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# USING A SYSTEM OF LEAST PROMPTS AND A GRAPHIC ORGANIZER TO TEACH ACADEMIC CONTENT TO STUDENTS WITH MODERATE INTELLECTUAL DISABILITIES

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USING A SYSTEM OF LEAST PROMPTS AND A GRAPHIC  
ORGANIZER TO TEACH ACADEMIC CONTENT TO  
STUDENTS WITH MODERATE INTELLECTUAL DISABILITIES

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THESIS

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A thesis submitted in partial fulfillment of the  
requirements for the degree of Master of Science in the  
College of Education  
at the University of Kentucky

By

Kristen B. Dieruf

Lexington, Kentucky

Director: Dr. Melinda Jones Ault, Associate Professor of Special Education

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2017

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## ABSTRACT OF THESIS

### USING A SYSTEM OF LEAST PROMPTS AND A GRAPHIC ORGANIZER TO TEACH ACADEMIC CONTENT TO STUDENTS WITH MODERATE INTELLECTUAL DISABILITIES

The purpose of the study was to evaluate the effects of a system of least prompts procedure and use of a graphic organizer to teach an academic standard for elementary students with moderate intellectual disabilities. A multiple probe (days) across participants design was used to evaluate the effectiveness of using a system of least prompts and a graphic organizer to teach students how to compare two characters from adapted text. The results showed a system of least prompts and the use of graphic organizer was effective in teaching an academic standard for students with moderate intellectual disabilities.

**KEYWORDS:** Moderate and severe disability, graphic organizer, system of least prompts, compare, academic content

Kristen B. Dieruf  
April 14, 2017

USING A SYSTEM OF LEAST PROMPTS AND A GRAPHIC  
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## **Section 1: Introduction**

Over the past decade, an emphasis on academic content assessment and instruction for students with moderate to severe disabilities (MSD) has been present in public school education. Under the No Child Left Behind Act (NCLB), now reauthorized as Every Student Succeeds Act (ESSA), and the Individual with Disabilities Education Act (IDEA), this population of students is mandated to receive access to the general education curriculum and state assessments (Collins, Hager, & Galloway, 2011) Doing so in the most appropriate, effective, efficient, and educational manner for these students is a top priority for special education teachers.

Reading is one such academic area in which teachers of students with MSD must teach their students. Historically, however, research with the MSD population has underemphasized reading instruction. Until a recent focus on academics taught in combination with functional skills, a student's IQ score could determine if reading instruction would be taught at all. Access to academic content cannot be underestimated, as students who do not have access to reading instruction have fewer opportunities as adults. Instruction in reading fluency, vocabulary, and comprehension has lasting effects upon economic security, independence, and an individual's overall well-being (Browder, Wakeman, Spooner, Ahlgrim-DeLzell, & Algozzine, 2006). However, students with MSD often experience difficulty recalling, organizing, and retaining verbal and written information (Ozmen, 2011). Teaching students with MSD grade-level content can be challenging, especially if the student is a non-reader (Mims, Hudson, & Browder, 2012). This may be why, in a survey on literacy instruction for students with multiple disabilities, 92% of teachers indicated they would like to seek more training on literacy

for this population (Durando, 2008). A study completed by the National Assessment of Educational Progress (NAEP) found that 66% of fourth graders with disabilities scored below the basic reading level in reading achievement, almost 40% more than students without disabilities. More research is needed in how to support reading comprehension and achievement for students with disabilities, specifically those with moderate and severe disability (United States Department of Education, 2009).

Teachers of students with MSD must develop methods for modifying and teaching the academic standards, including reading standards, so students can access the general education curriculum. Teachers must rely on proven methods for teaching academic content while also combining with evidence-based systematic instruction. Systematic instruction includes methods to teach discrete behaviors and chained skills to students with significant disabilities. One such systematic response prompting procedure is the system of least prompts. This procedure provides the least intrusive prompt after a targeted stimulus is given and the student makes an error or does not respond. The student then has more opportunities to respond correctly or the more intrusive prompt is given. This method has been used to effectively teach elementary-aged students with cognitive disabilities to make phone calls and leave voicemail messages (Manley, Collins, Stenhoff & Kleinert, 2008), to teach young adults with moderate disabilities to complete a cooking task (Mechling, Gast, & Fields, 2008), and to teach pre-school aged children with disabilities to engage in pretend play (Barton & Wolery, 2010).

A method for facilitating access to core content, that has appeared in the literature, is through the use of graphic organizers. According to Zakas, Browder, Ahlgrim-Delzell, and Heafner (2013), graphic organizers are “organizational tools that

utilize visual and spatial displays that facilitate comprehension of text through the use of lines, arrows, and a spatial arrangement that describe text content, structure, and key conceptual relationships” (p. 1076). The use of graphic organizers encourages generalization of a particular process, student independence, and a deeper understanding of the content, which is essential in the education of students with a moderate to severe disability (Wakeman, Karvonen, & Ahumada, 2013).

A number of studies have been published examining the use of graphic organizers to teach academic content. In a study completed by Schenning, Knight, and Spooner (2013), a graphic organizer paired with explicit instruction (model, lead, test) was effectively used to increase comprehension of social studies content in three middle school-aged students with autism spectrum disorders (ASD). Students were also able to generalize the social studies content to “real world” situations. Zakas et al. (2013) were also able to show increased comprehension of grade-level social studies content through the use of a graphic organizer. In this study, three middle school–aged students with ASD used a modified graphic organizer to answer questions about United States history passages. The intervention showed that the participants increased their ability to independently respond to comprehension questions through the use of the modified graphic organizer.

