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## COMPARATIVE EFFECTS OF WORDS PLUS PICTURES AND WORDS ALONE ON THE READING COMPREHENSION OF YOUTH WITH DISABILITIES

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COMPARATIVE EFFECTS OF WORDS PLUS PICTURES AND WORDS ALONE  
ON THE READING COMPREHENSION OF YOUTH WITH 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 Education in the  
College of Education  
at the University of Kentucky

By

Lindsay Caudill

Lexington, Kentucky

Director: Dr. Melinda Ault, Professor of Special Education

Lexington, Kentucky

2021

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## ABSTRACT OF THESIS

### COMPARATIVE EFFECTS OF WORDS PLUS PICTURES AND WORDS ALONE ON THE READING COMPREHENSION OF YOUTH WITH DISABILITIES

This study compared the effectiveness and efficiency of two instructional conditions on the reading comprehension of fifth and sixth grade students with moderate and severe disabilities. A words plus pictures and words alone condition were examined through the use of an adapted alternating treatment design replicated across 3 participants. Results indicated that the effect was minimal, with words plus pictures being slightly more effective.

KEYWORDS: [moderate and severe disabilities, reading instruction, comprehension, words plus pictures, and picture supports]

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Lindsay Caudill

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11/17/2021

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Date

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## SECTION 1: INTRODUCTION

Recent legislation including The No Child Left Behind Act (NCLB, 2002), Every Student Succeeds Act (ESSA, 2015), and amendments to the Individuals with Disabilities Education Improvement Act (IDEA, 2004), emphasizes teaching students with disabilities to read and gain access to core content curriculum (Edmonds et al., 2009). The educational focus for students with disabilities has historically lacked in teaching this population fundamental literacy skills. The National Reading Panel (NRP, 2000) found that the best approach to reading instruction incorporates explicit instruction in phonemic awareness, phonics instruction, methods to improve fluency, and methods to enhance comprehension.

For students with moderate and severe disabilities (MSD), reading instruction has not traditionally focused on all areas recommended by the NRP (2000). Rather, instruction in isolated sight words has been the primary focus of literacy research (Browder et al., 2006). Teaching sight word reading however, does not incorporate the imperative skill of understanding what is read (Edmonds et al., 2009). According to O'Connor and Klein (2004), reading comprehension involves being able to read and understand written text. Failing to understand what we read can lead to a breakdown in comprehension. According to Chiang and Lin (2007), to be able to read and understand written text broadens learning opportunities, improves communication, and is an important skill for functioning independently in society. The ability to read influences success in school, employment, and general quality of life (Allor et. al., 2009). Reading skills are linked to a range of important outcomes including success in postsecondary education and holding competitive employment (Wei et al., 2011). Literacy skills afford individuals control over their independence and choices in life. Unfortunately, students with MSD often leave school

and enter society without the necessary skills to be included in the workforce or live an independent, meaningful life.

The U.S. Bureau of Labor Statistics (2021) reports that approximately 8 in 10 individuals with disabilities are not in the workforce, meaning that these individuals do not hold a job and are not looking for a job. Specifically, according to the Kentucky Post School Outcomes Annual Report (2021), only 6.5% of former Kentucky students classified as having a functional mental disability (FMD) hold competitive employment. Only .6% of this sub-group attends higher education. Comparably, 14.7% of students classified as having autism hold competitive employment. Although 20.1% of these students attend higher education, 52.5% are non-engaged, meaning they are not competitively or otherwise employed or attending any form of higher education. This report also revealed that students who exit high school with an alternate diploma or age-out have the lowest percentage of successful outcomes. This may suggest that educators, parents and other stakeholders may not be practicing the most effective strategies that will prepare students with significant disabilities with the critical skills they need for a meaningful post school outcome (Kentucky Post School Outcomes, 2021).

Because students with MSD often have receptive and expressive language deficits, comprehension is of critical importance and can be challenging to teach and assess (Orlando & Ruppert, 2016). Browder et al. (2006) found that interventions to teach students with disabilities were often addressed in the context of a functional activity or in the natural environment. The functional skill in literacy is to gain meaning from text (Browder, 2009). Sight words are often taught in a functional context, but few studies include any assessment of comprehension after sight word instruction (Browder et al., 2006). In order for students

to apply comprehension skills when reading passages or listening to read alouds, they need expanded strategies such as answering *wh* questions (who, what, when, where, why). Morgan et al. (2009) found that questioning is a core strategy that educators used to facilitate understanding. They recommend the use of *wh* questions to elicit retelling.

Limited research is available in teaching comprehension strategies effectively to students with MSD (Knight & Sartini, 2015), however, there is preliminary evidence that suggests adding pictures to the text in books may increase reading comprehension for students with severe disabilities (Rankin et al., 1994). Research by Browder and Lalli (1991) supports the use of the paired-associate strategy, in which a student learns to read sight words by repeatedly being presented with the words paired with pictures. Adding visual supports such as picture symbols to text has limited, but promising research. Shurr and Taber-Doughty (2012) studied the pairing of pictures with text in literacy instruction and the effects on the comprehension abilities of middle school students with MSD. Participants were presented with a picture symbol strip depicting five pictures both before and after a text was read aloud to them. Researchers used the pictures to review the text before students answered questions relating to the passage. Results indicated an increased accuracy in comprehension tasks for all participants.

Hudson et al. (2013) discussed different ways to adapt text for learners who are still learning to read or gain meaning from text. One strategy they described to support access to grade-level texts includes augmenting the text which may incorporate a repeated story line, adding symbols above text, or attaching actual objects to book pages. Hudson et al. (2013) also recommended providing a predictable structure for readers or rewriting the text

as a summary by either reducing the Lexile level, lowering the number of words, or adding definitions when necessary.

Jones et al. (2007) studied the comprehension of reading passages for adults with learning disabilities. Adults with disabilities read passages with or without picture symbols and then were asked questions after reading to test their comprehension. Researchers compared comprehension scores from plain text and symbolized text passages. A within-subject counterbalanced design of the addition of picture symbols to the text was applied. Results of the study indicate that symbolized text provided positive effect on participant's comprehension scores. Jones et al. also found that participants who had lower reading skills displayed further improvement from the addition of the picture symbols.

