Effective methods for adapted text learning for students with mild to severe intellectual disabilities: Differentiating character comparisons

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Abstract Teaching students with mild to severe intellectual disabilities who are early readers or non-readers to interact with grade-level literature is difficult. This article outlines research-based teaching methods for early readers and non-readers who have moderate to severe intellectual disabilities and need modified texts and text comprehension instruction. The study’s overarching goal was to evaluate the efficacy of a System of Least Prompts (SLP) procedure and a visual organizer in helping first-grade children with mild to severe intellectual disabilities learn the academic literacy criterion of character comparison. These methods may help instructors create resources and guidelines to encourage student involvement with altered literature. To assess the outcomes, various participants are probed in different ways was utilized. The findings showed that one student learned the skill well using the least graphic organizers and prompts intervention strategy. For two more students, the intervention worked well with some adjustments. All participants kept the ability and applied it generally. Future research directions are considered, as well as any practical ramifications. The research on academic content acquisition and students with MSID is furthered by the findings of this study. Through methodical training and the usage of a visual organizer, students with Mild and severe Intellectual disability were able to replicate prior academic studies in teaching by making quantifiable progress in the learning of a reading benchmark. By being the first to instruct primary pupils with MSID in the standard of character comparison, this research also advances the literature.

Keywords: primary students, MSID, SLP, adapted text, visual organizer

1. Introduction

In the last ten years, there has been a focus on Academic material, criterion-referenced tests, and teaching for children with Mild to Severe Intellectual Disabilities (MSID) in public school education (Griffen 2017). This demographic of children is required to have access to the common studies lessons and be held responsible in state alternative examinations as mandated by the Each Student Success Act and the reauthorization of the Students with Disability Education Act (Yell 2017). Special education teachers strive to use the most relevant, effective, efficient, and instructive methods for teaching academic standards as researchers develop new evidence-based methods (Figure 1).
Researchers and educators have created strategies for adapting and training academic standards, such as literacy requirements, so students with MSID may take part in the common education curriculum (Parsons et al. 2018). According to current best practices and study, students with MSID have developed their literacy skills using a variety of teaching methods, such as adapted texts that are aligned to grade-appropriate texts, task analysis and read-aloud, shared story reading, the use of visual organizers and methodical teaching that includes response prompting techniques like continuous time lag and the least prompts system. The SLP and a visual organizer have been utilized by researchers as a therapy package to impart academic material. The SLP is a response prompting technique that has been effectively utilized to train academic literacy skills in people with MSID (Griffen 2017). It has also been widely used to educate people with developmental disabilities. With the use of visual and spatial displays that group and illustrate the connections between the topics being learned, graphic organizers help students understand the knowledge being presented. This study's objective was to evaluate an SLP's effectiveness and the use of a visual organizer that was part of the prompt hierarchy. While instructing primary school-aged children with moderate intellectual impairments in the academic literacy benchmark for text comparison.

2. Literature Review

Shurr and Taber-Doughty (2017) examined the efficacy of the Picture plus Discussion (PPD) intervention to improve the understanding of expository texts by higher secondary school students with mild impairments. Spooner et al. (2019) were to analyze the literature published since 2005 that focuses on the application of evidence-based practice (EBP) principles to the process of teaching mathematics to students with moderate to severe developmental disabilities. Weiss et al. (2018) focused on the skills, knowledge, and attitudes required of instructors as they examined the need for educating children with moderate and severe intellectual impairments in inclusive and special education settings. The purpose of the research was to look at the children’s routine physical activity. Wouters et al. (2019) comprised 68 children and adolescents (2–18 years old) with moderate–severe intellectual disabilities. Knight et al. (2020) aimed to summarize current scientific education studies for children with intellectual disabilities and intellectual disability/autism (2009–2018). Wouters et al. (2020) examined the connection between physical activity and motor development and physical fitness in children with intellectual impairment (ID) and evaluated their health-related physical fitness.