In a study completed by Mims et al. (2012), four middle-school-aged students with ASD used a modified system of least prompts to answer listening comprehension questions after read-alouds of adapted grade-level biographies. Part of the modified prompt hierarchy included the use of two graphic organizers. The first graphic organizer helped students with sequencing questions (i.e. What came first? Last?). The second

graphic organizer was a t-chart that contained rules for answering “Wh” questions. The outcome of the study showed that the students improved their listening comprehension through the use of a modified system of least prompts, which included the graphic organizers.

The current study examined the effects of presenting a graphic organizer as a part of a prompt hierarchy in a system of least prompts procedure to support students’ comprehension of comparing text. The purpose of this study was to evaluate the effects of a system of least prompts and use of a graphic organizer to teach an academic standard for elementary students with moderate intellectual disabilities. This study extends the literature in that it is an additional demonstration of teaching academic content to students with moderate and severe intellectual disabilities. To the best of the author’s knowledge, this study is the first demonstration in the literature of teaching students with moderate to severe intellectual disability to make comparisons between two characters from adapted text.

## **Section 2: Research Question**

The research question includes: Is there a functional relation between the use of a system of least prompts and graphic organizer and an increase in level and trend in the ability to make comparisons between characters from adapted text for elementary students with MSD? Once learned, do the skills generalize to novel texts?

### Section 3: Methods

#### Participants

**Students.** Three participants were selected from a suburban elementary school in the southeast region of the United States. The school serves preschool through fifth grade students and has a total enrollment of 550 students. To be included in the study, participants (a) received special education services under the state's category for moderate to severe intellectual disability, (b) were enrolled in first through fourth grades, (c) were able to receptively make a selection from an array of more than two choices on known items, (d) had regular school attendance, (e) had signed informed parental consent, (f) were identified by parents, special education, or general education teachers as having difficulty comparing characters, from text, and (g) had vision and hearing within normal limits. Two female and one male student met these criteria. Full-scale IQ levels as determined from the Kaufman Assessment Battery for Children (Kaufman & Kaufman, 2004) and the Weschler Preschool and Primary Scale of Intelligence (Weschler, 2002) were 48 or below for each participant. Adaptive behavior scores as determined by the Vineland Adaptive Behavior Scale (Sparrow, Cicchetti, & Balla, 2005) were 63 or below for each participant. Demographic information for each participant can be found in Table 1.

Table 1

*Participant Descriptions*

| Name<br>Race                   | Age<br>Grade                                   | Diagnosis   | IQ score  | Adaptive<br>Behavior<br>Score <sup>d</sup> | Hours<br>per Day<br>in MSD<br>Class | Skill Level   |
|--------------------------------|--|-------------|---|--|-------------------------------------|---|
| Bobby<br>African-<br>American  | 11 years<br>4months<br>4 <sup>th</sup> grade   | MD,<br>ELL  | 1-2 year<br>old range<br>of<br>develop<br>ment <sup>a</sup> | 48   | 4                                   | Identifies letters<br>and sounds<br>Identifies and<br>reads familiar sight<br>words<br>Has an interest in<br>books and reading                    |
| Katie<br>Asian                 | 10 years<br>8months<br>4 <sup>th</sup> grade   | FMD,<br>ELL | 48 <sup>b</sup>   | 63   | 3                                   | Reads basic sight<br>words<br>Verbalizes or<br>points to answer<br>choice when asked<br>reading<br>comprehension<br>questions                     |
| Cassie<br>African-<br>American | 8 years<br>3months<br>1 <sup>st</sup><br>grade | MD          | 46 <sup>c</sup>   | 47   | 3                                   | Reads basic sight<br>words<br>Verbalizes or<br>points to an answer<br>choice questions<br>Difficulty retaining<br>and generalizing<br>information |

*Note.* MD = multiple disabilities; FMD = functional mental disability; ELL = English language learner

<sup>a</sup> Assessed using the Bailey Scales of Infant Development (Bailey, 2006).

<sup>b</sup> Assessed using Kaufman Assessment Battery for Children (Kaufman & Kaufman, 2004).

<sup>c</sup> Assessed using Weschler Preschool and Primary Scale of Intelligence (Weschler, 2002).

<sup>d</sup> Assessed using Vineland Adaptive Behavior Scale –Second edition (Sparrow, Cicchetti, & Balla, 2005).

**Bobby.** Bobby's scores from the Kaufmann Assessment Battery for Children (Kaufman & Kaufman, 2004) were in the extremely low range. Adaptive behavior scores from the Vineland Adaptive Behavior Scale (Sparrow et al., 2005) were in the <1 percentile and consistent with adaptive scores of a Functional Mental Disability. When given the Bailey Scales of Infant Development, Bobby was able to attend to pictures, display intentional movements to obtain something, orient to sounds, search for missing objects, pick up items, and place items in a container (Bailey, 2006). Bobby received reading, math, and vocational instruction in the special education classroom, and attended science and math classes, with the help of a paraeducator, in the general education classroom. Bobby was an English Language Learner and his family spoke Swahili. He immigrated to the United States with his mother and sister 4 years ago and has been attending public school and receiving special education services since he arrived. In the classroom, Bobby was pleasant and cooperative with teachers and peers. He required frequent redirection and prompting to stay on task. His individualized education program (IEP) indicated that his strengths included his eagerness to learn new information as well as his willingness to follow directions.

