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Using direct instruction flashcards on the development and maintenance of word recognition skills for two elementary students with severe behavioral/emotional disorders

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Abstract
The purpose of this study was to evaluate the method of Direction Instruction (DI) flashcards in increasing word recognition with elementary school students with Emotional and Behavior Disorders. The study wanted to replicate the use of DI flashcards to other settings and populations of students. Two participants were selected for the study. One was a fourth grade male, age 10 and the other was a fourth grade female, age 11. Both were receiving all school day services under the category of Emotional and Behavioral Disorders. The male participant also had been diagnosed with learning disabilities in reading and writing. The study was conducted in an elementary behavior intervention classroom. The behavior measured was number correct words read after being presented a flashcard. Data were also gathered from a pre- and posttest employing all 50 high use grade level words. The results showed mastery of all 50 words out of a total possible of 50 words for both participants. Suggestions for future classroom research were given.

Keywords: Direct Instruction (DI) Flashcards, Emotional and Behavioral Disorders, Word Recognition, Elementary School, Multiple Baseline Design, Data-Based Decisions, Reading, Literacy

Introduction
The skill of reading is essential to a majority of daily activities in our current society. Being an active and achieving member of American society requires the recognition and comprehension of reading for these everyday things. According to the National Assessment of Adult Literacy in 2003, 11 millions are Americans are considered illiterate, 7 million cannot answer simple test questions, and 4 million cannot take a test due to language barriers. It is evident that American school systems are not sufficiently providing reading instruction.

Approximately 10% of children in the American school system have significant difficulty developing reading skills (B. Shaywitz & S. Shaywitz, 2010). Treatments for reading disabilities have been evaluated through the development of effective reading programs (Carnine, Silbert, Snow, Burns, & Griffin, 1998). The inability to decode words using phonological processing contributes to the significant problems of poor readers (Wagner & Torgesen, 1987). Phonological awareness can be learned through numerous commercially available programs. These programs may be used in various ways as an intervention program for children who have or are at risk for word recognition deficits (Catts & Hogan, 2003). The importance of learning sight words for poor or struggling readers cannot be stressed enough (Browder & Lalli, 1991; Browder & Xin, 1999; Carnine, Silbert, Kameenui, & Tarver, 2010; Wagner & Torgesen, 1987).

Children with severe behavior disorders often have an increased difficulty in learning the basic skills necessary to reading (Wills, Kamps, & Abbott, 2010). When possible reading disabilities are added to the behavior, children may fall significantly behind in their academics. A study by Wills and colleagues (2010), found that students with behavior and emotional disorders (EBD) need a high level of structured reading interventions in order to improve their reading skills and become successful readers. They also noted that consistent use of small group instruction also greatly benefits students that are behind in their reading skills.

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One possible structured classroom reading intervention that has shown to be effective is the use of direct instruction (DI) flashcards (Bishop, McLaughlin, & Derby, 2011; Green, McLaughlin, Derby, & Lee, 2010; Hopewell, McLaughlin, & Derby, 2011; Kaufman, McLaughlin, Derby, & Waco, 2011; Ruwe, McLaughlin, Derby, & Johnson, 2011; Thomas, McLaughlin, & Derby, 2015). DI flashcards have been used in variety of academic settings, to improve sight word skills of children with several different disabilities and age ranges have all shown to be quite effective (Thomas et al., 2015). DI flashcards have been employed with children in special education preschool classrooms (Mangundayo, McLaughlin, Williams, & Toone, 2013 to special high school classes (Brasch, Williams, & McLaughlin, 2007). One of the most important aspects of DI flashcards is the error correction procedure that is built into the intervention (Kaufman et al., 2011; Ruwe et al., 2011). When students read a word incorrectly, the teacher models the correct pronunciation of the word, the student and teacher say the word together and finally, the student must pronounce the word correctly when presented the flashcard. If the student again makes an error, this procedure is again applied. If the student pronounces the word correctly, the word is placed two to three cards back, so the student will be presented with this former error word very quickly. The use of error correction with words that a students needs to gain and maintain mastery of the words the student is struggling (Hopewell et al., 2008; Kaufman et al., 2011; Romjue, McLaughlin, & Derby, 2011; Ruwe et al., 2011).

