesson is about to start by giving the prompt to transition the student to the reading area. “Hello friend, it’s time to read our book; let’s go sit in the computer area.”</td>
<td>Student transitions to reading area.</td>
</tr>
<tr>
<td>2. The researcher started the PowerPoint presentation by stating the slide show and clicking on the sound Icon to begin the reading.</td>
<td>Student listened to the story.</td>
</tr>
<tr>
<td>3. At the end of each reading page, the researcher turned to the comprehension question distributed on the next slide and clicked on the sound icon. (e.g., Who did the boy give the cookie to?”)</td>
<td>Student pointed to a response.</td>
</tr>
<tr>
<td>4. When the student gave a correct response, the researcher provided verbal praise and let the student know that the response is correct. “That is correct, good job”. However, when the response was delayed (i.e., after 4 seconds), no response was given, or an incorrect response was emitted, the researcher used the prompting hierarchy to deliver least-to-most prompts to the student.</td>
<td>Student ended the trial on a correct response.</td>
</tr>
<tr>
<td>5. The researcher then turned to the next slide with the distributed question. The researcher then asked the pivotal skills question “What is the ending sound?”</td>
<td>Student said the sound</td>
</tr>
<tr>
<td>6. When the student gave a correct response, the researcher provided verbal praise and let the student know that the response is correct. “That is correct, good job”. However, when the response was delayed (i.e., after 4 seconds), no response was given, or an incorrect response was emitted, the researcher used the prompting hierarchy to deliver least-to-most prompts to the student.</td>
<td>Student ended the trial on a correct response.</td>
</tr>
<tr>
<td>7. The researcher recorded the response on the data sheet C (correct), I (incorrect), N (No response) or P(Prompt), and describe the type of prompt given.</td>
<td></td>
</tr>
<tr>
<td>8. When the student completed the book reading and the questions, the researcher praised the student and gave the student the tangible reinforcement determined in the pre-intervention stage. “Great job! Here is the _____. You earned to play with it for 2 minutes.”</td>
<td>Student played with reinforcement for a few minutes.</td>
</tr>
<tr>
<td>9. The researcher asked the student to put away the “toy” and return to the carpet area to join the rest of the students. “Now, it is time to put the ____ back and go back and join the group.”</td>
<td>Student put away the toy and returned to carpet or designated classroom area.</td>
</tr>
</tbody>
</table>
Generalization Assessment Procedures

Generalization occurs when the target behavior is emitted in the presence of new stimulus conditions, different from the stimulus condition under which the student was trained (Cooper et al, 2007). When the student can generalize a behavior, the behavior is emitted more frequently and can, therefore, be maintained better. Generality is one of the seven principles of ABA (Baer, Wolf, & Risley, 1968). It is important to assess for the occurrence of both stimulus generalization and response generalization. Stokes and Baer (1977) recommended to provide stimuli that can be found in the students’ natural environment when training for generalization. The teacher test for generalization once the student has mastered the skill taught during the acquisition phase. To test for generalization, the researcher created a new adapted story book that was very similar in style and difficulty level to the book used in intervention. The book was chosen with the help of a literacy specialist. The researcher adapted the book “If you give a Dog a Donut”.

In this study, generalization was tested in the special education classroom, using a new book to examine the effect of intervention on other shared story readings. The generalization phase conditions and procedures were the same as the baseline phase conditions (i.e., no feedback was given for incorrect responses). Reinforcement was only given for participating in the reading activity.
CHAPTER 4

Results

The purpose of this study was to examine the effects of distributing trials instruction in a shared story reading lesson, using multimedia and UDL principles, on the acquisition of academic skills and listening comprehension of students with SCD in a special education classroom. More specifically, the study aimed to answer the following research questions:

- Does distributing trials in a shared story reading and systematic prompting improve pivotal skills acquisition of students with SCD?
- Does distributing trials in a shared story reading and systematic prompting improve the listening comprehension of students with SCD?
- Does distributing trials in a shared story reading and systematic prompting lead to a change in the frequency of appropriate and inappropriate behaviors for students with SCD?
- What effect does a distributed trial strategy have on pivotal skills acquisition and listening comprehension when generalized to a novel story for students with SCD?
- What is the social validity distributing trials in a shared story reading for teachers and students with SCD?

The following chapter is a detailed report and description of the results and findings of this study. The first section reports the data collected for each of the research questions. The first two questions investigated the effects of the distributed instruction and systematic prompting on the dependent variables, (i.e., acquisition of pivotal skills and listening comprehension). A functional relationship was found across questions one and two. (See Table 2 & 3; Figure 1 &2).

The third research question reported the anecdotal data taken while the students were
working with the researcher. The data collected were to determine the levels of engagement in
the intervention through monitoring the occurrence of the appropriate and inappropriate
behaviors pinpointed in the previous chapter. The fourth and fifth questions reported the
generalization and social validity data collected for the study.

Data Analysis

The students were randomly assigned to begin baseline, and then based on the trend and
stability of the baseline data, were accordingly assigned to participate in the multiple baseline
design. Each student started with having one page read to them, then were asked the
comprehension and distributed questions assigned to that page. The first two research questions
were answered immediately following the reading of each page in the shared story. The
researcher collected data using frequency recording the number of correct responses for each
dependent variable. Once the data were recorded, they were then charted on a graph to show
results. In the first question, (i.e., the distributed pivotal skill), the students had a baseline
average of 3.7, which went up to an overall average of 90.2% once the intervention was
administered. In the second question, (the listening comprehension questions), the students
started out with an overall baseline average of 41.6%. Once the intervention was administered,
the overall student score went up to 84.6%. Descriptive and visual analysis were used to examine
the data. Descriptive statistics included the mean ($M$) and percentage. Baseline logic between the
independent and the dependent variables were assessed. In addition, the visual representation of
each independent variable was determined based on vertical representation. Finally, a functional
analysis suggested the dependent variable, have directly influenced by the independent variables.

Question 1: Does distributing trials in a shared story reading and systematic prompting
improve pivotal skills acquisition of students with SCD?
The first research question examined the effects of distributing trials in a shared story reading and systematic prompting on pivotal skill acquisition of students with SCD. In baseline, the overall average among all six students was 3.7%. Once the intervention was administered the students’ overall average increased to 90.2%, suggesting a functional relationship. The students had an overall average of 98.9% for non-overlapping data, meaning that 98.9% of the points during the intervention phase, were higher than the highest point during baseline (see Table 2 for Means and PND). Below, the results of the effect of the distributed instruction on the pivotal skill acquisition, for each of the six students, are reported. (See Figure 1 for a visual representation).

**Eli**

In baseline, Eli had a mean of 8% correct responses. When the intervention was implemented, Eli’s percentage of correct responses increased gradually, to a mean of 83.3 for the intervention sessions on the distributed skill questions. His percentage of non-overlapping data (PND) was 100%. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.