In contrast, Worah et al. (2015) compared the identification of 10 early emerging concept vocabulary terms by 2 to 3-year old children when using symbols from commercially available symbol sets and a developmentally appropriate symbol set (created during the study). Previous research in enhancing augmentative and alternative communication (AAC) technologies suggest that symbols should be bright, colorful, appealing, and include entire scenes, not isolated pieces or parts of events or activities (Light & Drager, 2007). The developmentally appropriate symbol set was created based on guidelines from previous research and addressed conceptual issues by displaying whole people/objects embedded in familiar activities in which children typically participate. These symbols were colorful scenes, with smooth shapes and smiling faces when applicable. The vocabulary terms chosen for the study are acquired by typically developing children between the ages of 1-2 years. These vocabulary terms, (e.g., who, more, come, etc.) were abstract concepts that are difficult to represent pictorially. Results of this

research found that typically developing children performed better when asked to identify vocabulary from the developmentally appropriate symbol set when compared to identifying vocabulary from a commercially available picture communication symbol set. This study explored the need for a different type of vocabulary representation rather than the commonly used and commercially available picture symbols. The developmentally appropriate symbol set captured student's background knowledge and personal understandings whereas current AAC systems and picture symbol software available for children/adults with complex communication needs are based on adults conceptual understanding and require language skills for the user to interpret. Practitioners are widely using these commercially made graphic symbols.

Technological applications and software have made many contributions in supporting literacy development for students who have disabilities (Anderson et al., 2008). The number of commercially available applications and software being marketed to teachers is constantly on the rise. With so many available options, schools may be underutilizing the extensive range of tools that are currently available to support, modify and adapt literacy materials (Parette et al., 2008). Parette et al. (2008) outlined the Writing with the Symbols software as an available option for teachers to enhance the literacy skills of their students. Writing with Symbols (Widget Software, n.d.) inserts a picture symbol above words when typed into the software. Boardmaker, (Tobii Dynavox, 2021) a similar platform, gives teachers and other professionals the ability to create, edit, and share materials using their library of over 45,000 picture communication symbols (PCS). Boardmaker enables practitioners to create symbol-supported text for their students. These

symbols often are used to support individuals in their ability to communicate and learn, however more research is needed on their effects in facilitating comprehension.

## SECTION 2: RESEARCH QUESTION

In many published curriculum and teacher made materials, commercially available graphic symbols are used. Teachers are using symbol-supported text to teach their students with severe disabilities, but there is little evidence to support its use in the literature. With several software options available for purchase or subscription, additional research must be conducted to compare the effects of symbol-supported text and words alone on comprehension of text. Therefore, the research question addressed in this study is: What are the effects of a words plus picture symbols condition when compared to a words alone condition on the comprehension of frustrational level text for fifth and sixth grade students with MSD?

## SECTION 3: METHODS

### **Participants**

The participants in this study included three males. To be included in the study, all participants must (a) have been receiving special education services in a resource room for students with MSD, (b) been enrolled in fifth or sixth grade, (c) had regular school attendance, (d) had signed informed parental consent, and (e) provided student assent. Following a review by the Office of Research Integrity, we followed all ethical standards of rigorous single case research.

#### Inclusion Criteria

Prerequisite skills for the study included attending to auditory and visual stimuli for a minimum of 5 min; the ability to communicate a selected response from a choice of 3 by either pointing, circling, or stating an answer; the ability to accurately respond to *wh* questions for known topics; and the ability to read at least 20 words on a Pre-Primer sight word list. Prerequisite skills were assessed through direct observation during classroom activities. Prior to the start of the study, all participants had a history of learning using error correction strategies and were familiar with reading words paired with picture symbols. Participants had verbal imitation skills. All participants had goals relating to answering comprehension questions on their individual education program (IEP).

#### Students

David was an 11-year-old male who received special education services under the disability category of autism spectrum disorder. Due to David's transfer of school districts,

no cognitive assessment scores were available at the time of the study. David spent 50% of the school day in general education settings including core content, special classes, lunch, and recess. He attended core content classes with an instructional assistant and attends lunch, specials, and recess independently. He spent the remainder of his school day in the MSD resource classroom. David received school-based occupational therapy (OT) and speech services. David had an IEP with goals in the area of reading, writing, math, and adaptive skills. David had goals to read independently and to answer comprehension questions related to a text. David could follow 2-3 step commands with minimal prompting. He could read and write at least 75 frequently used sight words and can answer *wh* (who, what, when, where) questions relating to simple reading passages. He had difficulty responding to *wh* questions when the passage is more complex. David becomes frustrated during work that he finds challenging or when someone does not understand what he is saying. He would often cry or become unresponsive (e.g., withdraw, angrily express that he is sick, put head down, ignore) if he responded incorrectly or was not understood. David communicated using vocal speech in full sentences. He could communicate all functions of communication (requests, protests, comment, etc.), however due to multiple speech sound errors and cluttering of speech, his overall intelligibility was poor to familiar and unfamiliar listeners, even if the topic was known. He benefits from the use of a pacing board to assist slowing his rate of speech and when producing multisyllabic words. David could follow multi-step directions, generalize some basic skills across settings, but has difficulty with grade-level material and vocabulary. David could answer basic *wh* comprehension questions given answer choices with an average of 80% accuracy.

Sam was an 11-year-old male who received special education services under the disability category of other health impairment (OHI). Sam had a primary diagnosis of attention-deficit/hyperactivity disorder (ADHD) and his secondary disability included sensory processing disorder (SPD) and hypotonia. Sam received a score of 63 on the *Wechsler Intelligence Scale for Children-Fifth Edition* (WISC-V; Wechsler, 2014). This score falls in the extremely low range when compared to same aged peers. Sam's adaptive behavior was assessed using the *Adaptive Behavior Assessment Scale 3<sup>rd</sup> Edition* (ABAS-3; Harrison & Oakland, 2015). Based on his classroom teacher's evaluation, his adaptive behavior falls in the extremely low range with a general composite score of 72. Sam spent less than 40% of the school day attending general education programs including core content and special classes. He spent the remainder of his day in the MSD resource classroom. Sam received school-based OT services every month. Sam had an IEP with goals in the area of reading, writing, math, and adaptive skills. He had goals to read a passage independently, read sight words, and answer comprehension questions related to a passage. He could identify 10-20 frequently used sight words and is could read on a kindergarten grade level based on the Reading A to Z (RAZ) correlation chart (LAZEL, 2021). Sam required verbal praise, positive reinforcement, and encouragement from adults to put forth effort in challenging tasks. He could follow simple 1-2 step directions and he was able to communicate his wants, needs, thoughts and ideas using oral speech and full sentences.