**Cassie.** Cassie's scores from the Weschler Preschool and Primary Scale of Intelligence (Weschler, 2002) were in the <0.1 percentile and in the extremely low range of general intellectual functioning for her age. Adaptive behavior scores from the Vineland Adaptive Behavior Scale (Sparrow et al., 2005) were in the <1 percentile. When given the Brigance Comprehensive Inventory of Basic Skills II (Brigance, 2010), Cassie was able to count to three and sometimes asked questions using "who" or "where." She was unable to state her name or identify basic colors. Cassie received reading, math, and



vocational instruction in the resource special education classroom. In the classroom, Cassie was friendly and enjoyed interacting with teachers and peers.

**Katie.** Katie's scores from the Kaufman Assessment Battery for Children (Kaufman & Kaufman, 2004) were in the extremely low range. Adaptive behavior scores from the Vineland Adaptive Behavior Scale (Sparrow et al., 2005) were in the 1<sup>st</sup> percentile, or low range. When given the Letter and Word Recognition and Reading Comprehension subtests of the Kaufmann Test of Educational Achievement (Kaufman & Kaufman, 2014), Katie obtained a composite score of 47 in the <0.1 percentile as compared to other students her age, indicating overall reading skills in the extremely low range. Katie received reading, math, and vocational instruction in the resource special education classroom. In the classroom, Katie was helpful and cooperative with teachers and peers. She was a quiet and shy student and often did not audibly verbalize responses to questions or interactions.

**Others.** The primary investigator was the special education teacher. The special education teacher had taught for 9 years in a MSD classroom and was in a teacher leader master's program for moderate to severe disabilities. One paraprofessional from the special education classroom and an undergraduate practicum student collected reliability data during baseline and intervention sessions. The paraprofessional had a college degree and had worked in the special education setting for 7 years. Both individuals had experience using a system of least prompts, taking data, and working with all three participants in the general education or special education settings.

## **Instructional Setting and Arrangement**

Sessions during baseline, intervention, and maintenance conditions were conducted in the special education classroom in a one-to-one format (i.e. one student, one special education teacher). During each session, the students sat across from the instructor at a rainbow-shaped table. While in the special education classroom, distractions were lessened through the use of a room divider to block out extraneous noise and visual distractions. Up to two other students and one paraprofessional were present at any time during sessions. Generalization sessions were conducted in the special education classrooms in a 1:1 format using a novel story.

## **Materials/Equipment**

Data sheets were created for screening, baseline, intervention, maintenance, and generalization and can be found in Appendix A. This study required the use of 10 selections of adapted text. Each selection was no longer than one page in length and did not exceed 100 words. The Lexile measure ranged between 270L and 600L, equivalent to 1<sup>st</sup>-3<sup>rd</sup> grade reading level, as measured by the Lexile Framework for Reading (2011). Adapted text selections were taken from grade level content workbooks and picture books. Both fiction and non-fiction texts were represented. Each adapted text selection contained two characters so that comparison questions could be asked. Descriptions of adapted reading selections, including grade level and Lexile score are listed below.

Table 2

*Adapted Reading Selections*

| <b>Text</b>   | <b>Word Count</b> | <b>Lexile Measure</b> | <b>Reading Grade Level Equivalent</b> |
|---|-------------------|-----------------------|---------------------------------------|
| Story 1 <sup>a</sup> – Lions and Tigers (Pre/Post Generalization Story) | 86                | 600L                  | 3 <sup>rd</sup>                       |
| Story 2 <sup>a</sup> – Beth and Sarah                                   | 75                | 380L                  | 2 <sup>nd</sup>                       |
| Story 3 <sup>a</sup> – Best Friends                                     | 34                | 300L                  | 1 <sup>st</sup>                       |
| Story 4 <sup>a</sup> – Dogs and Cats                                    | 83                | 340L                  | 2 <sup>nd</sup>                       |
| Story 5 <sup>b</sup> – Andrew and Maria                                 | 93                | 480L                  | 3 <sup>rd</sup>                       |
| Story 6 <sup>b</sup> – The Ostrich and the Penguin                      | 70                | 440L                  | 2 <sup>nd</sup>                       |
| Story 7 <sup>b</sup> – Andrew Jackson and Jimmy Carter                  | 90                | 270L                  | 1 <sup>st</sup>                       |
| Story 8 <sup>c</sup> – Miss Nelson and Miss Swamp                       | 76                | 500L                  | 3 <sup>rd</sup>                       |
| Story 9 <sup>d</sup> – The Town Mouse and the Country Mouse             | 75                | 530L                  | 3 <sup>rd</sup>                       |
| Compare 10 <sup>e</sup> – The Tortoise and the Hare                     | 95                | 490L                  | 2 <sup>nd</sup>                       |

<sup>a</sup> Original text from the *Kentucky KCCT Coach* (Rose, 2007).

<sup>b</sup> Original text from *Crosswalk for the Common Core* (Valle, 2011).

<sup>c</sup> Original text from *Miss Nelson is Missing!* (Allard, 1977).

<sup>d</sup> Original text from *Town Mouse and the Country Mouse* (Jones, 1995).

<sup>e</sup> Original text from *The Tortoise and the Hare* (Stevens, 1984).

Each selection of adapted text was accompanied by three questions. Each question had four picture answer choices. Of the answer choices, one showed the correct answer, two showed plausible answer choices, and one showed an implausible answer choice. An example text, storyboard, question, and answer choice can be found in Appendix B, C, and D, respectively. The picture storyboard (Appendix C) that accompanied each story had a maximum of 12 pictures per page on a 110.4mm X 279.4mm sheet of paper to support comprehension of the text. Pictures used for the storyboards came from Boardmaker software (Tobii Dynavox, 2016) and were the same pictures used on the Venn Diagram. Under each picture was a short sentence that corresponded with the picture and pictures were numbered from 1-12. As the instructor read, she stopped at pre-determined times during the reading to point to the corresponding picture on the storyboard.