**Zander**

Zander had a mean of 0% correct on the distributed instruction during baseline, and increased to a mean of 92.9% during intervention and reached mastery within seven sessions. His PND was 100%. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.

**Ellen**

Ellen had a mean of 18.7% correct on the distributed skill during baseline, and increased to a mean of 80.7% during intervention. Her PND was 84.3% Ellen did not reach mastery
however her data were on an upward trend during intervention, and was stabilizing at above 70%. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to an upward trend once intervention was introduced.

**Bob**

Bob had a mean of 0% correct on the distributed instruction during baseline, and increased to a mean of 88.3% during intervention and reached mastery within 5 sessions. His PND was 100%. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.

**Fran**

Fran had a mean of 0% correct on the distributed instruction during baseline, and increased to a mean of 97.5% during intervention and reached mastery within 4 sessions. Her percentage of non-overlapping data (PND) was 100%. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.

**Don**

Don had a mean of 0% correct on the distributed instruction during baseline, and increased to a mean of 95% during intervention and reached mastery within 4 sessions. His percentage of non-overlapping data (PND) was 100%. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.

The table below represents the average of each of the students during the baseline and intervention stages.
Table 2

* Distributed Pivotal Skill Data *

<table>
<thead>
<tr>
<th>Student name</th>
<th>Baseline Average</th>
<th>Intervention Average</th>
<th>Percentage of Non-overlapping data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eli</td>
<td>8%</td>
<td>83.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Zander</td>
<td>0%</td>
<td>92.9%</td>
<td>100%</td>
</tr>
<tr>
<td>Ellen</td>
<td>14%</td>
<td>84.3%</td>
<td>92.9%</td>
</tr>
<tr>
<td>Bob</td>
<td>0%</td>
<td>88.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Fran</td>
<td>0%</td>
<td>97.5%</td>
<td>100%</td>
</tr>
<tr>
<td>Don</td>
<td>0%</td>
<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Overall</td>
<td>3.7%</td>
<td>90.2%</td>
<td>98.9%</td>
</tr>
</tbody>
</table>

The data are also represented in a graph, Figure 1. On the graph below, the circles represent the baseline data; the squares on the graph represent the intervention data; the triangles represent the generalization data, and the diamond shape represents the maintenance data.
Figure 1. Distributed Pivotal Skill Data (Circle=baseline; Square=Intervention; Triangle=
Generalization; Diamond= Maintenance)
Question 2. Does Distributing Trials in a Shared Story Reading and Systematic Prompting Improve the Listening Comprehension of Students with SCD?

The second research question examined the effects of Distributing Trials in a shared story reading and systematic prompting when answering listening comprehension questions. In baseline, the overall average among all six students was 41.6%. Once the intervention was administered the students’ overall average increased to 84.6%, suggesting a functional relationship. The students had an overall average of 98.9% for non-overlapping data, meaning that 67.5 % of the points during the intervention phase, were higher than the highest point during baseline (see Table 3 for Means and PND). Below, the results of the effect of the distributed instruction on listening comprehension, for each of the six students, are reported (see Figure 2 for a visual representation)

Eli

In baseline, Eli had a mean of 20% correct responses on answering the comprehension questions for the book. When the intervention was implemented, Eli’s percentage of correct responses increased gradually, to a mean of 77.8% for the intervention sessions on the comprehension questions. His PND was 100%. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.

Zander

Zander had a mean of 42.9% correct on the comprehension questions during baseline, and increased to a mean of 81.4 % during intervention and reached mastery within seven sessions. His PND was 85.7%. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.
Ellen

Ellen had a mean of 20% correct on the comprehension questions during baseline. Once intervention was implemented her data did not show much progress. She had an average of 20% during the first three days of data collection and the trend was going downwards. An intervention within the intervention was then introduced. The researcher read the questions to Ellen rather than have it read by the voice over. Once that second phase of intervention was administered, Ellen’s data started showing a change in level and moving towards an upwards trend. Her intervention average during the second phase of the intervention was 67.3%. Her PND was 35.7%. Ellen did not reach mastery however her data moved in an upward trend once the second intervention phase was introduced.

Bob

Bob had a mean of 53% correct on the comprehension questions during baseline, and increased to a mean of 86.6% during intervention and reached mastery within 5 sessions. His PND was 83.3%. Because of the time constraints, maintenance data were not collected for Bob. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.

Fran

Fran had a mean of 56% correct on the comprehension questions during baseline, and increased to a mean of 86% during intervention and reached mastery within 4 sessions. Her percentage of non-overlapping data (PND) was 100%. Because of the time constraints, maintenance data were not collected for Fran. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.
**Don**

Don had a mean of 57.8% correct on the comprehension questions during baseline, and increased to a mean of 95% during intervention and reached mastery within 4 sessions. His percentage of non-overlapping data (PND) was 0, because one time during baseline, Don got a score of 100% on the comprehension questions. Although, he had reached mastery, the following session, his scores declined and were not stable. However, once the intervention was introduced, Don reached mastery, (i.e., 100% on three consecutive sessions), within four sessions. Because of the time constraints, maintenance data were not collected for Don. There was a change of level from baseline to intervention. While the trend seemed stable in baseline, it changed to upward trend once intervention was introduced.

The table below represents the average of each of the students during the baseline and intervention stages.

**Table 3**

*Comprehension Questions Data*

<table>
<thead>
<tr>
<th>Student name</th>
<th>Baseline Average</th>
<th>Intervention Average</th>
<th>Percentage of Non-overlapping data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eli</td>
<td>20%</td>
<td>77.8%</td>
<td>100%</td>
</tr>
<tr>
<td>Zander</td>
<td>42.9%</td>
<td>81.4%</td>
<td>85.7%</td>
</tr>
<tr>
<td>Ellen</td>
<td>20%</td>
<td>20% / 67.3%</td>
<td>35.7%</td>
</tr>
<tr>
<td>Bob</td>
<td>53%</td>
<td>86.7%</td>
<td>83.3%</td>
</tr>
<tr>
<td>Fran</td>
<td>56%</td>
<td>97.5%</td>
<td>100%</td>
</tr>
<tr>
<td>Don</td>
<td>57.8%</td>
<td>97.5%</td>
<td>0%</td>
</tr>
<tr>
<td>Overall</td>
<td>41.6%</td>
<td>84.6</td>
<td>67.5%</td>
</tr>
</tbody>
</table>
The data are also represented in a graph, Figure 2. On the graph below, the circles represent the baseline data; the squares on the graph represent the intervention data; the triangles represent the generalization data, and the diamond shape represents the maintenance data.
Figure 2. Comprehension Data (Circle= baseline; Square= Intervention; Triangle= Generalization; Diamond= Maintenance)
Reliability

Accuracy of the data refers to whether the data are acute and to the degree to which the
data collected by one observer is the same as the same data collected by another observer (Gast,
2010). This study assessed the accuracy of the measurement of the dependent variables using the
following procedure: (a) recording the student’s correct and incorrect responses, based on the
prompt given; (b) recording prompts, no responses and incorrect responses (c) collecting
anecdotal data of behaviors occurring during the intervention. Frequency data taken by the
interrater and the researcher were compared and an interrater agreement (IOA) was recorded by
using this formula: number of agreement/number of possible agreements X 100 = percent of
agreement. A minimum of 80% reliability were required to accept the data as reliable. Interrater
data were collected by two different observers for 37.9% of the intervention sessions. To ensure
reliability, the researcher operationally defined the behaviors measured (i.e., correct response).
This allowed the researcher and the observer to assess the same behaviors more accurately. The
researcher and the interrater observers agreed on the data collected 100% of the time.