Harry was an 11-year-old male who receives special education services under the category of autism spectrum disorder. Harry had a medical diagnosis of Autism. Due to his history of language difficulties and his Autism diagnosis, Harry was assessed using the

Nonverbal (NVI) model of the *Kaufman Assessment Battery for Children, Second Edition, Normative Update* (KABC-II-NU; Kaufman & Kaufman, 2018), receiving a score of 67. This score falls in the lower extreme range. Harry's adaptive behavior was assessed using the ABAS-3. Based on his classroom teacher's evaluation, his adaptive behavior fell in the extremely low range with a general composite score of 55. Harry spent less than 40% of the school day attending general education programs including core content and special classes. He spent the remainder of his day in the MSD resource classroom. Harry received school-based speech and OT services. Harry had an IEP with goals in the area of reading, writing, math, and adaptive skills. He had goals to read a passage independently, read sight words, and answer comprehension questions related to a passage. Harry could read approximately 20 high frequency sight words and was reading at a Kindergarten grade level. After listening to a passage, Harry was answering *wh* questions related to the passage with 50% accuracy. Harry benefitted from frequent, positive reinforcement while working in the classroom. When transitioning from preferred to non-preferred activities or if a preferred item was not available, Harry often displayed aggressive behavior (e.g., hitting, kicking, screaming) which could typically be deescalated with the use of a token chart. He could follow simple 1-2 step directions. Harry could use oral speech to communicate his wants and needs through one-to-two word utterances. He was prompted to expand his utterances with the use of a core board. Harry's core communication board included 45 commonly used words across settings and activities. The words were categorized by parts of speech (pronouns were yellow, verbs were pink, prepositions were green, question words were orange, and adjectives were blue). The core board was attached to Harry's

desk, but there were larger versions available at the front of the classroom, hallway, and on lanyards around teacher's necks.

#### Others

The researcher conducted all screening, training, and best alone sessions for this study. The researcher also served as the MSD classroom teacher for the participants at the time of the study. She held a bachelor's degree in special education, a teaching certificate for moderate and severe disabilities, and had 6 years of teaching experience with fifth and sixth grade students with MSD. She is currently enrolled in a teacher leader master's program in special education. Prior to the current study, the researcher has used error correction strategies when teaching students with MSD. She frequently uses symbol-supported text programs when teaching comprehension to the students in her class. A second classroom teacher gathered interobserver reliability and procedural fidelity data throughout the study. He held a teaching degree in MSD had 3 years of teaching experience. He had experience with response prompting and error correction strategies and using symbol-supported text software.

#### **Instructional Setting and Arrangement**

This study was conducted in an intermediate school in a public school district in the southeast United States. All conditions, (screening, training, best alone) took place in the special education resource room. Each session was conducted in a 1:1 instructional arrangement with the researcher and a student. A total of eight students and three instructional assistants were non-participants but were present during the study's sessions. The special education classroom was approximately 9 meters by 11 meters in size. During study sessions, the students and researcher sat in chairs at a kidney-shaped table in the front

of the classroom in a 1:1 arrangement. Non-participants were in the classroom completing academic tasks and were monitored by instructional assistants and the second classroom teacher. No other students sat at the same table as the student being taught during study sessions. During reliability sessions, the reliability observer sat at the table with the student and researcher. Additional students in the room were supervised by instructional assistants and were engaged in academic work tasks. Distractions were controlled for with the use of a partition between the table and the other side of the classroom.

### **Materials and Equipment**

The needed materials for this study included leveled passages from the RAZ curriculum (LAZEL, 2021) and Boardmaker software. The RAZ curriculum was selected to use throughout this study as it has been adopted and purchased for use by the school, and because it provides a leveling system that has an assigned Lexile level, grade, and age equivalency. RAZ-leveled passages were downloaded from the RAZ website and printed on standard paper size (21.59 cm x 27.94 m). The RAZ program is a curriculum platform for reading instruction. Materials can be downloaded from the website or used while online. The researcher used the Boardmaker software to re-create these passages to include symbol-supported text for passages in the words plus picture symbols condition. Passages were typed into the Boardmaker program, and the auto-populated symbols were included above words for nouns, verbs, and adjectives. Passages in both words alone and words plus pictures condition were one page. Stories were typed in Tahoma font at 14-point font size. Appendix A provides an example of a symbol-supported text from the study. Appendix B provides an example of words alone passage from the study. Passages were printed on standard paper size. A question page was also used with each participant. Each question

page contained three questions about the specific passage participants read in their session. Question pages were printed on a standard sized printer paper. Question pages in all conditions did not include pictures. Question pages were typed using Tahoma font using 14-point font size. The arrangement of each question and answer choices were randomly assigned for each passage. Appendix C provides an example of a question page from the study. One participant, Harry, used a token board (20 cm x 14 cm) made of laminated cardstock during all sessions to earn tokens toward a reinforcer. Available rewards included edibles (e.g., M&M's, gummy bears, and Skittles), and preferred student activities (e.g., blocks, legos, drawing, fidget spinners, bean bag). A Mac Book computer was used to access RAZ curriculum and Boardmaker software. Materials were age appropriate for participants. Data sheets were used for screening, training, and best alone sessions.

### **Dependent Variable and Data Collection**

Data were collected in screening, words alone, words plus picture symbols, and best alone conditions. The primary dependent variable was percent accuracy on comprehension questions and the secondary measure was reading accuracy on a running record.

Data were collected on the dependent measure of percent of unprompted correct responses to *wh* (who, what, where) comprehension questions about a passage. According to O'Connor and Klein (2004), reading comprehension involves being able to read and understand written text. The comprehension level of each participant was assessed using an error correction procedure within a symbols plus words condition and compared to an error correction procedure within a words alone condition. Three types of responses were possible in each instructional session: unprompted correct responses, unprompted incorrect

responses, or no response. The target skill for each participant during instructional and best alone condition sessions was the same: After reading a passage, the student will correctly respond to *wh* comprehension questions with 100% accuracy for a total of 3 different passages, not necessarily in consecutive order. A correct response was defined as the student orally stating, pointing to, or circling the correct answer to a comprehension question within 3 s of the instructor asking a question. Each student's percentage of correctly answered questions was calculated by taking the number of correctly answered questions and dividing by the number of questions asked (three).

Running records were also conducted during each session to calculate the participant's reading accuracy rate as a secondary measure. Errors during reading were defined as substituting one word for a different word, omitting a word, inserting a word, or being told a word. The accuracy rate was calculated by subtracting the number of errors made by the student from the total number of words read, and multiplying by 100 (LAZEL, 2021). The accuracy rate is expressed as a percentage. Appendix D provides an example of a data sheet used to conduct a running record from the study.