Students requiring remediation are often at risk for falling further behind in reading skills, resulting in limited participation in general education curriculum (Stanovich, 1986). This could lead to future restricted opportunities for employment and ability to function independently in society (Calhoon, Hunter, & Sandow, 2010). Improved reading skills increase sociability, self esteem, and positive peer interactions through opportunity to participate. Students, specifically those with EBD, have shown to increase their confidence in reading when a successful reading intervention has been implemented and evaluated (Hopewell et al., 2011).

The purpose of this study was to evaluate the effectiveness of DI flashcards and to increase the word recognition with two fourth grade students in a Behavioral Intervention (BI) classroom. An additional goal was to find an effective way to quickly increase reading skills of students that were falling one to three grade levels behind in their reading. The final purpose was to extend and replicate our previous research with DI flashcards with a different population and classroom setting.

Method
Participants and Setting
The participants in the study were two fourth grade students. Participant 1 was a 10-year-old male who was diagnosed with apraxia and specific learning disabilities in reading and writing. Participant 1 scores on the *Woodcock-Johnson* (Woodcock, McGrew, & Mather, 2007) showed him to be the lowest academically in reading and writing. From results of the test and classroom observations, he was found to be at an early second grade reading level, meaning he was falling at least two grade levels below. Participant 2 was an 11-year-old female who was diagnosed with Emotional and Behavior Disorders (EBD). Through classroom observations, Participant 2 was found to be struggling in reading. She was reading at a third grade level but was still falling one grade level behind. She was also the lowest reader in her reading group. Although the two participants were at two different reading levels, they were both falling behind their typical age peers.

The study took place at a public elementary school in the Pacific Northwest. Both of the participants were in a Behavioral Intervention (BI) classroom. The first author worked with the participants individually. The first author typically worked with the participants in the mornings after the students completed their daily reading assignment. Occasionally, when time did not allow or when the participants were struggling in the mornings, the first author would either skip the day or work with the participants when there was free time in the afternoon. The participants and first author would sit at one of the available tables in the classroom that was away from as many distractions as possible in the classroom.

Materials
Flashcards were created using *Reading Mastery III Workbook A* and the teacher presentation book (Engelmann & Hanner, 1988). Each word was hand written on a 3 x 2 ½ inch flashcard using letters which correspond with most common occurrence of letters when seen in text. Each participant also received a sticker chart with 20 boxes on it and a sheet of stickers. Fruit roll ups were used as a reward and one was given to each participants for every five stickers earned. Data recording sheets were also created by the first author and used to track the number of correct words each participant earned per session and which words the participant was reading correctly or incorrectly.

Dependent Variable
The dependent variable was the number of words identified correctly within 3 seconds of the presentation of the flashcard. Correct responses included accurately read words without adding endings. A self-correction within the 3 second time frame was also counted as correct. Incorrect responses included reading the words incorrectly, leaving off endings, self corrections in over 3 seconds, or not identifying words by saying, "I don't know." Since Participant 1 had a speech impediment, certain letter substitutions were accepted from Participant 1. Each participant was given a pretest at the beginning of the study to determine which words each participant was struggling with the most. After the completion of the pretest, the words were randomly split into 5 sets. The first author made sure that each set had at least one word the participant knew on the pretest to help boost motivation and confidence.

Date Collection and Inter-observer Agreement
The measurement system was an event recording procedure. Of the 50 total words, the participants were only measured on three sets of the words per session, for a total of 30 cards per session. This was done to help prevent overexposure and overwhelm the student with the number of words presented. If there was a set of words in the maintenance stage, that set was always recorded first. The set in the baseline stage was recorded next, and the set that was in intervention was always recorded last. Since the

participant had just been working on the words in the intervention set, the delay of taking data on the words was meant to help make sure that the participant had truly learned the words. After the presentation of the flashcards, data was recorded on the data collection form using a "+" to indicate correct and a "–" to indicate incorrect. The data collection form is attached as Appendix A. The data collection form which specified the words in each set was used to gather initial data to record the participants' correct and incorrect responses. The total numbers correct and incorrect were then calculated and transferred to the separate recording sheet. This data collection form is attached as Appendix A.