Procedural Fidelity

Procedural fidelity data were collected across all experimental conditions. The researcher
and the interrater observers used a checklist of the procedures for intervention and the
generalization phases (See Appendix G). The interraters observed 37.9% of the sessions. The
researcher compared the checklist with the interrater observer following each observed session.
An interrater minimum of 80% agreement was required to ensure procedural fidelity. The
researcher and the observers had 99.4% agreement during the observed sessions.
Question 3. Does Distributing Trials in a Shared Story Reading and Systematic Prompting Lead to a Change in the Frequency of Appropriate and Inappropriate Behaviors of Students with SCD?

The researcher kept a research log during the intervention about the behaviors that occurred during the time she was in the classroom. Notes suggest that the students were actively engaged and enjoying the activity. Students would say “I want to work with you”, and exclaim “yay” when called to work with interventionist. One of the students, Zander, would come to the table, sit at the desk, and put the headphones on as if to begin working, before the researcher would call on him. The intervention took place while the students were either engaged in small group activities, free-play, or completing independent seatwork. Sometimes the students would exhibit inappropriate behaviors while they were completing work in the classroom, such as hitting, taking others students’ toys, or crying. However, these behaviors were never observed while working on the story reading. Based on these observations, it appeared that the students enjoyed working with the interventionist and enjoyed the story reading activity. Every day, four of the six students would ask the researcher if it was their turn to work with her. Oftentimes, they would exclaim “I want to read with you today!” Because of the type of research design, the researcher did not work with all the students daily, on the days when the researcher would not work with them, four or the six students would verbalize or show nonverbal signs indicating being disappointed.

Question 4: What Effect Does a Distributing Trial Strategy have on Pivotal Skill Acquisition and Listening Comprehension When Generalized to a Novel Story for students with SCD?
**The distributed pivotal skill- ending sounds of CVC words.** Eli generalized the distributed skill to a new book at 80%, and maintained the newly acquired skill over a period of two weeks. Zander generalized the pivotal skill to a new book at 100%, and maintained the newly acquired skill over a couple of weeks at 96.7%. Bob generalized the pivotal skill to a new book at 100%. Fran and Don generalized the pivotal skill to a new book at 100%. Because of the time constraints, maintenance data were not collected for Bob, Fran, and Don. Because of time, Ellen did not reach mastery within the time frame set for this study, and therefore no generalization nor maintenance pivotal skills data were collected for Ellen.

**Comprehension questions.** Eli generalized answering comprehension questions to a new book with 50% correct responses, and maintained the newly acquired skill over a couple of weeks with 100% accuracy. Zander generalized answering comprehension questions to a new book with 20% correct responses, and maintained the newly acquired skill over a couple of weeks, and maintained the newly acquired skill over a couple of weeks at 86.7%. Bob generalized the listening comprehension to a new book at 50%. Fran generalized the listening comprehension to a new book at 100%. Don generalized the listening comprehension to a new book at 70%. Because of the time constraints, maintenance data were not collected for Bob, Fran, and Don. Ellen did not reach mastery within the time frame set for this study, and therefore no generalization nor maintenance pivotal skills data were collected for Ellen.

The table below represents the percentage of each of the students’ generalization data points for both dependent variables.
Table 4

*Generalization Percentage*

<table>
<thead>
<tr>
<th>Student</th>
<th>Pivotal Skill</th>
<th>Listening Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eli</td>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>Zander</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Ellen</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Bob</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>Fran</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Don</td>
<td>100</td>
<td>70</td>
</tr>
</tbody>
</table>

**Question 5. What is the Social Validity of Distributing Trials in a Shared Story Reading?**

Social validity was assessed following the completion of the study in the form of a survey (i.e., Likert scale) that determined the level of satisfaction in the intervention of the special education teacher, parents, and students. The teacher survey included questions for the teacher with regards intervention, procedures, and results. The questions covered the following social validity criteria regarding the dependent variable, the procedures, and the results: (a) whether the dependent variables were socially significant for the participants, (b) if the procedures were practical and cost effective, and (c) if the dependent variable could be maintained over time (Horner et.al., 2005; Storey & Horner, 1991). The social validity data from the teacher indicated that the teacher liked the intervention, found it appropriate, and beneficial to the students. She indicated that the procedures of the study were followed as indicated. She indicated that she would use this intervention in her classroom with her students in the future. She wrote “I think the results were fantastic and help to show how capable my students are!”
A short informative letter about the study and procedure was sent to the parents of the six participating students. Attached to the letter, were the graphs showing the baseline, intervention, generalization, and maintenance conditions for each student. Every parent received two graphs; one for their child’s comprehension skills data, and one for their child’s embedded pivotal skill data attached to the survey. The survey consisted of five questions with a Likert scale response. Only one parent completed the survey and returned it. Regarding the first question, “how do you think your child did? The range was from 1 being poor to 7 being excellent. The parent chose 4. The next four questions ranged from 1 being strongly disagree to 7 being strongly agree. For question 2, “My child benefited from this study”, the parent selected 6. For question 3, “My child made progress in this study”, the parent selected 7. Question 4, reading and answering comprehension questions is an important skill”, the parent selected 2. And lastly, for question 5, “would you like to see more teachers using this intervention? The parent answered 7.