### **Experimental Design**

The adapted alternating treatments design (AATD) was chosen as the design of this study because unlike the standard alternating treatment design (ATD), the AATD identifies two functionally independent but equivalent instructional sets (Sindelar et al., 1985), and compares those instructional sets with two independent variables. The AATD was chosen over other designs because it is a comparative design that can be used with nonreversible behaviors.

An AATD across two comparison conditions and replicated across three participants was selected to compare the efficiency and effectiveness of words plus picture symbols and words alone and their effect on correctly responding to comprehension questions. In AATD, two or more conditions are introduced in a rapidly alternated fashion and randomized order (VanLaarhoven et al., 2010). The AATD was developed to compare the efficiency of instructional procedures with non-reversible behaviors (Sindelar et al., 1985). Multi-treatment interference can occur when a participant's behavior is influenced by more than one planned treatment throughout a study (Ledford & Gast 2018). Multi-treatment interference was controlled for by counterbalancing the presentation of passages of words alone and words plus symbols across sessions and participants. Sessions also were counterbalanced by time of day and by ensuring no more than three consecutive sessions of the same intervention occurred in consecutive order for a single participant. Appendix E shows the counterbalance schedule used for the study that was randomly determined prior to the beginning of the study. The schedule was created by flipping a coin, with heads representing a words plus pictures session and tails representing a words alone session. Separation of treatments issues occur when two or more treatments are applied to the same behavior (Ledford & Gast 2018). The AATD solves this issue because two treatments are being implemented using two different behaviors of equal difficulty (reading passages paired with comprehension questions). To determine equal difficulty of instructional stimuli across conditions, each participant read the same level of passages in each condition, and all questions pages included one *who* question, one *what* question, and one *where* question. Answer choices were also equally difficult for each passage. Students were read the question and then provided with three response options: one correct answer, one

that was nowhere near correct, and one that was a plausible answer but incorrect. Issues related to separation of treatments were addressed by conducting a best alone condition, where only one treatment was applied. Experimental control is demonstrated in this design if there is a consistent difference in level and or trend between interventions (VanLaarhoven et al., 2010). For example, if the criterion assigned to each independent variable is acquired, but one intervention displays superiority, if the dependent variable is acquired for one intervention but not for the other, or if one is acquired more quickly than the other.

## **Procedures**

### General Procedures

This study was intended to compare the effectiveness and efficiency of symbols plus words versus words alone on the comprehension of text for students with MSD. Screening sessions were conducted first, followed by the comparison condition, and the study ended in a best alone condition. Two instructional conditions were presented to participants in a counterbalanced, alternating format. Two sessions were conducted with each student per school day during the comparison condition. Training sessions continued until there was a clear differentiation in data or until one condition reached mastery. A minimum of five sessions in each condition were conducted or until one condition reached mastery. Sessions were held in a 1:1 instructional arrangement.

### Screening Procedures

Prior to the beginning of the study, screening sessions were conducted with each participant to determine their frustrational reading level. A frustrational reading level is

defined as a reader being able to read 89% or less of the words accurately (LAZEL, 2021). The frustrational level of text was chosen for the study because the independent reading level of each participant may have been mastered quickly; and it was difficult to create *who*, *what* and *where* questions from the simplistic lower-level reading passages. One screening session took place for each participant. Each student had a goal on their IEP to read sight words and answer comprehension questions. Screening sessions were conducted in a 1:1 format with each participant. One screening session was conducted with each participant. At the beginning of each screening session, the instructor began by gaining the participant's attention and securing an attentional response. The participants were then presented with a benchmark passage in the first level (AA) of the RAZ curriculum and given the task direction, "Read the story." The instructor waited 5 s for the student to begin reading. The instructor conducted a running record as the student read. Errors were recorded at any time that the student incorrectly read a word, omitted a word, did not know a word, or inserted a word in the text. The instructor provided the correct response following any error. Each instance of self-correction as a student read was also recorded. After each participant read a leveled passage, the instructor scored the accuracy rate for that passage. If the student's accuracy rate was 90% or higher, the student was presented with the next leveled passage (A, B, etc.; successive in order) in the RAZ curriculum. The instructor continued conducting running records with each leveled passage until the participant's accuracy rate was 89% or lower. When a participant received an accuracy rate of 89% or lower, the most recently read leveled passage was selected for use throughout the duration of the study for all comprehension tasks. For example, if the participant received an accuracy rate of 89% on the level C passage, that participant was assigned a

level C for the study. Reinforcement in the form of descriptive verbal praise, edibles, or giving a token for a token chart was given to participants for attending to the task.

### Baseline Procedures

Due to the nature of the design, baseline sessions were not conducted in this study. The purpose of this study was to compare the effects of words plus picture symbols and words alone on the comprehension skills of students with MSD. In one condition, students read passages with text plus picture symbols, and in the other condition, students read passages with text alone. Conducting a baseline session was not necessary, as both of these conditions were introduced during instructional sessions in a rapidly alternating order.

### Independent Variables and Instructional Procedures

The two experimental conditions in this study were the use of words plus picture supports and the use of words alone during instructional sessions. Instructional sessions began after screening was conducted and a reading level was established for all participants. All sessions were conducted in a 1:1 instructional arrangement. The students were assessed on their reading comprehension of a leveled passage using three *wh* comprehension questions during each session. The student was asked each question one time. The instructor conducted two sessions with each participant for every day of the study. One session was conducted in the morning and one in the afternoon with at least 3 hours between sessions. The words alone condition and words plus picture symbols condition were counterbalanced, with no more than three consecutive sessions in the same condition for a single participant. Conditions were also counterbalanced across time of day (morning and afternoon), meaning there were also no more than three consecutive sessions

in the same condition occurring in a morning or afternoon. The sessions in each condition were conducted in the same format, except for reading passages were counterbalanced between passages of symbols plus text and text alone. Each reading passage was only used once, and no participant read the same passage.

Each session began with the attentional cue, “Let’s get started!” from the instructor followed by the attentional response from the student (“okay”, nodding, thumbs up, or another affirmative response). The participant was presented with a leveled story (based on their screening results) and then given the task direction, “Read the story, and be sure to pay close attention because I will ask you questions when you’re finished.” During the words plus picture symbols condition, each passage included symbol supports above words. The instructor waited 5 s for the student to begin reading. As the student read, the instructor conducted a running record as a secondary measure to calculate the student’s accuracy rate while reading. Errors were recorded at any time that the student incorrectly read a word, omitted a word, or inserted a word in the text. The instructor provided the correct response following any error. Each instance of self-correction as a student read was also recorded. Self-correction was defined as any instance of the student realizing their own error and correcting it. If a student self-corrected, the error was not recorded as an error, but as a self-correction. This information was used to further evaluate participant’s results.