An enlarged Venn Diagram was used for the visual prompt in the prompt hierarchy and as a visual aid during instruction. Each side of the Venn Diagram was labeled with a character's picture that corresponded with the chosen adapted text. The pictures placed on the Venn Diagram were made using Boardmaker software (Tobii Dynavox, 2016). The overlapping section of the Venn Diagram, or where "same" visuals were placed, was colored yellow to highlight its importance. An example of a completed Venn Diagram can be found in Appendix E.

### **General Procedures**

Prior to baseline, the special education teacher conducted informal screening sessions with each participant in a 1:1 format. These sessions were used to ensure that each participant was able to demonstrate an understanding of the concept "same". The

teacher presented a black and white line drawing of an animal, shape, and an uppercase alphabet letter, one picture at a time. After presenting the first line drawing, the special education teacher requested that the participant point to the same picture from a choice of 3 pictures placed on the table in front of them. Two pictures did not match the picture shown by the special education teacher, and one picture was a duplicate picture. The special education teacher then presented the second and third line drawings. Each participant was able to identify a matching or “same” picture from a choice of three.

The instructor conducted the majority of sessions Monday through Friday at 9:00 a.m. and 12:30 p.m. during regularly scheduled reading instruction. Students participated in one instructional session per day. In the event of excessive absences or unexpected interruptions to the classroom schedule, it was sometimes necessary for students to participate in two instructional sessions per day, with one in the morning and the other in the afternoon. Data were collected on the participants’ ability to identify what is the same (compare) across conditions about characters in adapted text by choosing the correct picture choice answer from an array of four.

Each participant received probe conditions until baseline data were stable, then intervention began with the first participant until criterion was reached, while intermittent probe data were collected for the second and third participants. Once criterion was reached by the first participant, intervention began with the second participant until criterion was reached, while intermittent probes were collected for the third participant. Once criterion was reached by the second participant, intervention began with the third participant. Criterion was reached when a participant scored 100% for at least three consecutive sessions.

## **Dependent Variable**

The dependent variable in this study was the number of correct, independent responses to text-dependent reading comprehension questions where students compared characters from adapted text. A discrete trial recording data sheet was used to record student responses during baseline, intervention, maintenance, and generalization phases. During baseline, generalization, and maintenance phases, participant responses were scored as correct (participant touched the correct picture from a choice of 4 within 5 s of the task direction), incorrect (participant touched an incorrect picture within 5 s of the task direction), or no response (participant did not touch any picture within 5 s of the task direction). During intervention, when the participant responded incorrectly or did not respond, the instructor proceeded through a system of least prompts, which included verbal prompts, a visual prompt, a model of the correct response, and physical prompting. The level of prompting delivered that resulted in a correct response was recorded on each trial. The instructor used a 5 s response interval between each prompt level. Each independent, correct, response was given specific verbal praise.

## **Procedures**

**Probe procedures.** Probe data were collected for a minimum of five sessions at the beginning of the study and then once every ten sessions while intervention occurred for the other students, and were conducted in the special education classroom. Each student completed 3 trials per probe session. Data sheets used for probe sessions are included in Appendix A.

The trial sequence for probe procedures was as follows: The teacher provided an attentional cue, “It’s time to read a story! Please come to the table.” The special

education teacher was seated across from the student. The student gave an attentional response (thumbs up or “yes”) to indicate they were ready for instruction. The teacher then said, “We are going to make a visual while we read. You can use it to help you answer the questions that follow the story.” The teacher chose a selection of adapted text at random and read it to the student, pointing to each picture that corresponded with different parts of the story on the storyboard. As the teacher pointed to the storyboard, she placed corresponding visuals on a Venn Diagram on a vertical board placed next to the student. Each visual was placed on the left, right, or overlapping area of the Venn Diagram, dependent upon which character the visual relates to. After the story was read, the teacher asked the student, “Compare \_\_\_\_\_ and \_\_\_\_\_ (e.g. names of the characters being compared). How are they the same?” and showed the question and answer choices sheet. The teacher read each answer choice to the student. The student then selected their answer from a picture choice of four. The teacher provided a 5 s response interval. Once the student selected their answer, the teacher asked again, “Compare \_\_\_\_\_ and \_\_\_\_\_ . How are they the same?” and showed the question and answer choices sheet. The teacher read each answer choice to the student. The student was given an opportunity to identify another way the two characters were the same. The student then selected their answer from a picture choice of four. The student was given a 5 s wait time to respond. Once the student selected their answer, the teacher asked again, “Compare \_\_\_\_\_ and \_\_\_\_\_ . How are they the same?” and showed the question and answer choices sheet. The teacher read each answer choice to the student. The student was then given an opportunity to identify a third way that the characters were the same. The student selected

their answer from a picture choice of four. The student was given a 5 s wait time to respond.

Responses to questions were scored as correct (participant touched the correct picture within 5 s), no response (participant did not touch any picture within 5 s), or an incorrect response (participant touched an incorrect picture within 5 s.). Praise was delivered for correct responses, on-task behavior, and participation. Students received reinforcement for attending and effort toward answering questions on a continuous reinforcement schedule (e.g. “Good job looking at the pictures.”) If a student selected an incorrect answer or gave no response, the teacher praised their effort and behavior (e.g. looking, attending) rather than accuracy. Each student answered three questions per probe session.