The students were given a short survey with four questions. They had a happy or sad face to select from and one question that is a short answer. The classroom teacher assisted the students in filling out the surveys. The first question was “Did you enjoy working with Ms. Mona?”. All six students selected the happy face. The second question was “Did you like listening to the story”. All six students selected the happy face. The third question was “Would you like to listen to another story?”. All the students selected the happy face. The final question was a short answer question, and asked: “What did you like about reading with me?” The following answers were given and written out by the classroom teacher; “I like Ms. Mona”, “If you give a dog a donut”, “Yes”, “I liked to play the toys”, and “I say yes”
CHAPTER 5

Discussion

The purpose of this study was to examine the effects of distributing trials instruction in a shared story reading lesson, using multimedia and UDL principles, on the acquisition of academic skills and listening comprehension of students with SCD in a special education classroom. To examine the effects of this independent variable, a literacy book that is at the students’ grade level, was adapted and created using the principles of UDL, in a shared story format. The shared story was created in a PowerPoint presentation format. Comprehension questions and a pivotal skill trials were also distributed within the reading. The researcher used a system of least to most prompts to deliver the intervention, and aimed to answer research questions about the effect of the intervention on: (a) pivotal skill acquisition, (b) listening comprehension, (c) a change in the frequency of appropriate and inappropriate behaviors, (d) generalization, and (e) the social validity of the dependent variables. In this chapter, the results of the study will be discussed and analyzed. The discussion will address each research question separately.

Question 1. Examining the Effect of Distributing Trials in a Lesson on Pivotal Skill Acquisition.

The first question explored if distributing trials in a shared story reading and systematic prompting would improve the pivotal skill acquisition of students with SCD. The outcomes of this study suggest that there was a functional relationship among the dependent and independent variables. The students all made gains once the intervention was introduced. Previous studies have strongly suggested that students with significant cognitive disability (SCD) experience success with skill acquisition when instruction is delivered through distributing instruction
within a lesson (Johnson & McDonnell, 2004; Johnson et al., 2004; Polychronis et al., 2004; & Sigafoos, et al., 2006). Whether administered in the general education setting, alongside their peers (Reisen et al., 2003; Jimenez et al., 2012), or in the special education classroom (Geiger et al, 2012; Majdalani et al, 2014, Sigafoos et al., 2006), embedding instruction or distributing trials in a lesson have been successful strategies used with students who have SCD.

Although the words distributed in the lesson, (e.g., cat) had no connection with the story being read, the researcher tried to find CVC words that related to the previous reading slide when possible. However, in the literature, studies indicate that the different skills are randomly distributed, and do not necessarily have a connection or function to the lesson they are distributed in. The pivotal skill chosen in the study happened to be a literacy skill, however, if the teacher would have indicated the need of a social or behavioral skill, the researcher would have used that skill and distributed it in the reading just the same.

In this current study, the students made progress in acquiring the distributed skill once the intervention was administered. Parallel to the results of Geiger et al., (2012) and Majdalani et al., (2014), the students did well with the trials being dispersed throughout the story. Five out of the six students reached mastery which required a score of 100 on three consecutive days. In previous studies, there was no preferred method of instruction (i.e., mass trials or interspersed embedded trial), rather the students acquired the skills sometimes with the embedded strategy, and other times with the mass trials strategy. It depended on the individual student (Geiger et al, 2012; & Majdalani, et al., 2014). However, Geiger et al. (2012) and Majdalani et al., (2014) suggested that while there was no preferred method in the acquisition rate and frequency of the skills, the frequency of inappropriate behaviors exhibited by the students during the traditional mass trials phase were higher than when the instruction was distributed within the lesson. In this
study, this was also observed. Once the students started working with the researcher, the inappropriate behaviors were diminished. The students did not try to escape or show a disinterest while working with the researcher. On the contrary, the students who were in baseline, often asked if they were going to be reading with the researcher that day. If they were told that they would not be working that day, they would show disappointment and say things such as: “I [want to] work with you today”, “I want to read”. This will be discussed more in question 3.

**Question 2. Distributing Trials in a Read Aloud to Improve Listening Comprehension**

The results of the second research question, “does distributing trials in a shared story reading and systematic prompting improve the listening comprehension of students with SCD?”, also suggest the existence of a functional relationship among the dependent and independent variables. The students all made gains once the intervention was introduced. Previous researchers have used shared stories paired with systematic instruction to deliver academic instruction to students with SCD with success (Browder, Lee, & Mims, 2011; Courtade, Lingo, & Whitney, 2013; Hudson, Browder, & Jimenez, 2014; Mims et al., 2012; Spooner et al., 2014). The results of this intervention furthered the support to the results of previous studies completed. Mims et al., (2012), used a shared story reading to improve the listening skills of student with SCD during a literacy reading. Mims et al, (2012), used wh-questions, to determine the students’ ability to comprehend the text read aloud. Mims used systematic instruction to teach the students how to answer the questions. This study, also used a system of least to most prompts to assist the students in correctly answering the comprehension questions and the pivotal skill trials.

Although some may argue that the students were taught to memorize the correct answer, however, having the three different presentations, with the answers in different positions, randomly given to the students, this may have helped in allowing the students to navigate the
page, and cognitively consider which answer to pick. Also, to control for this, the researchers used systematic instruction and went back to the text and taught the students to look for the correct response in the text. Overtime, the students’ need for the prompts were reduced significantly, and the students often self-corrected immediately after giving the incorrect response, before waiting for feedback from the researcher.

**Question 3. The Effect of Distributed Instruction in a Lesson on Classroom Behaviors**

Question three explored the if distributing trials in a shared story reading and systematic prompting may lead to a change in the frequency of appropriate and inappropriate behaviors for students with SCD? The research notes collected during the intervention suggest that the students exhibited appropriate behaviors, were engaged, and enjoyed the reading intervention. During this study, the students looked forward to participating in the read aloud. When the researcher walked into the classroom, some of the students would express their desire to work with her. Some would run over to the computer area, where the study took place, before they were called over by the researcher or the classroom teacher. Bob and Fran would squeal with excitement when answering the comprehension and pivotal skill questions. The students listened and followed direction very well, while working with the researcher. One time, Eli, who typically tries to escape situations when asked to sit one on one with an instructor, got up from his playing area and skipped over to the computer area, where the researcher was sitting, immediately following being given directive to go to the reading area. The classroom teacher expressed that he usually resists change in routine and does not transition easily. She was very surprised at how compliant his behavior was. Although, the notes compiled suggest engagement, and high positive behaviors, however, they can not be quantified and used a data to determine effect. Previous studies that embedded and distributed instruction in a lesson, reported with an increase in
positive behaviors (Geiger, et al., 2012 & Sigafoos, et al., 2012). In Geiger, et al., (2012), the results of the study suggested that both participants made academic gains during the intervention, but, the students engaged in higher negative affect behaviors during the distributed trial phase than during embedded skill phase. Similarly, in Sigafoos and colleagues, (2012), the results of the study suggested that the embedded instruction intervention was more effective and the student displayed less self-injurious behaviors, more correct responses, and higher mood levels.