After the student completed reading the passage, they were presented with a question page. The question page was the same layout for all participants. Each question page contained three questions about the specific passage participants read in their session. Each question page contained a who, what, and where question about the passage. Each

question was paired with three answer choices. These choices were plain text with no symbols in every condition. The instructor again secured an attentional response from the participant before reading question one aloud. After the instructor read question one, they pointed to and read the available answer choices. The instructor gave the student 3 s to select an answer. Three response types were possible during intervention sessions. An unprompted correct response was defined as the student orally stating, pointing to, or circling the correct answer to a comprehension question within 3 s of the instructor asking a question. Unprompted correct responses were followed by descriptive verbal praise) (e.g., “You answered the question! Great job!”). An unprompted incorrect response was defined as the student initiating a response within 3 s but answering incorrectly. An unprompted incorrect response was followed by error correction in the form of the instructor verbally stating the correct response. A no response made by the student was defined as the student not initiating a response within 3 s and was followed by error correction in the form of the instructor verbally stating the correct response. Student responses were recorded on a data sheet. The data sheet used in the study can be found in Appendix F. Reinforcement in the form of descriptive verbal praise, edibles, or a token for a token chart were given to participants for attending to the task. Intervention sessions were conducted until mastery criterion was reached of 100% correct responses for 3 different passages. A minimum of 5 sessions per condition were conducted. Words plus symbols and words alone conditions were counterbalanced.

#### Best Alone Condition Procedures

After superiority was established with one treatment, a best alone condition was conducted. The superiority of one treatment over another included the number of sessions

to criterion or the number of errors to criterion. Using a best-alone condition provides evidence of a procedure's effectiveness (Shepley et al., 2019). To determine superiority of treatments, the researcher calculated the number of sessions each participant needed to reach the target criterion.

All sessions were conducted in a 1:1 instructional arrangement. The students were assessed on their comprehension of a leveled passage using three *wh* comprehension questions during each session. The student was asked each question one time. The instructor conducted one session per day with each participant in the best alone condition. The intervention used throughout the best alone condition was selected based on the superiority shown from the words alone and symbols plus words conditions. Best alone condition sessions were conducted until mastery criterion was reached.

Each session in the best alone condition was conducted in the same format as the instructional conditions, minus the counterbalancing of symbols plus text and text alone passages. This best alone condition was implemented to provide an additional demonstration of the effectiveness of a procedure (Shepley et al., 2019).

### **Interobserver Agreement and Procedural Fidelity**

The reliability observer, a special education teacher collected interobserver agreement (IOA) and procedural fidelity data in 20% of all sessions in each condition for each participant. Acceptable levels of agreement and accuracy for reliability data were 80%. Prior to data collection, the reliability observer was trained by role-playing training sessions until 100% agreement and accuracy were reached. During the study, if agreement or accuracy fell below 90%, the researcher planned to retrain the second teacher and conduct practice sessions until data were at acceptable levels.

The researcher calculated IOA using the point-by-point method. This formula involves dividing the number of total agreements by the number of agreements plus disagreements, then multiplied by 100.

Procedural fidelity was calculated using the following formula: number of observed teacher behaviors divided by the number of planned teacher behaviors and multiplied by 100. Training and best alone conditions assessed the teacher behaviors of (a) having materials ready, (b) providing the attentional cue before reading, (c) ensuring attention before reading, (d) presenting the correct leveled passage either with or without pictures based on the counterbalance schedule plus the task direction, (e) conducting the running record as the student reads, (f) providing praise for reading, (g) presenting the correct question page, (h) providing the attentional cue before answering questions, (i) ensuring attention before answering questions, (j) reading all questions while pointing to the answer choices, (k) waiting 3 s after each question for the student response, (l) providing praise for correct answers or correcting errors for incorrect responses/no responses, and (m) providing a token for token chart if applicable. The reliability data sheet used in the study can be found in Appendix G.

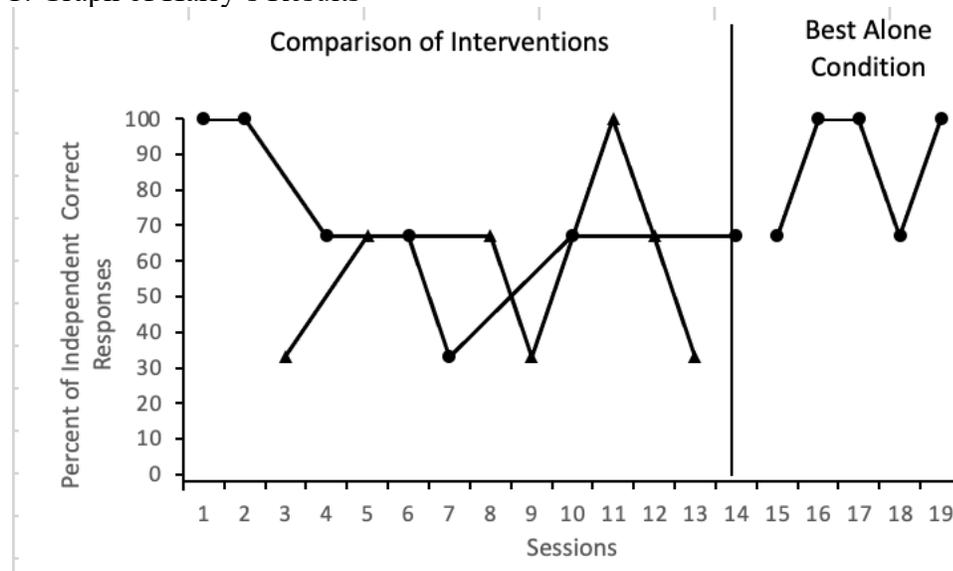
## SECTION 4: RESULTS

The student performance data for Harry, David and Sam are shown in Figures 1, 2, and 3 respectively. Based on the results, there is not a substantial difference in the use of words alone or words plus picture symbols in a passage on the comprehension of text. After analyzing participant's data, words plus picture symbols may be slightly more effective.

### Effectiveness

Figure 1 depicts the percent of unprompted correct, independent responses for Harry in the words alone, words plus picture symbols, and the best alone conditions.