**Intervention.** Intervention sessions were conducted during the participants’ daily reading instruction in the special education classroom and in a 1:1 format. The instructor used a system of least prompts procedure to teach compare. Instruction was provided on comparing characters from adapted text. The instructor randomly picked the adapted text selection and corresponding storyboard before each instructional session began. Data sheets used during instructional sessions can be found in Appendix A.

The participants each answered three questions for each story, each a different question relating to three ways that the characters were the same. The trial sequence for procedures during intervention was as follows: The participant’s attention was secured before beginning using an attentional cue, “It’s time to read a story! Please come to the table.” The special education teacher was seated across from the student. The student gave an attentional response (thumbs up or “yes”) to indicate they were ready for



instruction. The teacher conducted a mini-lesson on comparing characters using an example text. During the mini-lesson, she first chose a selection of adapted text at random and then placed the enlarged Venn Diagram in front of the student. The teacher gave a brief explanation of the Venn Diagram, (“This is a Venn Diagram. It helps us to know how two things are the same and how they are different. We are going to use it to compare two characters. We need to find out how they are the same.”). The teacher then explained where the same visuals would be placed (“If I want to know how two characters are the same, where should I look?”) She then guided the student to point to the overlapping area of the Venn Diagram. The teacher then read the selection of adapted text to the student using the storyboard to support comprehension. The teacher placed corresponding visuals on the Venn Diagram. Each visual was placed on the left, right, or overlapping area of the Venn Diagram, dependent upon which part of the Venn Diagram the visual related to. When the teacher placed a visual in the middle, that showed the characters are the same, she paused and said, “Look, tigers and lions are both big cats. That is how they are the same!”

When the mini-lesson was completed, the teacher chose another selection of adapted text at random and read it to the student using a storyboard to support comprehension. The teacher placed corresponding visuals on the Venn Diagram, on a vertical board placed next to the student. Each visual was placed on the left, right, or on the overlapping area of the Venn Diagram, dependent upon which part of the Venn Diagram the visual related to. When the teacher placed a visual in the middle, that showed the characters are the same, she paused and said, “Tigers and lions are both big cats. That is how they are the same.” After the story was read and the Venn Diagram was

completed, the teacher said to the students, “You can use the Venn Diagram we made together to help you answer your questions. Then the teacher asked the student, “Compare \_\_\_\_\_ and \_\_\_\_\_. How are they the same?” The teacher pointed to each answer choice and read the sentence that corresponded with the choice. Each student selected their answer from a picture choice of four. The students were given 5 s to respond at the independent level, e) Each correct response during intervention was given specific verbal praise (i.e., “Yes, you are right! Tigers and lions both have paws. That is how they are the same!”). The teacher then referred to the Venn Diagram and pointed to the picture that matched the correct answer while saying, “Look! You made the right choice!”

When the participant answered a question incorrectly or provided no response at the independent level, the instructor said, “Wait if you need help,” then proceeded through a system of least prompts:

- (a) Verbal cue (ex: “Find how Tigers and Lions are the same.”)
- (b) Visual (prompt to look at the correct picture on the Venn Diagram and a verbal prompt such as, “Lions and tigers are both big cats!”).
- (c) A model of the correct response (“We are comparing. Lions and tigers both have paws. Touch the correct answer.” The teacher then touched the correct answer choice to model the correct response).
- (d) Physical prompting (physical guidance to touch the correct answer choice).

The instructor used a 5 s response interval between each prompt level. Specific verbal praise was delivered on a continuous schedule for every correct response.

Participants reached criterion when they achieved three consecutive sessions of 100% correct, independent responses.

Intervention sessions were delivered once per day, per student, Monday through Friday. Intervention sessions were delivered twice per day if excessive absences or interruptions to the classroom schedule occurred. Sessions were done in a small group format. Each student answered three questions per intervention session.

**Maintenance.** After each participant reached 100% correct independent responses for three consecutive sessions, the instructor discontinued instruction on the skill mastered. Once the skill was mastered, maintenance probes were completed with random selections of adapted text while intervention was being completed with other students a minimum of once per 2 weeks. Once all three students mastered the skill, maintenance checks were done once per week.

Maintenance probes were conducted using the same procedure as in baseline. If the participant was unable to maintain 100% accuracy during maintenance probes, instruction was reinstated until the participant was able to maintain 100% over two consecutive sessions.

**Generalization.** A generalization probe was given during baseline and once the participant met criterion. Procedures for generalization probes were the same as procedures for baseline and maintenance. During generalization probes, a novel story was used that was not used during intervention or maintenance.

### **Experimental Design**

This study used a multiple probe (days) across participants design (Gast & Ledford, 2014). Each participant received probe trials until instruction with the first

participant began. After the first participant met criterion, instruction began with the second participant. After the second participant met criterion, instruction began with the third student. Due to health problems, intervention with participant three began before participant two met criterion in order to prevent a possible delay in instruction for participant 3.

With this design, experimental control is demonstrated by a therapeutic change from baseline to intervention across all three participants, and only when the intervention is introduced.

### **Reliability**

The paraprofessional and an undergraduate practicum student collected both inter-observer and procedural fidelity data. Examples of reliability data sheets can be found in Appendix A. Training for the paraprofessional and practicum student was provided during the school day, lasting no more than 30 minutes. They were introduced to the data sheets used during both probe and intervention and were shown how to take data. They were also given descriptive definitions and examples for the independent and dependent variables. Verbal prompts, models, visual and physical guidance, as well as verbal praise to be provided during the baseline and intervention sessions, were modeled for accurate implementation. The prompt hierarchy was also reviewed with the paraprofessional and practicum student so that they were able to identify specific student and teacher behaviors.