Also, the technological format of the story may have also been reinforcing for the students. The students often tried to navigate their way through the shared story by clicking in the sound icon, and the turning the page icon. Even though, these were skills that were not directly taught to the students, the students acquired them, nonetheless, through observing the researcher over time. Much like previous research that incorporated lessons build on the UDL principles (Coyne et al., 2012; Spooner et al., 2014; & Rivera, et al., 2013), the ability of the students to click in the sound icon to listen to the story, then turn the page, and navigate their way through the reading, allowed the students to become more independent, which also may have contributed to the increase in positive affect and behaviors during the intervention. This independence may have also had a positive effect on the increase of appropriate behaviors among students. It also provides further opportunities for students to become more included in mainstreamed settings and participate more in lessons alongside their peers in the general education classrooms.

**Question 4. Generalization of the Intervention**

Question four explored the effect of the intervention when generalized to a novel story for students with SCD. The five students who reached mastery, were tested for generalization on both dependent variables. Results of the generalization probes suggest that the students were able
to successfully generalize the embedded pivotal skill to a new book. Four of the students, (i.e., Zander, Bob, Fran, and Don), achieved a 100% on generalizing the embedded skill. Eli generalized the embedded skill with 80% accuracy. Eli struggled with the ending sound for the letter “G”. He continued to say the sound “J”, and was therefore tallied as an incorrect response. However, he successfully distinguished between the beginning and ending sound, which was also required, successfully every time.

The students, however, varied in their ability to generalize the comprehension skills to a new book. Eli was the first student to master the intervention. He tested for generalization in the next session. He received 50% on the comprehension questions part. This score was still higher than his baseline average of 8% correct responses in the previous book. Fran was the only student who reached 100% when answering the listening comprehension of the new book. Zander, Bob and Don, got 20%, 50% and 70% respectively on the comprehension questions.

These scores indicate that the pivotal skill was easily generalized, perhaps because the ending sound of a CVC is a pivotal skill for emergent literacy. Thus, once the student learned the sound and mastered it, and understood how to differentiate between the directive of beginning sound and ending sound, the skill can be easily generalized in different settings. However, when considering the generalization of the comprehension questions, the variables were different. the texts, content, and concepts of the two stories were different. The setting and the words included in each story differed as well. While both the intervention and generalization books received a similar difficulty rating (e.g., 2.7 based in the accelerated reader), the different words and theme may have been a variable that possibly influenced the results of the comprehension data during generalization. Also, the students received only one baseline probe. It would be interesting to examine if the students were given the intervention, using the new book, in a new intervention
phase, if the student would achieve mastery faster than with the first book, especially that they already had some practice with using the systematic instruction. The fact that the students made progress from the mean of the baseline of the first book, to the first generalization probe, suggests that further practice with the use of systematic instruction, may be beneficial for students with SCD, and help further their abilities to successfully answer listening comprehension questions.

**Question 5. The Social Validity of the Intervention**

The fifth question explored the social validity of the intervention for the teacher, parents, and students with SCD. In previous studies, the social validity of having students participate in a shared story lesson, that allowed students to access the general curriculum, has been very high (Jimenez, et al, 2012; Mims et al., 2012). Similarly, the survey results of the social validity data collected this study suggest that the study was well received among the students and the classroom teacher. Social validity questionnaires were sent out to the parents of the participating students, but only one was returned. That parent indicated that the student made gains during the intervention.

The social validity of an intervention is determined by its ability to be (a) cost and time effective, (b) socially and academically significant and relevant to the student, and (c) easily replicated (Storey & Horner, 1991). Adapting a story using a UDL format to create a shared story may be time consuming, but is highly socially relevant, because it can be accessed by multiple learners, and can be used across different settings. It also allows the students to access the general curriculum, and participate in academics similarly to their peers in the mainstreamed classrooms, which is compliant with the federal laws regarding educating all learners with disabilities (IDEA, 2004).
When participating in this intervention, the students accessed literature that was of grade level, learned an academic pivotal skill that could be generalized into other academic settings, and learned how to listen for comprehension. The intervention also indirectly influenced other academic and social behaviors for the students, such as directionality of print, using the mouse to click on desired response, turning the page, waiting to listen to the question before answering, and looking for clues to make meanings from the pictures included.

The classroom teacher stated that while she often read stories for the students, they were rarely engaged during the read aloud. She stated that she will use this strategy of adapting stories and other academic lessons in a shared story format, and embedding academic, social, and behavioral skills in them in her future lessons. The teacher also commented that the ability of the students to independently follow such a lesson, can allow her to better manage her time and theirs, to maximize their learning opportunities in her classroom.

Limitations

While this study was successful in furthering the support for previous studies with regards to strategies on including students with SCD in academics and accessing the general curriculum in the classroom, there are several limitations to this study. The first limitation is the participants. In order to examine each individual student and to answer the specific research questions, a single-subject multiple-baseline design across participants was chosen. A single-subject study typically has a small number of participants. Horner et al., (2005) suggest a minimum of three participants. In this study, there were six participants. In addition to the small number of participants, the study took place in a large urban environment with one school district. Therefore, the participants were chosen using a convenience sample. It is acknowledged
that the results may not be easily generalized to others. To establish external validity, the study will need to be replicated among other participants and settings.

A second limitation was the environment in which the study was carried out. All the phases of the study (i.e., baseline, intervention, generalization, and maintenance), were completed in the special education classroom, in a self-contained setting. The students participated in the study in the special education classroom, while other students were present. Often time, when the researcher arrived to the classroom, the students were either finishing work on their own, engaging in free-play, or participating in a group lesson presented by the speech therapist or classroom teacher. The noise level in the classroom was often high during the intervention. Sometimes, there were outbursts or fights that broke out between other students, that distracted the student participating in the intervention. This could be counteracted by presenting stories, such as these, during centers or small group instruction time where other students are also working. Another option would be to present the shared story to the entire class at the same time.

A third limitation was that when the study started, Ellen had a diagnosis of autism. However, two weeks into the study, Ellen’s diagnosis was turned back to Traumatic Brain Injury (TBI), a diagnosis she has had since she was 11 months old. Having a TBI may have influenced Ellen’s results. Ellen’s progress was different from the other five students. The researcher needed to start another phase of intervention and slightly alter the intervention procedures for Ellen, following a no change in level or trend from baseline to intervention, after three days in intervention. While Ellen still made progress, however, her results indicate that her data were more variable and unpredictable than those of her peers. Possibly because of her TBI, it may have differently influenced her learning ability.
Oftentimes, there may be a carryover effect, especially with the extended baseline, although, the comprehension data suggest that there may have been a diffusion of treatment effect in the case of Don and Fran, however, once the intervention was administered, both students’ data stabilized and maintained stability. But, this may be another possible limitation.