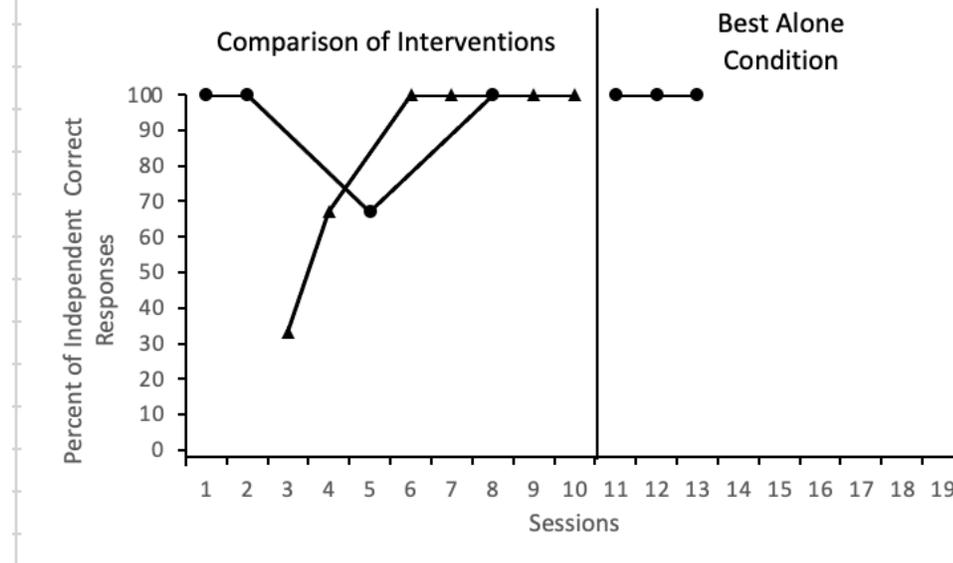
Figure 1: Graph of Harry's Results



*Note.* The percent of correct, independent responses for Harry are shown. Closed circles represent the words plus picture symbols condition, closed triangles represent the words alone condition, and closed squares represent the best alone condition (words plus picture symbols).

Figure 2 depicts the percent of correct, independent responses for David in the words alone, words plus picture symbols, and the best alone conditions.

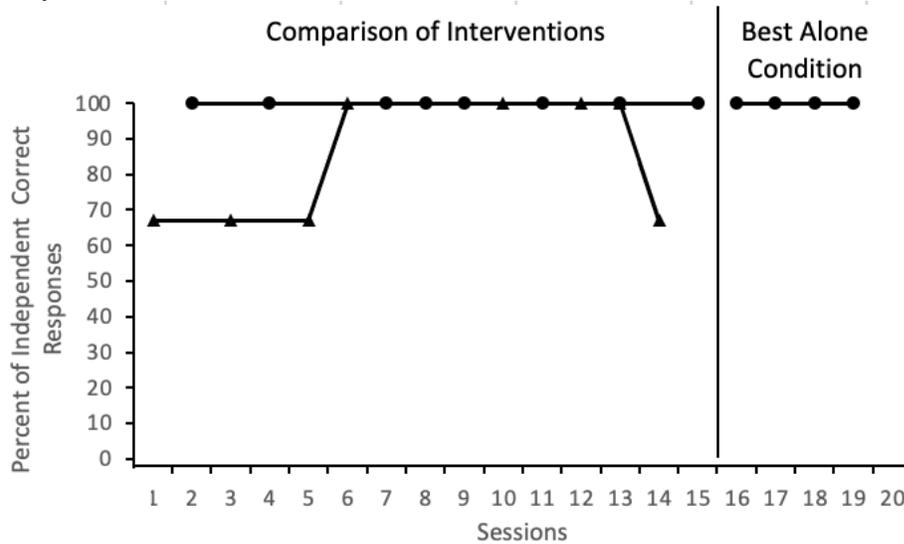
Figure 2: Graph of David's Results



*Note.* The percent of correct, independent responses for David are shown. Closed circles represent the words plus picture symbols condition, closed triangles represent the words alone condition, and closed squares represent the best alone condition (words plus picture symbols).

Figure 3 depicts the percent of correct, independent responses for Sam in the words alone, words plus picture symbols, and the best alone conditions.

Figure 3: Graph of Sam's Results



*Note.* The percent of correct, independent responses for Sam are shown. Closed circles represent the words plus picture symbols condition, closed triangles represent the words alone condition, and closed squares represent the best alone condition (words plus picture symbols).

During screening sessions, the frustrational reading level of each student was determined. Screening results determined that Sam would be assigned level D passages for the entirety of the study, David a level C, and Harry a level B. Level B and C correlate to a kindergarten grade level, while level D correlates to a first-grade reading level (LAZEL, 2021).

Visual analysis revealed an initial immediate increase in level on percent of correct, independent responses in the words plus picture symbols condition when compared to the words alone condition for all 3 participants.. Sam reached criterion in the words plus picture symbols condition in three sessions and in the words alone condition in six sessions. His average score in the words plus pictures condition was 100% and in the words alone

condition was 84%. Harry did not reach criterion in either condition however his average score in the words plus pictures condition was 72% and in the words alone condition was 57%. David reached criterion in the words plus picture symbols condition in four sessions and in the words alone condition in five sessions. His average score in the words plus pictures condition was 92% and in the words alone condition was 83%. Each participant's data path displays some overlap and there is not a clear separation of data paths, suggesting there is no functional relation.

Table 1 displays running record data from participants throughout the study. All three participants had a higher average accuracy rate while reading passages in the words plus picture symbols condition when compared to passages in the words alone condition.

Table 1: Running Record Data

	Words Alone	Words Plus Picture Symbols	Best Alone
<hr/>			
Harry			
Mean %	92	93	91
Median %	95	93	92
Mode %	96	-	-
David			
Mean %	78	88	93
Median %	78	86	94
Mode %	78	-	-
Sam			
Mean %	79	83	85
Median %	80	85	85
Mode %	-	79	-

Note. No mode was calculated for columns with a “-“

### Reliability

Reliability results indicate the IOA was 100% for both intervention and best alone conditions. The reliability observer used a checklist to determine the investigator’s use of

the planned behaviors during all conditions. The percentages of agreement were 100% for all behaviors in all conditions with the following exceptions. The researcher provided the attentional cue before reading during instructional conditions with an overall mean of 80% (range 0-100%). The researcher ensured attention before asking the student *wh* questions during instructional conditions with an overall mean of 80% (range 0-100%). The researcher ensured attention before asking the student to read the passage during instructional sessions with an overall mean of 80% (range 0-100%).