Both inter-observer agreement and procedural reliability data were collected in 25% of all sessions across participants by the classroom

paraprofessional or undergraduate practicum student, and at least once in each condition. Inter-observer agreement was calculated by dividing the number of agreements on student responses by the number of agreements plus disagreements and multiplying by 100 (Gast & Ledford, 2014).

Procedural reliability checks were taken in all experimental conditions. During baseline, maintenance, and generalization sessions data was taken on the presence of the following teacher behaviors: (a) Having materials ready, (b) giving an attentional cue, (c) ensuring an attentional response, (d) placing the Venn Diagram on the table, (e) telling the participant they can use the Venn Diagram to help answer the questions, (f) reading the passage aloud, (g) ensuring the student points and looks at the pictures on the storyboard while the story is read (h) using a wait time of 5 s, (i) ignoring errors, (j) and praising correct answers.

During intervention sessions, data were taken on the presence of the following teacher behaviors: (a) Having materials ready, (b) giving an attentional cue, (c) ensuring an attentional response, (d) placing the Venn Diagram on the table, (e) completing the mini-lesson, (f) telling the participant they can use the Venn Diagram to help answer the questions, (g) reading the passage aloud, (h) ensuring the student points and looks at the pictures on the storyboard while the story is read (i) using a wait time of 5 s, (j) and providing the correct consequences after the student response. Procedural reliability was calculated by dividing the number of observed behaviors by the number of planned behaviors (Gast & Ledford, 2014).

If either score fell below 80%, the investigator, paraprofessional, and/or practicum student reviewed the instructional and data collection procedures. Reliability

data were collected in 25% of all sessions in baseline/probe, intervention, and maintenance on both the dependent and independent variables. The overall reliability agreement the both the independent and dependent variable was 100%. Inter-observer agreement was calculated by dividing the number of agreements on student responses by the number of agreements plus disagreements and multiplying by 100 (Gast & Ledford, 2014).

## Section 4: Results

The results indicated that a system of least prompts and a graphic organizer were effective in increasing the level and trend in the ability to make comparisons between two characters from adapted text for elementary students with MSD. Figure 1 shows the data for each participant.

**Katie.** During the baseline/probe phase, Katie always responded by pointing to an answer. Given students could choose from four response options, Katie was able to select the correct answer several times. Once intervention was introduced, her percentage of independent, correct responses increased for 8 sessions, then decreased for 5 sessions before increasing to criterion levels. Of the three participants, Katie was able to reach criterion in the fewest number of sessions during intervention, which was 14 sessions. Once reaching criterion, she was able to generalize the ability to compare two characters to a novel story. She also maintained her responding at 100% while her peers began baseline and intervention phases. Katie required no modifications for the procedures.

**Cassie.** In the baseline/probe phase, Cassie selected incorrect answers or did not respond within the 5 s response interval in each session. Once intervention was introduced, Cassie's percentage of independent, correct answers increased, but responding was variable. Approximately 1 month after intervention began, several days before winter break, Cassie had surgery. Beginning in session 38, Cassie received homebound instruction by the special education teacher and intervention continued while she was at home. Cassie received 4 intervention sessions while she was recovering from surgery at home.

Due to Cassie's lack of progress after 10 intervention sessions, a modification was made to the procedures, beginning in session 38. To simplify the graphic organizer, the instructor only placed the "same" visuals on the Venn Diagram during intervention sessions, rather than both "same" and "different". During intervention sessions after this modification was made, Cassie's percentage of independent, correct responses increased. The modification was effective in increasing independent, correct responses. However, when Cassie returned from homebound (session 42), her percentage of correct, independent responses decreased. It is thought that fatigue and illness negatively impacted Cassie's responding, and an additional modification was made to the procedures after she was unable to reach criterion. Beginning in session 56, one plausible answer choice was removed, and she was given three answer choices instead of four. This left one plausible answer choice, one correct answer choice, and one implausible answer choice. Once this second modification was made, Cassie was able to reach criterion within 3 sessions. Cassie was then able to generalize her ability to compare two characters to a novel story. The generalization session was presented in a modified format with just three answers. Cassie was able to maintain criterion level scores while participant 3 was still in intervention.

**Bobby.** While in baseline/probe phase, Bobby did not respond correctly or within the 5 s response interval. The decision was made to begin intervention with Bobby before Cassie had reached criterion due to her homebound status and uncertainty about her return to school. Once intervention began, Bobby's percentage of correct, independent responses increased immediately. After session 56, when Bobby had not increased his responding for 5 sessions, Bobby received the same modification as Cassie, where only



the “same” visuals were placed on the Venn Diagram for the remainder of intervention. Once this modification was made, Bobby’s percentage of independent, correct responses increased to criterion levels. Bobby was able to generalize his ability to compare two characters to a novel story in a generalization session with 66% accuracy. Bobby was able to maintain 100% accuracy in a maintenance session after reaching criterion.