And finally, the novelty of the study may be considered a limitation. This was the first time the students had ever participated in a study. Typically, students may either be excited about partaking in something new, and be more cooperative, attentive, and engaged. This would have an effect on their data scores. Therefore, the novelty of the intervention may have influenced their behaviors. Also, the intervention was completed by the researcher and not the classroom teacher, which may have also influenced the results of the study. Again, because the researcher worked with the students individually, on the computer, and awarded students with a tangible reinforce, once the session was completed, this may have influenced the students’ behaviors, which may have impacted their scores. However, in the case of novelty of a study, we typically see a plateau after a while, which was not evident in the data collected in this study. In addition to that, the researcher was conducting the study and collecting data and both depended variables, as well as the research notes. Because the researcher was engaging the multiple tasks simultaneously, it was difficult of collect frequency data on the behaviors of students. Therefore, the research notes collected could not be quantified and used to determine the effect of the intervention on the engagement and positive behaviors of the students.

Despite the limitations, the data suggest that distributing skills in shared story reading successfully impacts the ability of students with significant cognitive disability to acquire pivotal skills, answer listening comprehension questions, and engage in positive behaviors during an
academic lesson. This allows students to access the general curriculum and may be generalized into different academic materials.

**Implication for future practice.** Teachers can adapt and create shared stories using multimedia to allow the students to access the general curriculum while in the general education classroom or in the special education classroom. Creating the story in a multimedia format, while incorporating UDL principles for designing the lesson activity, may allow for the lesson to be successfully accessed by diverse learners. It can provide an opportunity for students to learn side by side, each at their own pace, level, and abilities. Using technology to create a story in multimedia and add components such as voice over is helpful because it allows the students to independently navigate themselves through the lesson, and promotes independence in learning.

This intervention is not meant to replace English Language Arts (ELA) instruction, but is meant to allow students to participate in a literacy lesson at grade level. This intervention can be completed easily in the classroom setting and does not take much time to complete. Overall, the average time for both dependent variables took on between 6-8 minutes to complete.

Table 5

*Average Time Data*

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<th>Name</th>
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<th>Intervention Average Time</th>
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<tr>
<td>Eli</td>
<td>7 min. 30 sec.</td>
<td>6 min. 59 sec.</td>
</tr>
<tr>
<td>Zander</td>
<td>6 min. 44 sec.</td>
<td>7 min 25 sec.</td>
</tr>
<tr>
<td>Ellen</td>
<td>8 min. 15 sec</td>
<td>7 min 26 sec.</td>
</tr>
<tr>
<td>Bob</td>
<td>6 min. 46 sec.</td>
<td>6 min. 48 sec.</td>
</tr>
<tr>
<td>Fran</td>
<td>5 min. 13 sec.</td>
<td>6 mins. 57 sec.</td>
</tr>
<tr>
<td>Don</td>
<td>5 min. 29 sec.</td>
<td>5 min. 55 sec.</td>
</tr>
</tbody>
</table>
Future Recommendations

This study furthered the support for other existing research regarding the effect of embedding instruction in a lesson (Jimenez, et al., 2012; Jimenez & Kamei, 2015; & Johnson & McDonnell, 2014). The lessons were created using shared story readings as a strategy to deliver academic content to students with significant cognitive disability (Browder, et al., 2008; Browder, et al., 2011; & Mims, et al., 2012). The study also incorporated a multimedia component that also contributed to the literature on the effects of including multimedia in academics for students with SCD (Knight et al., 2014; Rivera et al., 2013; & Spooner et al., 2014). The following are suggestions for future research that will further the support for this area of study, and move it forward by adding to the existing literature.

1. Replicating the study using a different group of students, in a different demographic location, and with a different interventionist to determine if the study yields the same results as this current study. Replicating this study at least a couple of times, and in multiple settings is important for the external validity of this study.

2. Exploring the effects of replicating the exact study, but in the general education classroom setting.

3. This study targeted literacy readings for primary classrooms (1st and 2nd grades). Investigating the effects of the intervention when generalized to a chapter book, or higher reading level novel.

4. Examining the effects of generalizing this intervention to other academic content areas such as math, science, and social studies.

5. Comparing the effect of using multimedia independent shared stories e-text versus peer books read aloud to deliver instruction to students with SCD.
Summary

Based on the results of this study, the following conclusions may be drawn. Embedding instruction in a shared story reading was beneficial for all six student participants in improving their listening comprehension skill, acquiring a new pivotal skill, and engaging them in a literacy reading session. A clear functional relationship was determined across the dependent variables for all participants. Five out of six students reached mastery and generalized the embedded skill successfully to another book. All students indicated in their social validity questionnaire that they enjoyed the reading intervention. The students were all engaged in the study. During the intervention, the frequency of inappropriate behaviors was less than when students were not participating in the study. The teacher expressed satisfaction with the intervention, and expressed an interest in using the intervention strategies in her classroom in the future. Overall, the study added to the existing research on embedding skills in lessons, and using shared story readings, paired with systematic instruction, to deliver the new skills to students with SCD.
APPENDIX A

Parent Permission Form

UNLV
PARENT PERMISSION FORM
Department of Educational and Clinical Studies

PARENT PERMISSION FORM Department of Educational and Clinical Studies

TITLE OF STUDY: Effects of Embedding Trials in a Shared Reading on the Behaviors of Students with Significant Cognitive Disability. INVESTIGATOR(S): Joshua Baker, PhD; Mona Nasir-Tucktuck, M.A. CONTACT PHONE NUMBER: 702-895-3238

Purpose of the Study

Your child is invited to participate in a research study that will investigate the effects of reading a story that is changed to meet your child’s specific abilities and needs, on your child’s listening comprehension and his/her ability to learn a specific targeted skill.

Participants

Your child is being asked to be one of five students to participate in the study. The criteria for participant inclusion in the study will be that: (a) the student receives services in a special education classroom in a self-contained setting for students with significant cognitive disability and/or autism (b) the student had a good attendance record (i.e., attend school 5 days per week), (c) English is the primary language in the home, (d) the student can sit quietly in close proximity to instructor, listen to the story, and answer questions when they are asked, (e) the student can stay on task for 10 minutes at a time (f) the student can wait for the prompt before giving a response, (g) the student can follow one step directions, and (h) the student has motor and verbal imitation skills.

Your child will be receiving the same skills taught in the classroom, but using a different teaching method. Your child’s performance will assist the research team in evaluating the effectiveness of this instructional strategy, and determine if this instructional strategy is effective for your child.
Procedures

If you allow your child to volunteer to participate in this study, your child will have a story read aloud to him/her. Data will be collected on the number of correct responses your child makes during the setting. The data collected will be used to determine the effectiveness of the intervention on the listening comprehension, ability to learn skills, as well as on the behaviors that the child exhibits during the intervention. The intervention will take place in your child’s classroom. At the end of the study, we will be sending home a short survey to hear from you what your thoughts are about the intervention and your child’s participation in it. The survey is short and should not take longer than 2-3 minutes. The survey will show you the results of the study and ask for your comments.