## SECTION 5: DISCUSSION

Picture supported text is a widely used strategy by teachers of students with disabilities to modify text. However, there is not adequate data to provide evidence that picture supports enhance comprehension. Some research has found symbol supported text to be beneficial in the comprehension of text for students with disabilities (Jones et al., 2007, Shurr & Taber-Doughty, 2012). However, other studies provide evidence that the symbols do not significantly affect the comprehension of text for individuals with disabilities (Benson-Goldberg & Erickson, 2020, Poncelas & Murphy, 2006, Roland, 2014, and Worah et al., 2015).

Restricting comprehension instruction exclusively to answering *wh*-questions (who, what, where) may limit a student's comprehension. Although participants in this study did demonstrate the ability to correctly respond to these questions, other methods in assessing comprehension may provide a better picture of a student's true comprehension of a text. Are students truly comprehending a passage if they are only able to answer *wh*-questions after reading? Morgan et al. (2009) suggest that learners with disabilities may not understand the meanings of *wh*-question words (who, what, where, when, why, how). The meaning of these question words may need to be taught.

With results indicating that picture supports provide little to no effect on comprehension, practitioners should instead focus on developing student comprehension skills using other strategies. Engaging students in activities that provide them experience with future reading material may help them to demonstrate improved comprehension. Strategies such as watching videos or looking at photos may develop background

information leading to deeper understandings of the text. Training students to retell events or information from stories they read could also further develop their comprehension skills.

### **Limitations**

One limitation from the study included the limited reading ability of participants. The frustrational level of text determined for each participant correlate to an approximate kindergarten or first grade level. Passages at these levels were short and difficult to capture the complete comprehension of each participant because their listening comprehension ability is higher than their reading comprehension ability. The lower-level passages used in the study allowed for only the most basic *wh* questions to be asked. Higher level passages would have provided more detailed information allowing for complex questions that encouraged higher-level thinking. Using more age-appropriate and high interest literature may have contributed to differences between the two conditions.

Another limitation from the study includes concerns after visual analysis of the participant data. When looking at participant results, there is overlap in the data between the two conditions. In an AATD, when a certain degree of overlap appears in the data, a functional relation cannot be demonstrated. Without a functional relation, it cannot be proven that picture supports in a text improve the comprehension for students with MSD.

Lastly, this study is limited by the use of only 3 questions for assessing student comprehension. Participants only had the opportunity to score a 33%, 67%, or 100%. Additionally, students being screened twice would have ensured a definitive frustrational reading level. A broader range of reading ability levels may have also provided more detailed information about the comparison of words alone compared to words plus picture symbols on the comprehension of text.

## **Future Research**

Comprehension can take multiple forms rather than only answering questions. Students can demonstrate comprehension of text through the use of visual supports such as graphic organizers (Dieruf et al., 2020) and model lead test (MLT) strategies which incorporate providing examples and non-examples to develop comprehension concepts (Knight & Sartini 2015). Other ways to support comprehension include video anchors, building on student's background knowledge, and the use of multiple exemplars during instruction. More research is needed on the effects of these instructional methods.

Additional research is also needed on the effects of augmenting text (repeated story lines, using objects, etc.) on the reading comprehension of individuals with disabilities. Adding symbols to text is not the only way to adapt text to facilitate understanding for students with MSD. Shortening and simplifying high-interest, age-appropriate text may lead to improved comprehension and literacy skills among individuals with MSD.

The 2000 NRP (NRP, 2000) identified the following evidenced-based comprehension instructional methods that appear to be most effective for assessing student comprehension: (a) comprehension monitoring, (b) cooperative learning, (c) graphic and semantic organizers (including story maps), (d) story structure (e) questioning, (f) question answering (g) question generation, and (h) summarization. Browder et al. (2006) found that only one of these identified instructional methods (question asking) has been used in comprehension interventions for individuals with intellectual disabilities. Their research found a need for future research to examine the use of other NRP strategies with participants who have intellectual disabilities. The NRP identified strategies have been found effective for the general education population, however more research is needed with

these methods with students with disabilities, as they could be effective for both populations (Browder et al. 2006).

## **Implications**

Based on this research, picture supported texts have minimal effect on the comprehension of text. It takes considerable time and effort for a classroom teacher to develop reading passages and lesson materials that include symbol-supported text. Results from this study indicate that the symbols may not provide adequate benefit to justify teachers spending additional time preparing these adaptations.

“Tarheel Reader” (<https://tarheelreader.org/>) an online collection of adapted texts that are designed to allow for multiple different access methods while reading (switch, touch screen, pointing devices). The books found on this site range in age-level and type of book. These books provide a way for students to access books that they may not have had the opportunity to read independently. Combining text with colors, pictures, movement, or sounds may provide more ways to adapt text. Because many students with MSD do not reach a chronological age grade level reading ability, teachers may consider the use of text to speech software. Software that reads the text aloud to students also may impact their comprehension.

Benson-Goldberg and Erickson (2020) shared that guidelines concerning text accessibility for people with disabilities continue to include recommendations to include symbol-supported text. Additionally, practitioners have a positive viewpoint and often gravitate towards text that includes symbol supports. Teachers should think carefully before including symbols in academic materials and instead consider other way students may be supported in their comprehension of text.

Hudson et al. (2013) recommended individualizing response options for students. For example, some students may need to begin responding from only two answer choices and work towards responding with more answer choices. Other ways to individualize may include the type of question; (*wh*, standards-based, etc.). Prompting hierarchies are another research-based practice to use with students when acquiring comprehension skills (Dieruf et al., 2020).

Poncelas and Murphy (2007) suggest that students should be familiar with symbols and understand that the symbols carry meaning. It may not be best practice to place symbols above words in a text and expect them to facilitate understanding. Just as written words need to be taught and learned, many symbols may also need to be taught and learned. Before including symbols in reading passages, teachers may consider ensuring their students know the meaning of the picture symbols being used.

Results from this study agree with previous research that symbol supports do not necessarily improve the comprehension of text. Roland (2014) concluded that words with pictures provide little to no benefit in teaching core content vocabulary to students with MSD. Results from Worah et al. (2015) suggest that teachers interested in providing picture supports for students should use scenes rather than line drawings or parts of objects to support literacy.

## **Conclusion**

The results of this study indicate that symbols may not be an effective strategy for facilitating comprehension to justify implementing them on future student reading materials. The symbols did not substantially increase student understanding. Results show that two out of three of the participants reached criterion in the words plus picture symbols

condition in fewer sessions and all three participants had higher average comprehension scores in the words plus picture symbols condition. However, the overlap in data paths illustrate that the use of the symbols provided little benefit.