Kapsal et al. (2019) aimed to quantify the positive physical and mental health benefits of exercise for young people with intellectual disability. Hodge et al. (2018) aimed to examine the perspectives of physical education instructors in Brazil on their practice of educating children with special needs. Adeniyi and Omigbodun (2016) goal was to find out how social skills training for students with intellectual disabilities attending a special school in Southwest Nigeria affected them. Cook and Rao (2018) focused on that secondary school instructors may create and adapt successful strategies for students with learning disabilities (LD). These children need rigorous interventions to enhance skills (such as reading comprehension and decoding) and access to grade-level material. Lee et al. (2015) was to analyze the perspectives of Hong Kong’s preschool instructors (N = 410). Among educators, support for inclusion is reportedly low. Inclusion of students with intellectual disability, visual, auditory, or speech and language impairments was supported more strongly by educators with special education training, regardless of their position in the school.

3. Materials and Methods

In the Southeast region of the United States, a student attends a suburban elementary school. The total strength of 550 preschools through fifth grade was the source of three participants. Participants had to meet certain criteria to be considered for the study, including the following: Three students, two females, and one male, met this criterion: (i) getting special education services below the state’s MSID varieties; (ii) registered initially via fourth grade; (iii) being capable of openly selecting an established stimulus from a list of three or more responses within a few seconds; (iv) using symbolic language for communication purposes; (v) consistently present at school; (vi) having signed informed parental consent; and (vii) participating in a research study. Table 1 contains demographic data for each participant. These three students are designated here as A, B, and C, respectively.

Student A:

Student “A” performed well below average on the Children’s Kaufman Assessment Battery. Scores on the Vineland Adaptable Behavior Scale for adaptable behavior were in the first percentile or the lowest possible range. “A” received a combined score of 47 reading comprehension and letter/word recognition scores on the Kaufmann Test of Educational Progress which indicates that their overall reading abilities are at a very low level. Katie was proficient in reading short passages including well-known sight words, writing personal information, and recognizing all letters and numbers up to 50. She was unable to finish mathematical puzzles and speak audibly in new situations or with new people. In the resource special education classroom, Katie received lessons in reading, arithmetic, and vocational skills.

Student B:
The Preschool and Primary Wechsler Scale of Intelligence results for student B were exceedingly her age-appropriate overall intellectual functioning was below average. The VABS ratings for adaptive behavior were in the 1 percentile. For Cassie, no reading test results were provided. Cassie could count to three on the Brigance Complete Assessment of Basic Skills II and would sometimes use the words "who" or "where" in her queries. The majority of alphabet letters could be said out loud by her. She needed assistance to keep on track since she couldn't say her name or recognize common colors. In the resource special education classroom, "B" got training in reading, arithmetic, and vocational skills.

**Student C:**

The scores on the KABC for Student C were very low range. According to a student with MSID, their adaptive behavior scores on the VABS were in the one percentile. Bobby didn't have any reading test results. When Bobby was administered the Bayley Scales of Infant Development, he demonstrated the ability to pay attention to visuals, make deliberate actions to get something, orient to noises, looks for missing things, picks up objects, and put them in a container. "C" took science and math courses in the general education setting with paraprofessional assistance, and acquired training in reading, arithmetic, and vocational subjects in the special education environment. Four years ago, he arrived in the country as an English language learner.

<table>
<thead>
<tr>
<th>Name of the student</th>
<th>Age and grade</th>
<th>Analysis, categorization</th>
<th>IQ level</th>
<th>Behavior adaptability index</th>
<th>Time spent studying MSD daily</th>
<th>Skill ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>9 years old, 4th grade</td>
<td>MSD, ELL</td>
<td>48&lt;sup&gt;a&lt;/sup&gt;</td>
<td>63</td>
<td>3</td>
<td>Provides spoken responses to questions testing reading comprehension by reading simple sight words or pointing to possible answers. Reads simple sight words, describes, or points to answers, but has trouble remembering and generalizing what they've learned. Shows interest in books and reading, recognizes letters and sounds, and can read some simple words.</td>
</tr>
<tr>
<td>B</td>
<td>7 years old, 1st grade</td>
<td>MD</td>
<td>46&lt;sup&gt;h&lt;/sup&gt;</td>
<td>47</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>10 years old, 4th grade</td>
<td>MD, ELL</td>
<td>3-year-old range of development</td>
<td>48</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

**Other students:**

The first author was the participant's special education teacher and the study's lead investigator. She possessed a special education bachelor’s degree, was enrolled in a master’s program for teacher leaders in special education with an emphasis on MSID, and had worked as an MSID classroom teacher for nine years. Two undergraduate practicum students and one paraprofessional from a special education classroom data on dependability were gathered throughout the study sessions. Both individuals are knowledgeable in organized instruction and gathering data from student replies.