Benefits of Participation

There may be direct benefits to your child as a participant in this study. However, we hope that the results of this study may be used to improve services to teachers and other students locally, state-wide, and nationally. Specifically, the results of this study will help guide professional development and supports needed to help teachers provide individualized instruction based on individual student data (e.g., data sheet on IEP goals).

Risks of Participation

This study poses no foreseeable risks to any of the participants. The research wants to investigate a different way to teach skill acquisition and include your child in a read aloud of books typically read by students at your child’s grade level in the mainstreamed classrooms.

Cost /Compensation

There will not be financial cost to you to participate in this study. The study will take 10 minutes of your child’s time, every day for about four weeks. Your child will not be compensated for their time.

Contact Information

If you or your child have any questions or concerns about the study, you may contact Dr. Joshua Baker at 702-895-3238, or Mona Nasir-Tucktuck at (702) 895-1104 for any questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact the UNLV Office of Research Integrity – Human Subjects at 702-895-2794, toll free at 877-895-2794, or via email at IRB@unlv.edu.
**Voluntary Participation**

This read-aloud activity occurs every day in your child’s classroom. Your child’s participation in this study is voluntary. Your child may refuse to participate in this study or in any part of this study. Your child may withdraw at any time without prejudice to your relations with the university. You or your child is encouraged to ask questions about this study at the beginning or any time during the research study. There will be other students from your child’s classroom invited to participate in the study. If you do not want your child to participate, he/she will read with the teacher. If your child at any time expresses verbally or nonverbally that he/she is wanting to stop, the intervention will be stopped and data collection will be terminated. The termination of the study, or not agreeing to participate does not affect your child’s status at the school.

**Confidentiality**

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link your child to this study. All records will be stored in a locked facility at UNLV for 5 years after completion of the study. After the storage time the information gathered will be destroyed.

**Parent Consent:**

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

Signature of Parent __________________________ Child’s Name (Please print) __________________________

Parent Name (Please Print) __________________________

Date __________________________
APPENDIX B

Student Ascent Form

UNLV

ASSENT TO PARTICIPATE IN RESEARCH
Effects of Embedding Trials in a Shared Reading on the Behaviors of Students with Significant Cognitive Disability.

1. My name is Mona.

2. We are asking you to take part in a research study because we are trying to learn more about how you answer questions on a story read to you.

3. If you agree to be in this study, we will be working you in your classroom, so you won’t have to leave the classroom and go elsewhere

4. If you work with me, we will read a story together and I will ask you questions about it at the end. If you do not want to do this, it’s ok. You will still stay in the classroom and get to learn and play with your friends

5. A story will be read to you, then you will be asked questions about what was read.

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

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

8. You can ask any questions that you have about the study. If you have a question later that you didn’t think of now, you can call me at 702-895-1104 or ask me next time. If I have not answered your questions or you do not feel comfortable talking to me about your question, you or your parent can call the UNLV Office of Research Integrity – Human Subjects at 702-895-2794 or toll free at 877-895-2794.

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

Date

Sign your name
APPENDIX C
Sample of Shared Story Page

If you give a mouse a cookie:

He is going to ask for a glass of milk.

(Read to me)

Turn the page
APPENDIX D

Sample of Listening Comprehension Questions

Who did the boy give the cookie to? Touch the correct response.

(Read to me)

Cookie  Mouse  Milk

Turn the page
APPENDIX E

Sample of Embedded Skill

C A T
APPENDIX F

Listening Comprehension Questions

Who did the boy give a cookie too?
What will the mouse ask for after you give him the milk?
What does the mouse look in to before deciding he needs a trim?
What does the mouse use to sweep the floor?
What does the mouse want to do when he’s done cleaning?
What does the mouse want you to do?
When does the mouse decide he wants to draw?
Where does the mouse hang his picture?
What does the mouse ask for after looking at the refrigerator?
If he asks you for a glass of milk, what will he want with it?
APPENDIX G

List of CVC words

CAT
MAP
FAN
DOG
NAP
BED
BAG
SAM
RUN
SIT
APPENDIX H

Frequency Data Sheet (used with both dependent variables)
APPENDIX I

Procedural Fidelity Checklist

1. _______ Researcher called the student to the area designed for the intervention.
2. _______ Researcher said to the student “Today we are going to read _______”
3. _______ Researcher asked the student to select a reinforcer to work for from a predetermined list of preferred reinforcers.
4. _______ The researcher put the reinforcer aside and let the student know that he will receive it after they are done working together.
5. _______ The researcher started the shared story reading.
6. _______ The researcher asked the comprehension question
   i. _______ The researcher waited 4 seconds before delivering the first prompt (verbal prompt).
   ii. _______ The researcher waited 4 seconds before delivering the second prompt (model).
   iii. _______ The researcher waited 4 seconds before delivering the third prompt (physical guidance).
7. _______ The researcher ended the trial with the student emitting the correct response.
8. _______ The researcher gave verbal reinforcement (e.g., “good job”) before closing the trial.
9. _______ The researcher recorded the data (i.e., “C”- Correct; “I” – Incorrect; “VP”- Verbal Prompt; “MP-Model Prompt; “PP”- Physical Prompt).
10 _______ The researcher asked the student to point to the ending sound on the next page. And gave least to most prompts (i.e., VP-Verbal Prompt; “MP-Model Prompt; “PP”- Physical Prompt).
11 _______ The reading continued for page 2 of the story. The researcher followed the steps 5-9 following the reading.
12 _______ The reading continued for page 3 of the story. The researcher followed the steps 5-9 following the reading.
The reading continued for page 4 of the story. The researcher followed the steps 5-9 following the reading.

The reading continued for page 5 of the story. The researcher followed the steps 5-9 following the reading.

The reading continued for page 6 of the story. The researcher followed the steps 5-9 following the reading.

The reading continued for page 7 of the story. The researcher followed the steps 5-9 following the reading.

The reading continued for page 8 of the story. The researcher followed the steps 5-9 following the reading.

The reading continued for page 9 of the story. The researcher followed the steps 5-9 following the reading.

The reading continued for page 10 of the story. The researcher followed the steps 5-9 following the reading.

After the student completed the book, the student received the tangible reinforcer.

After a couple of minutes of playing with the reinforcer, the student was asked to give the item back.

The researcher asked the student to return to her seat.