Regardless of whether the participant read a passage with words plus pictures or words alone, the participants assigned to a higher reading level seemed to have a higher level of understanding of the passage they read. Perhaps for higher level readers, the words rather than the symbols were being referred to. For example, Sam read highest level passages and had the highest comprehension scores.

Determining whether to provide students with adapted passages with symbol supports or text alone should not be the priority. Teachers will continue to educate students with low and high reading levels but need to be able to adapt and prepare text in ways that best meet each individual student's needs.

APPENDICES

APPENDIX A

Level: D

Word Count: 132

**Mack's Boxes**

   
Mack's Boxes

 had a lot of  boxes. He liked to  put things in them and he liked to  play with them.

 Mom  said , "I need a  box for my  yarn . Do you have a  box for me, Mack?"

 "Yes," said  Mack. "You can have this  box ." Mom  said , "Thank you."

 Jan  said , "I need a little  box for my  crayons. Do you have a  box I can have, Mack?"

 "Yes, I do" said  Mack. "You can have this  box ." "Thanks," said  Jan.

 "I need a box for some  books," said  Dad . "You can have this  big box , Dad ,"

 Mack  said . "Oh, good," said  Dad . "Thanks."

 Kitty  said , "Meow," "Hi, Kitty ," said  Mack. "Do you want a  box , too?" "Meow,"

 said Kitty .  Mack  said , "You can have this box."

 "Meow," said  Kitty .

Level: C

Word Count: 114

**The Missing Sock**

Holly had her hat for the game. She had her shirt and her pants, too. But Holly had only one sock...

"I can't find my other sock!" said Holly. So Holly looked in her bedroom. But the sock was not under her bed.

And Holly's sock was not in her book bag.

Holly looked in the laundry room. The sock was not in the basket.

Holly looked in the TV room. "Stop, Ella" said Holly. "That's not my sock!"

Holly looked and looked. Her little brother looked, too. "Nope," he said, "Your sock is not here."

Then Holly looked in the kitchen. Ella was there...

And Holly's sock was there, too!

***Mack's Boxes Level D***

**Question Page**

**1. Where did Dad put his books?**

- a. In a box                      b. in a basket                      c. in a bag

**2. Who needed a box for yarn?**

- a. Jan                              b. Mom                              c. Dad

**3. What did Jan have?**

- a. Yarn                              b. crayons                              c. books

APPENDIX D

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

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

Title: Mack's Boxes 132		Word Count:	E	SC	Cues Used		
Level: D					M	S	V
2	<u>Mack's Boxes</u>						
22	Mack had a lot of boxes. He liked to put things in them and he liked to play with them.						
39	Mom said, "I need a box for my yarn. Do you have a box for me, Mack?"						
51	"Yes," said Mack. "You can have this box." Mom said, "Thank you."						
70	Jan said, "I need a little box for my crayons. Do you have a box I can have, Mack?"						
83	"Yes, I do," said Mack. "You can have this box." "Thanks," said Jan.						
106	"I need a box for some books," said Dad. "You can have this big box, Dad," Mack said. "Oh, good," said Dad. "Thanks."						
129	Kitty said "Meow." "Hi, Kitty," said Mack. "Do you want a box, too?" "Meow," said Kitty. Mack said, "You can have this box."						
132	"Meow," said Kitty.						
	<b>Fluency:</b>						
<b>Totals:</b>							

**Accuracy: (Total words read – Total errors) / Total words read x 100**

**Self-Correction Rate:**

APPENDIX E

**Counterbalance Schedule**

**Harry**

<b>Date</b>	<b>AM</b>	<b>PM</b>
	Pictures	Pictures
	No pictures	No pictures
	No pictures	Pictures
	Pictures	Pictures
	No pictures	Pictures
	No pictures	No pictures
	No pictures	Pictures
	Pictures	Pictures
	No pictures	Pictures
	No Pictures	No pictures
	Pictures	No pictures
	No pictures	No pictures

**David**

<b>Date</b>	<b>AM</b>	<b>PM</b>
	Pictures	Pictures
	No Pictures	No pictures
	Pictures	No Pictures
	No Pictures	Pictures
	No Pictures	No Pictures
	Pictures	Pictures
	Pictures	No Pictures
	Pictures	Pictures
	No Pictures	No Pictures
	Pictures	Pictures

**Sam**

<b>Date</b>	<b>AM</b>	<b>PM</b>
	No Pictures	Pictures
	No Pictures	Pictures
	No Pictures	No Pictures
	Pictures	Pictures
	Pictures	No Pictures
	Pictures	Pictures
	No Pictures	Pictures
	No Pictures	Pictures
	No Pictures	No Pictures
	Pictures	Pictures

APPENDIX F

## Training Session Data Sheet

Student Name: \_\_\_\_\_ Condition: \_\_\_\_\_

Date:	AM/PM
Pictures or Text alone (circle one)	
Question (who, what, where)	Student Response
<b>% Correct</b>	
<b>% Incorrect</b>	
<b>%NR</b>	

Date:	AM/PM
Pictures or Text alone (circle one)	
Question (who, what, where)	Student Response
<b>% Correct</b>	
<b>% Incorrect</b>	
<b>%NR</b>	

Date:	AM/PM
Pictures or Text alone (circle one)	
Question (who, what, where)	Student Response
<b>% Correct</b>	
<b>% Incorrect</b>	
<b>%NR</b>	

Date:	AM/PM
Pictures or Text alone (circle one)	
Question (who, what, where)	Student Response
<b>% Correct</b>	
<b>% Incorrect</b>	
<b>%NR</b>	

APPENDIX G

**Reliability Summary Sheet**

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

Circle: AM/PM

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

IOA : \_\_\_\_\_

	Student Response (+ or -)	Yes	No	N/A
1. Materials Ready?				
2. Attentional Cue?				
3. Ensures Attention?				
4. Present correctly leveled passage either with or without pictures based on schedule + task direction				
5. Conduct running record as student reads; calculating accuracy rate				
6. Provide praise for reading				
7. Present correct question page				
8. Attentional Cue				
9. Ensure Attention				
10. Read Question 1/answer choices while pointing to choices				
11. Wait 3 s for student response				
12. Student Response				
13. Read Question 2/answer choices while pointing to choices				
14. Wait 3 s for student response				
15. Student Response				
16. Read Question 3/answer choices while pointing to choices				
17. Wait 3 s for student response				
18. Student Response				
19. Provide Praise for correct answers or correct errors for incorrect responses/no responses				
20. Provide Token for chart if applicable				
Notes:	_____/20 <b>Procedural Fidelity</b> # observed/ total planned x 100 (percent yes):			

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