3.1. Text selections and a picture storyboard

Ten text options that the researcher adjusted made up the materials. Each option was limited to one page and 100 words. The researcher chose sections from picture books and workbooks that had grade-level content, and then she edited them by reducing the text's length and adopting a more formal language. The options were printed on letter-sized paper in black text with no graphics and simple words. Each sentence had a number. According to the Lexile Framework for Reading, the range of the Lexile measure was from 270L to 600L, which corresponds to a first- to third grade understanding level. The collection included works of fiction and nonfiction equally. Each revised text selection included a story involving two people, allowing for in-depth comparative research. The second writer offers a comprehensive reference that includes reading levels, Lexile measures, and grade equivalencies. Each word option was accompanied by an image storyboard. On a piece of paper that measured 11 cm by 28 cm, the storyboard featured one image for each phrase of the chosen text. Using the Board Builder program, color-printed images were created for the storyboard. Under each image, a sentence with a number that matched the phrase from the text was printed in black script. As the investigator read the material aloud during research sessions, she noted the matching image on the storyboard.

3.2. Pictures and a visual organizer

Training and the SLP prompting hierarchy both made use of a visual organizer (Venn diagram) to visually arrange the information. Every surface of the Venn diagram was named after characters from the chosen literature. To emphasize its
significance, the overlap region of the Venn diagram was given the color yellow. A laminated Venn diagram with Velcro fasteners was used so that images could be affixed to the diagram's edges and overlapping regions. The people and objects in each text were represented by colored illustrations that were laminated and had Velcro straps connected to the back. The visual organizer was shown on a slant board throughout each session.

3.3. Conceptual Model and Choices for answering questions

There were three questions for each text choice with four possible answers that requested comparisons between the text's characters. On a letter-sized sheet of paper, one question and four possible answers were put in black type. Below the question were the four possible answers. Each possible answer included a colorful image and a statement that went with it in black text. The images on the answer choices and the storyboard were identical. The right response, two logical answers, and an improbable response were the options for the answer.

3.4. Study Design

This research used a variety of probes across participants' designs to evaluate the performance of SLP and visual organizers as pedagogical tools for improving reading comprehension. At the start of the research, each participant got probing trials. The intervention condition began with that individual after all layers of data were stable. The intervention was time lagged between the second and third participants before it was put to use, and irregular probes were conducted at untrained levels. A therapeutic shift from the starting point until the intervention for all three topics serves as an illustration of experimental control as it only takes place when the intervention is made available.

3.5. Data collection and dependent variables

The percentage of accurate, independent answers to reading comprehension questions requiring students to compare characters from an altered book served as the dependent variable. Student answers were recorded on a trial-by-trial data sheet throughout each session. All participant responses were graded as either correct, incorrect, or no response. The amount of prompting used during intervention sessions that produced the right answer on each trial was recorded by the researcher. For three sessions in a row, the standard was set at 100% accurate independent responding.

3.6. Procedures

This research provides a comprehensive look at four distinct sorts of procedures: probing procedures, intervention procedures, maintenance procedures, and generalized procedures.

3.6.1. Probe procedures

All participants' probe data were gathered at the beginning of the research, and the untrained individuals' data were gathered sporadically after that. Per the probing session, each participant performed three trials, each of which consisted of questionnaires referring to various ways the characters in the text were similar. The following was the order of the probe process trials: It's time to read a narrative, the investigator said, directing the participant to the teaching space. Welcome to the table, please. To signal preparedness for teaching, the participant had to provide an attention response. We're going to create a picture as we read, the investigator said. You may use it to aid in your response to the story's concluding questions. The researcher randomly selected a section of the altered text and read it to the participant while pointing to each image that represented a different section of the tale on the storyboard. To make sure the participant was paying attention, the investigator put similar images on the Participants were provided with a Venn diagram on a slanted board. While she pointed to the storyboard. Depending on whether the image linked to one of the characters or both, each visual was either put on the left, the right, or an overlapping section of the Venn diagram. Compare and the investigator commanded after the narrative had been read. "How are they the same?" she said, displaying the choice sheet for the question and answer. The subject was given a 5-second response window and the researcher read out each possible response to them. The investigator gave repercussions in response to the participant's answer. The investigator offered generic compliments (such as "Great" and "Good job") for accurate replies. The investigator offered encouragement for attendance and focus when subjects gave wrong or no answers (example: "Good job looking at the pictures."). The following trial was then provided after a delay of one to five seconds. During the probing sessions, a total of three questions were posed.