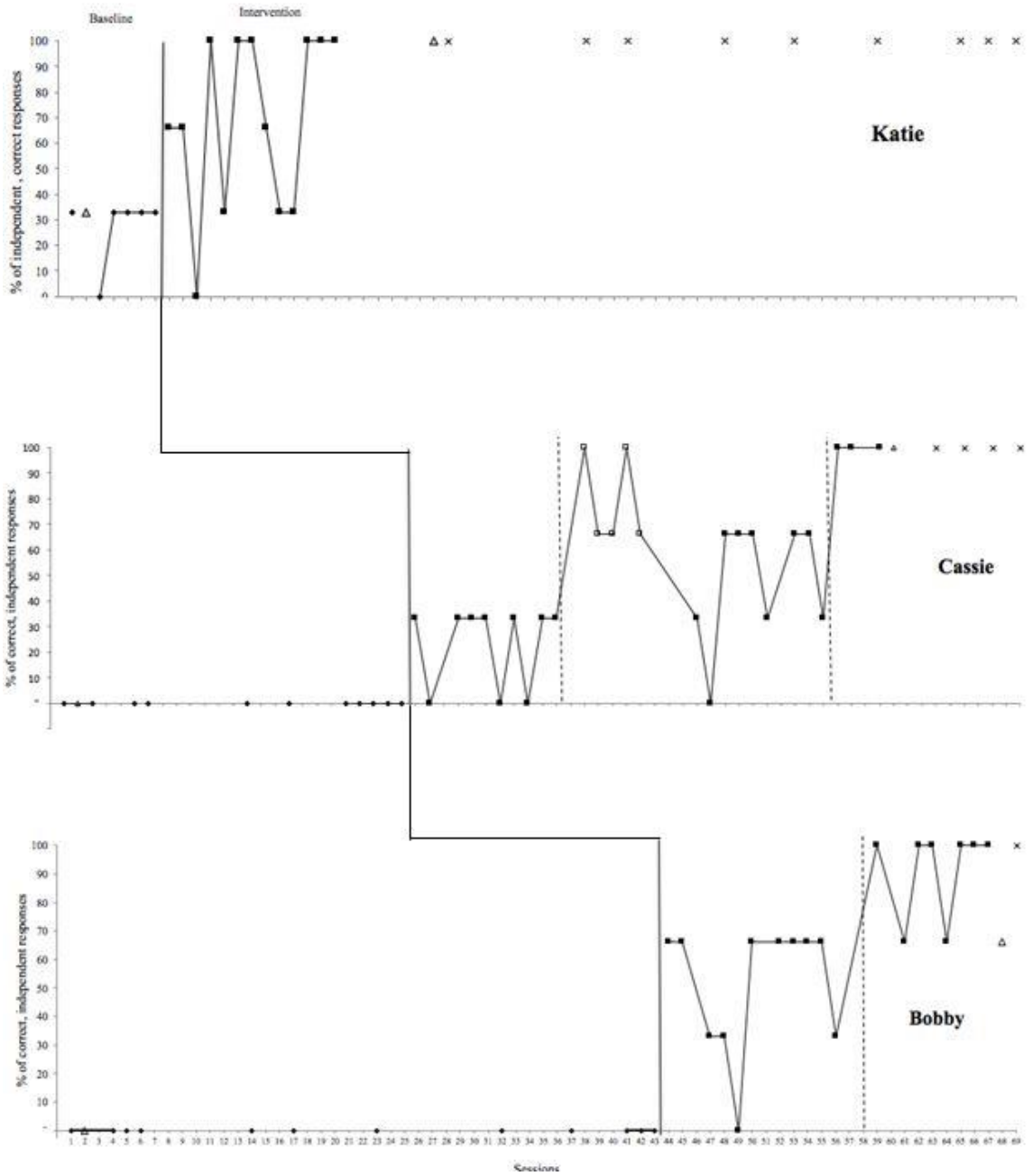


Figure 1: Graph of Results. Percentage of independent, correct responses. Triangles represent generalization probes/novel story. Xs represent maintenance sessions.

## **Section 5: Discussion**

### **Limitations and Future Research**

This study demonstrated the effectiveness of the system of least prompts with the use of a graphic organizer to teach students with MSD to compare characters in stories. All three participants were able to increase their percentage of correct, independent responses when a system of least prompts and graphic organizer were introduced. The results indicate a functional relation between the use of a system of least prompts along with a graphic organizer and the participants' ability to make comparisons between characters from adapted text. All three participants were able to maintain the skills they learned. Two participants were able to generalize these skills to a novel story with 100% accuracy, and the third participant was able to do so with 66% accuracy.

The results of this study add to the research that graphic organizers can be used to teach academic content to students with an intellectual disability (Mims et al., 2012; Schenning et al., 2013; Zakas et al., 2013). A distinctive component of this study was that students with moderate intellectual disabilities learned to reference a graphic organizer to make comparisons between two characters from grade level adapted text. There is little research on teaching students with moderate intellectual disabilities to make comparisons.

Since the procedures required modifications for two of the participants, it may have been beneficial to begin teaching comparison skills in a less complex manner (i.e. three answer choices, fewer visuals). The amount of time it took participants 2 and 3 to meet criterion reveals the complexity of academic content that is required for students with moderate intellectual disabilities to master for state assessment.

One limitation of this study was that the intervention was taught in a 1:1 instructional format. Although 1:1 instruction is beneficial for most MSD students, it is not always possible or practical in the classroom. A potential question for future research is whether the intervention could be taught in a small group setting with the same, or better, results. Based upon recommendations made by Collins, Gast, Ault, and Wolery (1991), small group instruction can (a) increase the number of students teachers are able to teach at once, (b) requires fewer classroom personnel and less instructional time, (c) prepares students for instruction in less restrictive classroom environments, where small group instruction is often used, (d) provides opportunities for students to learn and practice social skills, and (e) students may learn additional information from observing their peers.