Inter-observer agreement data were collected for 38% of the sessions for Participant 1 and 45% of the sessions for Participant 2. The primary and inter-observer recorded data simultaneously and independently on separate collection forms during the session. The data sheets the initial data recording sheets with all of the individual words on the sheets. The two sheets looked identical to one another. At the conclusion of the session, the data was compared and agreement scores were calculated using point-by-point procedure for each word. The mean agreement was 100% for Participant 1 and 98% for Participant 2 with a range of 90% to 100% agreement.

Experimental Design and Conditions

A multiple baseline design across word sets (Kazdin, 2011) as well as participants was employed to assess the efficacy of the DI flashcard procedure. Each participant was given a pretest at the beginning of the study to determine which words each participant was struggling with the most. After the completion of the pretest, the words were randomly split into 5 sets. The first author made sure that each set had at least one word the participant knew on the pretest to help boost motivation and confidence.

Baseline. Typical procedures were used during this time. The first author would hold up a flashcard and say, "What word is this?" The participant would answer as best as he or she could, and correct responses were only taken based on what the participant said within 3 seconds. Non-contingent praise was provided to help encourage the student to keep working. No teaching of the words was done during the baseline sessions. Each participant received a sticker for each baseline session to encourage participation in the study.

DI flashcards. During the study, each participant only worked on one set of flashcards at a time. The student was shown a flashcard and asked, "What word is this?" The participant would respond within 3 seconds. If the participant did not respond within 3 seconds or incorrectly identified the word, the first author employed an error correction procedure. The first author would correctly read

the word and then say, "Spell _____." The participant would then spell the incorrectly identified word. The first author would ask, "What word did you spell?" The participant would say the word correctly. Affirmation was given of the word by first author saying, "Yes _____." If the participant said the incorrect word after spelling it, the error correction procedure would begin again and continue until the participant correctly spelled and read the word. After the error correction procedure was completed the word would be moved three flashcards back in the pile so that participant was able to see the word again. The participant continued reading all of the words in the set until he or she was able to read all of the words in the set with 100% accuracy before data on that set was taken. A set of words was put in the maintenance stage if the participant was able to read all ten words with 100% accuracy for three consecutive days.

Maintenance. A set of words was put in the maintenance phase, if the participant was able to read all ten words with 100% accuracy for three consecutive days. Then data were gathered every third session. This was done to assess maintenance of treatment gains over time.

Results
Pretesting
Each participant was given a pretest prior to the study. Participant 1 correctly read 10 out of the 50 words on the pretest, for a score of 20% accuracy. Participant 2 correctly read 13 out of the 50 words on the pretest, for a score of 26% accuracy. Both of these scores rose to 100% accuracy on the posttest for both of the participants.

Baseline
The baseline scores can be seen in Figure 1 for Participant 1. For Set 1, our participant received a score of 2 words correct. In Set 2, Participant 1 correctly read an average of 2.33 words with a range from 1 to 3 words. In Set 3, he correctly read an average of 2.33 words with a range from 2 to 3 words correct. In Set 4, he correctly read an average of 2.67 words with a range from 1 to 4 words correct. In Set 5, Participant 1 correctly read an average of 2.89 words with a range from 2 to 4 words correct.