3.6.2. Intervention procedures

Participants were taught to compare characters in an altered text using an SLP process by the teacher. Before each instructive session started, the teacher chose a storyboard and an adaptation of a text at random. Participants were requested to attend the lecture and demonstrate their readiness, much like in probing sessions. The investigator then gave a quick tutorial on character comparison using a sample text. During the mini-lesson, the teacher initially randomly selected a passage from a modified text before displaying the larger Venn diagram in front of the students on the slant board. The
instructor went on to explain where on the diagram the illustrations of the "same" traits would be located ("If I want to know how two characters are the same, where should I look?"). She then instructed the pupil to indicate the Venn diagram's overlapping region. The instructor then read the student's choice of the altered text while positioning related images on the Venn diagram to aid in understanding and pointing to the storyboard. The instructor waited and examined how the characters were the same before placing a graphic in the overlapped space.

Following the completion of the mini-lesson, the researcher picked a different text selection at random, read it to the student, pointed to the storyboard to aid understanding, and added relevant images to the visual organizer as she read. The instructor stopped after placing a graphic in the diagram's overlapped area and made a comparison (for example, "Tigers and lions are both huge cats.) They are similar in this way. You may use the Venn diagram we drew together to assist you to reply your questions, the investigator added after reading the participant the question and response possibilities. Put (one character) and (another character) side by side. How are they comparable? The researcher recited the statement that went with each option while pointing to each response choice. After giving the subject 5 seconds to react, the researcher went through a hierarchy of prompts that were offered as required depending on their responses, going from the least to the most support. After asking the question, the researcher gave the subject 5 seconds to think it over before responding. When a question was answered incorrectly or not at all, the investigator remarked, "Wait if you need help," gave the following prompt, and waited for a response for five seconds. This pattern persisted until the participant provided a suitable answer or the whole hierarchy of prompts had been exhausted. If the subject replied properly at any stage of the hierarchy of prompts, the researcher gave particular verbal praise (for example, "Yes, you are right! Big cats include both tigers and lions. They are similar in that way. The instructor said, "Look!" and pointed to the image that matched the right response on the Venn diagram. You made the ideal decision.

3.6.3. Maintenance procedures

While some participants were getting training or participating in probe sessions, the investigator administered maintenance probes to those who had met the criteria at least once every two weeks. Maintenance probes were run once a week after all three students had acquired the skill. The same processes as in probe procedures were used to perform maintenance probes.

3.6.4. Generalization procedures

The investigator administered a generalization probe to participants twice: once before the intervention and once after they satisfied the criteria. Except for a fresh text selection that had never been used before throughout the research, generalization probe techniques were the same as those for probe and maintenance.

3.7. The reliability

In every setting of the experiment, procedural fidelity checks were performed. The observer gathered information on the following investigator behaviors throughout the probe, intervention, maintenance, and generalization sessions: Materials should be ready, attention cues should be given and responses ensured, the Venn diagram should be placed on the table, participants should be told they can utilize the Venn diagram to assist the response to the questions, the passage should be read aloud, students should be encouraged to point and look at the pictures on the storyboard, a response interval of five seconds should be used, and correct responses should be given for student responses. 27% of all probe, intervention, and maintenance sessions had IOA and process fidelity data gathered. IOA and procedural fidelity have an overall dependability agreement that was 100%.

4. Result and discussion

The percentage of accurate independent replies for Student "A" is shown in Figure 2. In the first probe scenario, a student may choose the right answer out of four alternatives just by chance since the task needed a receptive response. With an average of 27.5% accurate independent replies, Katie chose the right answer. She had an instantaneous improvement in level at the introduction of the intervention, moving to 66% correct independent replies; nevertheless, her responding varied throughout the remainder of the condition until she attained criteria in 13 sessions.