Another limitation of the study was the use of a separate setting for intervention. While most MSD students receive services in a special education classroom, there is research to support the acquisition of grade-level academic content in inclusive classrooms (Johnson & McDonald, 2004). Future research should explore whether skills taught during intervention could be generalized to the general education classroom, or with other personnel, such as a paraprofessional or general education teacher.

## **Conclusion**

In conclusion, this study adds to the growing research on the acquisition of academic content and students with MSD. This study shows that students with MSD are able to make measurable progress in the acquisition of reading content and reading comprehension skills through the use of systematic instruction and a graphic organizer.

### Appendix A: Data Sheets

Student: \_\_\_\_\_ Date: \_\_\_\_\_

Start time: \_\_\_\_\_ End time: \_\_\_\_\_

|   |        |
|---|--------|
| Materials Ready?  | Y or N |
| Attentional Cue given?  | Y or N |
| Ensures Attentional Response?   | Y or N |
| Venn Diagram on table?  | Y or N |
| Teacher tells student they can use the Venn Diagram to help answer questions after the story? | Y or N |
| Passage read aloud?   | Y or N |
| Student points to pictures on storyboard while the story is read?                             | Y or N |

|   | Wait 5s | Student Response | Ignore errors | Praise Correct Answers |
|---|---------|------------------|---------------|------------------------|
| “Compare the characters”  |         |                  |               |                        |
| “Compare the characters”  |         |                  |               |                        |
| “Compare the characters”  |         |                  |               |                        |
| IOA (# of agreements on student responses/by the number of agreements + disagreements X 100): |         |                  |               |                        |
| PR (# of observed behaviors/the number of planned behaviors):                                 |         |                  |               |                        |

Student name:  
Start time:

Date:  
End time:

|  |        |  | Ind. | Verbal | Visual | Model | Physical | Provides 5s response interval after each prompt | Provides correct consequences |
|--|--------|--|------|--------|--------|-------|----------|---|-------------------------------|
| Materials ready?   | Y or N |  |      |        |        |       |          |   |                               |
| Attentional cue given?   | Y or N |  |      |        |        |       |          |   |                               |
| Ensures attentional response?                                    | Y or N |  |      |        |        |       |          |   |                               |
| Instructional session completed?                                 | Y or N |  |      |        |        |       |          |   |                               |
| Passages read aloud?   | Y or N | IOA (# of agreements on student responses/by the number of agreements + disagreements X 100) = |      |        |        |       |          |   |                               |
| Student points to pictures on storyboard while stories are read? | Y or N | PR (# of observed behaviors/the number of planned behaviors):                                  |      |        |        |       |          |   |                               |

Participant Name: \_\_\_\_\_ Condition: Baseline/Generalization/Maintenance

Session #: \_\_\_\_\_

Date: \_\_\_\_\_

Time Begin: \_\_\_\_\_

Time End: \_\_\_\_\_

+ = correct response - = incorrect response 0 = no response

|                    | Student: |
|--------------------|----------|
| Compare Characters | + - 0    |
|                    | + - 0    |
|                    | + - 0    |
| % of +             |          |
| % of -             |          |
| % of 0             |          |
| Notes:             |          |

## Intervention Data Sheet

Participant Name: \_\_\_\_\_

Session #: \_\_\_\_\_

Date: \_\_\_\_\_

Time Begin: \_\_\_\_\_

Time End: \_\_\_\_\_

+ = correct, independent response V = verbal prompt VI = visual M = model P = Physical

prompt

|         |   |   |    |   |   |
|---------|---|---|----|---|---|
|         | + | V | VI | M | P |
|         | + | V | VI | M | P |
|         | + | V | VI | M | P |
| % of +  |   |   |    |   |   |
| % of V  |   |   |    |   |   |
| % of VI |   |   |    |   |   |
| % of M  |   |   |    |   |   |
| % of P  |   |   |    |   |   |
| Notes:  |   |   |    |   |   |



Appendix B: Sample Adapted Text

## Best Friends

<sup>1</sup>Kevin and Christopher are best friends.






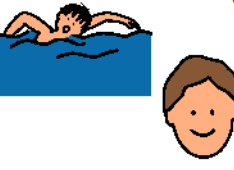
<sup>2</sup>Kevin has one brother. <sup>3</sup>Christopher has one

sister. <sup>4</sup>Both Kevin and Christopher are 8

years old. <sup>5</sup>Kevin is good at soccer. <sup>6</sup>

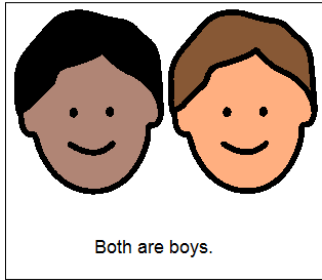
Christopher is an excellent swimmer.

## Appendix C: Sample Storyboard

|   |  |  |   |
|---|--|--|---|
| <p>1</p>  <p>Kevin and Christopher are best friends.</p> | <p>2</p>  <p>Kevin has 1 brother.</p>           | <p>3</p>  <p>Christopher has 1 sister.</p> | <p>4</p>  <p>Both Kevin and Christopher are 8 years old.</p> |
| <p>5</p>  <p>Kevin is good at soccer.</p>                | <p>6</p>  <p>Christopher is a good swimmer.</p> |  |   |

Appendix D: Sample Question and Answer Choices

1. Compare Kevin and Christopher. How are they the same?



**Appendix E: Photo of Graphic Organizer**



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