For baseline for Participant 2 can be seen in Figure 2, in Set 1, she correctly read 3 words. In Set 2, she read an average of 5.33 words correct with a range from 4 to 6 words. In Set 3, Participant 2 mastered the words in baseline, so intervention was never conducted in Set 3. She correctly read an average of 8 words with a range of 3 to 10 words correct. In Set 4, she correctly read an average of 3.5 words with a range from 3 to 4 words correct. In Set 5, Participant 2 correctly read an average of 5.25 words with a range from 4 to 7 words correct.
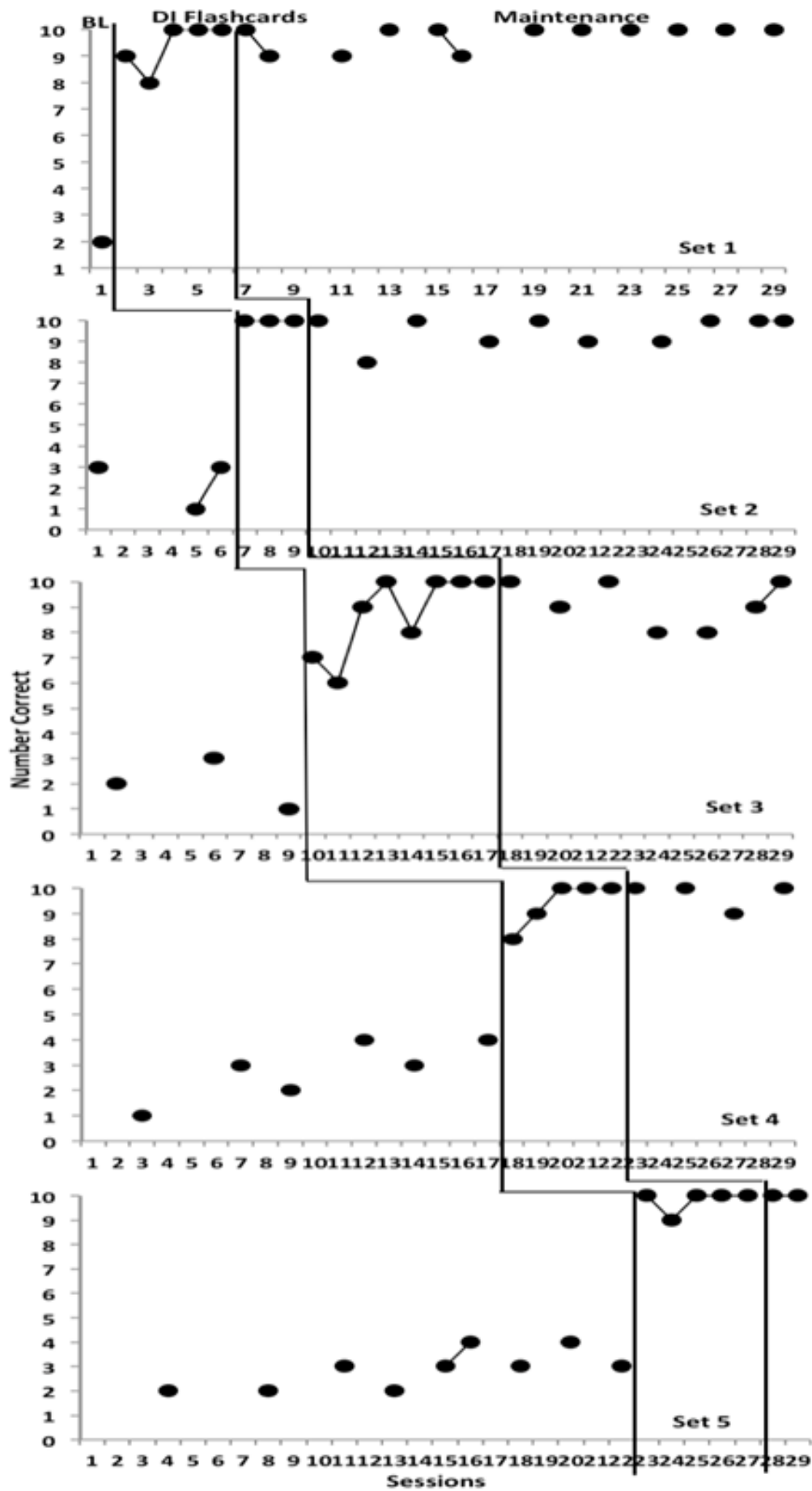
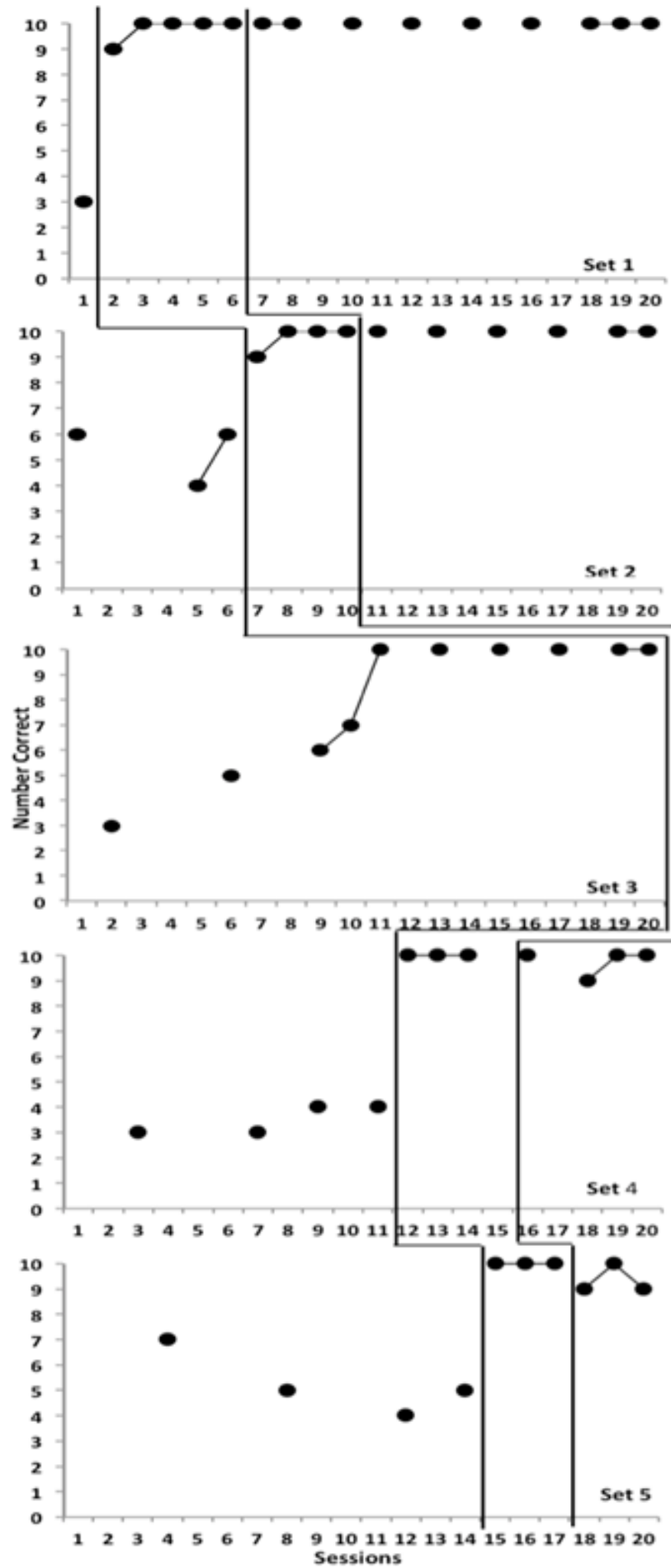**Fig 1:** The number correct Participant 1 scored for each session.