The percentage of accurate independent replies for student "B" is shown in Figure 3. "B" exhibited reliable zero-celebrating data in the first and intermittent probing sessions but either chose the wrong answer on each trial or did not reply. Once Katie had met the requirement, she was given the intervention condition. Her proportion of independently right replies rose when the intervention was introduced, but responding was inconsistent and demonstrated a lack of development.

The percentage of accurate independent replies for student "C" is shown in Figure 4. The C had consistent and zero-celebrating data in the first and intermittent probing sessions because he either gave inaccurate or no replies throughout the response interval. The investigator worried that "B" would not go back to school and be able to finish the intervention,
therefore C's intervention started before Cassie met the criteria. She thus did not want Bobby to endure an undetermined period of no therapy. However, "B" was reacting 66% to 100% over probe levels when "C" started the intervention.

![Figure 2](image2.png)

**Figure 2** The percentage of accurate independent replies for Student “A”.

![Figure 3](image3.png)

**Figure 3** The percentage of accurate independent replies for Student “B”.

![Figure 4](image4.png)

**Figure 4** The percentage of accurate independent replies for Student “C”.

4.1. Delivered promptly levels

Depending on how each participant responded, the teacher varied the frequency of prompts throughout the prompt hierarchy for each participant. Katie got at least one prompt from each level of the prompt hierarchy during each educational session, but she never needed the physical prompt. For her to reply appropriately, she often required a verbal cue prompt from the researcher, who informed her of the pertinent stimuli to pay attention to. For Cassie to respond correctly, she needs to see every prompt at least once. The model and vocal prompt were the prompts that were given to Cassie over most sessions and yielded a successful reaction. Bobby too needs all of the hierarchy's instructions to respond correctly. The visual and verbal cue, the model and verbal prompt, and the reminder to look at the Venn diagram and to note the similarities
between the characters were the most commonly used prompts for Bobby. Table 2 lists the quantity and percentage of cues given to participants during instructional sessions.

Table 2 Total number and percentage of each kind of prompt used during intervention sessions.

<table>
<thead>
<tr>
<th>Students</th>
<th>Prompt given verbally</th>
<th>Prompt given verbally and visually</th>
<th>Illustration and admonition</th>
<th>Physical prompt</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>n =10; 25%</td>
<td>n = 2; 3%</td>
<td>n = 2; 7%</td>
<td>n = 0; 0%</td>
</tr>
<tr>
<td>B</td>
<td>n =11; 13%</td>
<td>n = 11; 12%</td>
<td>n = 14; 17%</td>
<td>n = 2; 3%</td>
</tr>
<tr>
<td>C</td>
<td>n = 5; 8%</td>
<td>n = 6; 13%</td>
<td>n = 6; 11%</td>
<td>n = 1; 2%</td>
</tr>
</tbody>
</table>

The results demonstrate that a visual organizer used in an SLP approach was beneficial in improving the level and trend in primary pupils with MSID’s ability to contrast two characters from adapted texts. The above instructions, with a few modifications, were successful for "A," "B," and "C." Children with MSID were taught how to utilize a visual organizer and respond to comparison questions of characters in the modified text, and the results showed that the SLP was successful. Of all participants, two students who modified the textual processes and one student who made no modifications met the requirements with the addition of an SLP and a visual organizer. The findings show a functional link between SLP, visual organizer presentation, and participants’ capacity to respond to questions concerning character comparisons in the modified text. The abilities were retained by all three individuals. Three people (Katie, Cassie, and Bobby) were capable to transfer these abilities to a novel tale with 99% accuracy, although Bobby could only execute it with a 66% accuracy rate.

5. Conclusion and Implications

The research on academic content acquisition and students with MSID is furthered by the findings of this study. Through methodical training and the usage of a visual organizer, students with Mild and severe Intellectual disability were able to replicate prior academic studies in teaching by making quantifiable progress in the learning of a reading benchmark. By being the first to instruct primary pupils with MSID in the standard of character comparison, this research also advances the literature. This research does have certain limitations. Due to the time restrictions of the school year’s conclusion, social relevance data were not gathered. It is impossible to assess the social validity of the objectives, methods, and results of this study, even if these processes are comparable to those used in related research. Future studies should look at the selection and use of visual organizers in the academic standards instruction of students with MSID.

Ethical considerations

Not applicable.

Declaration of interest

The authors declare no conflicts of interest.

Funding

This research did not receive any financial support.

References