The researcher recorded anecdotal data in the data sheets.
APPENDIX J

Social Validity-Parent

1. I think the intervention was fun for the students and for the teacher to implement.
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

2. I felt the student’s aggressive behavior decreased during the intervention.
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

3. The intervention was academically appropriate for the student.
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

4. I would use this Instructional strategy in my classroom.
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

5. The skills used during the intervention were socially appropriate for the student
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

6. The student did not benefit from this intervention
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

7. The procedures described in the study were carried out accurately during intervention
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

8. The student was given appropriate reinforcement following the completion of 10
   trials and comprehension questions.
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

9. The student enjoyed participating in this study.
   Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

10. You are likely to participate again as a teacher or have your students participate again
   in another study.
Strongly disagree … 1…2…3…4…5…6…7…Strongly agree

How do you feel about the results of the study?

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________
APPENDIX K

Social Validity-Parent

Dear Parents,

Our study is complete. All students made great gains during the intervention. We used an adapted story that was read daily to the children. The students were then each asked 10 comprehension questions about the story.

Also, 10 slides, each with a CVC word (i.e., NAP, CAT, DOG), were inserted after each comprehension question. The students were asked “What is the ending sound?”.

Please use the attached graphs that go over the results of this student and answer the following questions. Please return this form to your child’s teacher once it is completed.

1. How do you think your child did?

Very poor 1 2 3 4 5 6 7 Excellent

2. My child benefited from this study

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

3. My child made progress in this study.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

4. Reading and answering comprehension questions is an important skill.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

5. Would you like to see more teachers using this intervention?

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

6. I would have my child participate again in a similar study

Strongly disagree 1 2 3 4 5 6 7 Strongly agree
Please add any comments below that you have. I would be happy to discuss them.

______________________________________________________________________________

______________________________________________________________________________
APPENDIX L

Social Validity-Student

Please circle the appropriate response.

1. Did you enjoy working with Ms. Mona? ☺ ☿

2. Did you like listening to the story? ☺ ☿

3. Would you like to do listen another story? ☺ ☿

4. What did you like about reading with me?

___________________________________________________________________________
___________________________________________________________________________
___________________________________________________________________________
REFERENCES


Individuals with Disabilities Education Act Amendments of 1997, PL 105-17, 20 U.S.C §§ 1400 et seq.


high school students with moderate developmental disabilities. *Education and Training in Developmental Disabilities*, 43.


doi:10.1177/1088357614559214


doi:10.1007/BF02172479


Of constant time delay and simultaneous prompting with embedded instruction in general education classes with students with moderate to severe disabilities. *Journal of Behavioral Education, 12*, 241-259.


doi:10.1002/pits.20208


CURRICULUM VITAE

Mona Nasir-Tucktuck
Educational and Clinical Studies
University of Nevada, Las Vegas
Email: mona23675@gmail.com

EDUCATION AND PROFESSIONAL CREDENTIALS

DEGREES

<table>
<thead>
<tr>
<th>Degree</th>
<th>Institution</th>
<th>Field of Study</th>
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<tbody>
<tr>
<td>Ph.D.</td>
<td>University of Nevada, Las Vegas</td>
<td>Autism &amp; Intellectual Disabilities</td>
</tr>
<tr>
<td>M.A.</td>
<td>The Ohio State University, Columbus, OH</td>
<td>Special Education</td>
</tr>
<tr>
<td>B.A.</td>
<td>Hope College, Holland, MI.</td>
<td>Elementary education K-8, &amp; Learning Disabilities</td>
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Licenses
State of Nevada professional teaching license.
A-Level Special education, learning disabilities (Grades K-12)
A-Level Elementary education (Grades K-8)

PROFESSIONAL EXPERIENCE

August 2017-Present Visiting Lecturer, Special Education. University of Nevada, Las Vegas
August 2016- Present Part-Time Instructor. University of Nevada, Las Vegas
(Teaching Undergraduate and Graduate courses in Special Education)
August 2016- Dec. 2016 Graduate Assistant working on CARCREP Accreditation for Counselor Education Program, University of Nevada, Las Vegas
(Observing and supervising student teachers, practicum I and I Students in their field placements and classrooms)
(Research Assistant, part-time instructor, and University/Department supervisor for students during their practicum and student teaching.)


Feb. 1999-Sept. 1999. ABA interventionist for a preschooer with ASD.

TEACHING

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<td>ESP 740</td>
<td>Speech and Hearing Therapy for Classroom Teachers- Guest Lecture</td>
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<td>June 2014</td>
<td>ESP 763N</td>
<td>Single Subject Research Design- Co-teacher</td>
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<tr>
<td>Fall 2014</td>
<td>ESP 730</td>
<td>Parent Involvement in Special and General Education</td>
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<td>Fall 2016</td>
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RESEARCH

PUBLISHED ARTICLES


Articles in preparation


Unpublished articles/resources


BOOK CHAPTERS


PRESENTATIONS


Devi, K., Ewoldt, K., Gelbart, W., Nasir-Tucktuck, M., Rajadhyaksha, M., & Reding, C., [authors are listed in alphabetical order] (2016). Revision to iBook conversion of the UNLV Department of Educational and Clinical Studies: Doctoral policies and procedures handbook. Las Vegas, NV: The University of Nevada, Las Vegas (Updated 12-3-2014).


SERVICE

<table>
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<tr>
<td>October, 2017</td>
<td><em>Journal of Family Issues</em>- Guest Editor</td>
</tr>
<tr>
<td>May, 2017</td>
<td>Guest speaker on Leadership in Education. Pinecrest Academy St. Rose Campus. Las Vegas, NV.</td>
</tr>
<tr>
<td>Fall, 2016</td>
<td>Department Recruitment Graduate College Fair</td>
</tr>
<tr>
<td>Spring, 2015- Spring, 2017</td>
<td>Pinecrest Academy St. Rose, PTO Board, Secretary. Las Vegas, NV.</td>
</tr>
<tr>
<td>July, 2015</td>
<td><em>Focus on Autism and other Developmental Disabilities</em>- Guest Editor</td>
</tr>
<tr>
<td>August, 2014- May, 2015</td>
<td>Student Council of Exceptional Children (SCEC), UNLV Chapter. Doctoral Representative</td>
</tr>
<tr>
<td>January, 2015</td>
<td><em>Focus on Autism and other Developmental Disabilities</em>- Guest Editor</td>
</tr>
<tr>
<td>May, 2014</td>
<td><em>Focus on Autism and other Developmental Disabilities</em>- Guest Editor</td>
</tr>
<tr>
<td>April, 2014</td>
<td>Team meeting. Center for Autism Spectrum Disorder, University of Nevada, Las Vegas (UNLV).</td>
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<tr>
<td>March, 2014</td>
<td><em>Intervention in School and Clinic</em>- Guest Editor</td>
</tr>
</tbody>
</table>

Board Member

PROFESSIONAL MEMBERSHIPS

Council of Exceptional Children- Member since 2014
Division on Autism and Developmental Disabilities (DADD)-Member since 2014
Division of International Special Education and Services (DISES)-Member since 2014
Teacher Education Division (TED)- Member since 2014
TASH- Member since 2015