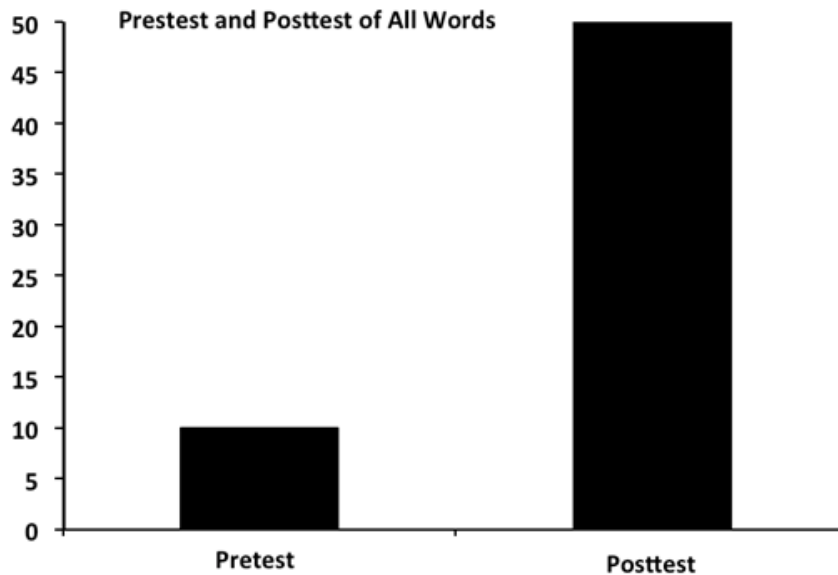**Fig 2:** The number correct Participant 2 scored for each session.

Fig 3: Pretest and Posttest scores for Participant 1 out of 50 words possible.

DI Flashcards

During intervention, in Set 1 Participant 1 correctly read an average of 9.4 words with a range from 8 to 10 words read correctly. In Set 2, he correctly read all 10 words in every session. With Set 3, he correctly read an average of 8.75 words with range from 6 to 10 words correct. In Set 4, he correctly read an average of 9.4 words with a range from 8 to 10 words. In Set 5, Participant 1 read an average of 9.8 correctly with a range of 9 to 10 words correct.

For DI flashcard intervention for Set 1 with Participant 2, she correctly read an average of 9.8 words with a range from 9 to 10 words correct. In Set 2, she correctly read an average of 9.75 words correctly with a range from 9 to 10 words correct. Participant 2 mastered Set 3 words in baseline, so intervention was never conducted with Set 3 words. For Sets 4 and 5, she read all 10 words correctly during every session in intervention.

Maintenance

During the maintenance phase, Participant 1 correctly read an average of 9.67 words with a range from 9 to 10 words in Set 1. In Set 2, he correctly read an average of 9.75 words with a range from 9 to 10 words. In Set 3, he correctly read an average of 9.14 words with a range from 8 to 10 words. In Set 4, he correctly read an average of 9.75 words with a range from 9 to 10 words. In Set 5, Participant 1 read all 10 words correctly throughout the entire maintenance phase.

During the maintenance phase for Participant 2, in Sets 1 and 2 she read all 10 words correctly for every maintenance session. Participant 2 did not reach maintenance in Set 3 since she mastered all of the words in baseline. In Set 4, she read an average of 9.75 words correctly with a range from 9 to 10 words. In Set 5, Participant 2 correctly read an average of 9.3 words with a range from 9 to 10 words.

Discussion

The results of this study indicated that DI flashcards was an effective academic intervention for increasing the word recognition skills of two fourth-grade students. This research showed that the implementation of DI flashcards was effective with students who have EBD, Learning Disabilities, and were at least one grade level behind in

their reading skills. Participant 1 increased his word recognition from 20% to 100% mastery of the words. Participant 2 increased her word recognition from 26% to 100% mastery of the words as well. This significant increase in the percent of word recognition shows the clear effectiveness of the use of DI flashcards with these students.

There were several strengths in the present study. First, there was the clear criteria for what was considered correct or an error. We felt this led to consistent data collection, high inter-observer agreement. Also, DI flashcards were a straight-forward instructional procedure for students who require clear and consistent instruction within their classroom (Kaufman & Landrum, 2013). Although Participant 2 developed mastery of the Set 3 in baseline, for both participants, there was a clear increase in word recognition at the start of intervention for every set to document the efficacy of the DI flashcard intervention. The willingness of the participants to work with first authors was an additional strength of the study. Typically, our participants eagerly came with the first author when they were asked to work with their flashcards. The motivational technique of using a sticker sheet with fruit roll ups as rewards may have also aided to their willingness to participate. At the beginning of the study, the participants were given the chance to choose what they wanted to work. In our view, this may have also helped to keep our participants on-task. The consistent attendance of the two participants also helped the first author to be able to work with the participants as often and frequently as possibly.

A weakness of the study was the mastery of Set 3 words in baseline by Participant 2. We were later informed that both participants received additional practice with their words. Since the words were taken from words that they were struggling with during regular reading instruction within the classroom, the participants had exposure to the related or similar words they were taught using DI flashcards. This may have been a possible reasons for the seemingly random spikes in scores during the baseline phases with both participants. Another weakness of the study was the possibility that each student simply memorized the words in their sets. Since the participants were frequently

exposed to their words , there is a possibility that they simply memorized the words instead of actually learning how to read them. Finally, a weakness of the study was the lack of data on generalization of sight words to other times of the day or in another academic subject matter areas. However, to informal classroom observations by the first and fourth author, the participants seemed to be reading more fluently in their classroom reading materials assignments. They also seemed to read the words that were in their sets that used to struggle, with at a higher success rate. Concrete data on these speculations would have been beneficial practitioners in the schools. Finally, the short length of the baseline for words in Set 1 needs to be increased. Horner, Carr, Halle, McGee, Odom, and Wolery (2995) recommend three or more data points in baseline as a quality indicator for single subject research. This issue will have to be examined in additional research. However, we employed three or more data points for Sets 2 through 5 with both participants.

The present research replicates previous research employing DI flashcards to teach students with behavioral issues, such basic skills as math facts (Cieslar, McLaughlin, & Derby, 2010; Treacy et al., 2012; Walker, McLaughlin, Weber, & 1212), or sight word acquisition (Bishop, McLaughlin, & Derby, 2011; Crowley, McLaughlin, & Kahn, 2013; Hopewell et al., 2011; Shahtout, McLaughlin, Derby, & Arenez, 2012). These outcomes also extend our previous research employing students with learning disabilities (Kaufman et al., 2011; Lund, McLaughlin, Neyman, & Everson, 2012) or intellectual disabilities (Green, McLaughlin, Derby, & Lee, 2010; Ruwe et al., 2011) and preschoolers (Crowley et al., 2013; Herberg, McLaughlin, Derby, & Gilbert, 2011). The present outcomes also add additional confidence for practitioners to employ DI flashcards in their respective classrooms to improve the academic skills for their students. The importance of replication for determining generalizability of treatment outcomes (Kazdin, 2011; Barlow, Nock, & Hersen, 2007) cannot be overlooked.

For future research we would recommend a less distracting environment for when the sessions ware conducted. The classroom often had several auditory and visual distractions for the participants that frequently caused them to lose their attention. More experimental control of the words being taught with the DI flashcards is also recommended. Generalization of the words across several settings would also be beneficial to see if the students truly mastered the words. Finally, since the participants succeed at such a high and fast rate with their words, an increase in the number of sets would also be a possible to increase the number of words learned or the time-line for data collection and analysis.

9.0 Appendix A
Frequency over Time Recording Sheet – Reading

Primary Observer: _____

Secondary Observer: _____

Student: _____

Definition of "Correct" Response:	Accurately reads words within 3 seconds
	Sounds out words within 3 seconds
	Self-correction within 3 seconds
Definition of "Incorrect" Response:	Incorrectly reading words
	Self-corrections after 3 seconds
	Student does not identity words by saying, "I don't know"

Date	Session	IOA (Y/N)	% IOA	Set 1: C	Set 1: I	Set 2: C	Set 2: I	Set 3: C	Set 3: I	Set 4: C	Set 4: I	Set 5: C	Set 5: I

Appendix B: Participant 1 Words

Date								
Set 1								
Zero								
Slobber								
Lost								
Large								
Thought								
Hardly								
Forward								
Count								
Stretch								
Pencil								
Set 2								
Juggle								
Members								
Nearly								
Heavy								
Construction								
Healthy								
High								
Twist								
Short								
Chimney								
Set 3								
Road								
Weight								
Rolling								
Reward								
Dancing								
Circus								
Teased								
Hungry								
Hungrier								
Different								
Set 4								
Crowd								
Already								
Motion								
Float								
Farther								
Escape								
Balloon								
Great								
Eight								
Instructions								
Set 5								
Tongue								
Problem								
Clearly								
Boast								
Around								
Expensive								
Goldfish								
Pushed								
Match								
Weakness								

Appendix C: Participant 2 Words

Date								
Set 1								
Interrupt								
Professional								
Blasts								
Noticed								
Favorite								
Sized								
Crouches								

Referee								
Wrecking								
League								
Set 2								
Evening								
Electricity								
Layers								
Imitates								
Immediately								
Pouring								
Magnetic								
Frequently								
Uniform								
Pretended								
Set 3								
Leopard								
Ruin								
Chimpanzee								
Treating								
Changed								
Chariot								
Mention								
Touchdown								
Streak								
Refrigerator								
Set 4								
Scolded								
Whistles								
Champion								
Championship								
Hollow								
Direction								
Ceiling								
Argue								
Echoed								
Valuable								
Set 5								
Muscle								
Tingling								
Lightning								
Laughter								
Airline								
Announcements								
Earn								
Impression								
Approached								
Package								

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