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THE EFFECTS OF USING DIRECT INSTRUCTION AND MODEL, LEAD AND TEST WITH FOUR YOUNG ADULTS WITH DEVELOPMENTAL DISABILITIES

BRIANNA NELSON[1] **T. F. MCLAUGHLIN**[2] **K. MARK DERBY**[3]
Student Full Professor Full Professor
Gonzaga University

Abstract: *The purpose of this study was to determine the effectiveness of combining a modified for of reading racetracks with Direct Instruction (DI) Flashcards to teacher colors and shapes. These procedures were implemented to teach an ESL kindergarten male with disabilities to orally label basic shapes and colors. The participant was enrolled in a self-contained special education classroom. The combined procedures were evaluated in a multiple baseline design across colors and shapes. During baseline, the participant was unable to label any of the colors or shapes. When DI flashcards and a modified racetrack procedures were employed, the child was able to name every color and shape. The results suggested using the techniques of Direct Instruction and racetrack procedures were very applicable to teach our participant to be able to name basic colors and shapes. The applicability of these teaching procedures are discussed and suggestions for future research made. .*

Key Words: *direct instruction flashcards, racetrack procedures, labeling colors and shapes, kindergarten student with developmental delays, multiple baseline design across colors and shapes*

Introduction

Educators have long been concerned with the teaching techniques that are effective in developing functional skills students in special education (Grenot-Scheyer & Falvey, 1986; Heward, 2013; Valletutti, Bender, & Sims-Tucker, 1996). Several techniques from evidence-based procedures have been shown to be effective in the instruction for such students. These have ranged from explicit instruction (Grenot-Scheyer & Falvey, 1986; Heward, 2013) to strategy-based instruction (Swanson, Hoskyn, & Lee, 1999). Labeling shapes and colors is a functional skill for students who are entering the primary grades (Howard, B. Williams, Miller, & Aiken, 2013; Valletutti et al., 1996). Several procedures have been suggested as being effective to teach students such skills. These have ranged from incidental teaching by parents to specific preschool instruction. However, little empirical evidence has been presented as to the efficacy of various approaches to teaching these skills

Review of the Literature

Direct Instruction can be used to teach many different areas including, but not limited to, math, reading, writing, and language (Cole & Dale, 1986; Marchand-Martella, Slocum, & Martella, 2004). Several reasons have been suggested for the effectiveness of the strategies of Direct

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Instruction. These have included (a) the belief that every child can learn; (b) clear scripted lessons for the instructor; (c) small group instruction; (d) frequent monitoring of student responding; (d) employing model, lead, and testing error correction; (e) the educational staff is responsible for instruction (Marchand-Martella et al., 2004; Morgan & Jenson, 1988). Direct instruction makes use of these evidence based procedures so that all students to be successful and increase the amount of time the classroom is able to focus on learning (Marchand-Martella et al., 2004). This is extremely important for children with special needs and is now part of many laws regarding the education of students with disabilities. With the 2004 reauthorization of IDEA in the United States (IDEA, 2004), evidence-based procedures are mandated to be implemented in the instruction for students with disabilities. Direct instruction clearly meets the definition of an evidence-based approach to teaching (Carnine,

A specific drill a practice procedure suggested by Silbert, Carnine, and Stein, (1981) has been labeled as Direct Instruction flashcard system. The Direct Instruction flashcard system was designed for one-on-one instruction sessions, incorporating review of arithmetic facts combined with the presentation of new unknown basic facts (Silbert et al., 1981). In "pretesting", the instructor assesses which facts are known or not. If a student says the problem and answers a fact correctly within two seconds it is defined as mastered. The flashcards to be used during the daily instruction sessions are constructed by the teaching staff. Each group of flashcards consists of a deck of 15 flashcards; 12 mastered and three unmastered facts. The ratio of 12:3 mastered to unmastered facts helps assure that the student will be successful. This procedure has been recently evaluated to teach students basic skills in math. Sante, McLaughlin, and Weber (2001) evaluated the effects of DI flashcards with two elementary students with ADHD and intellectual disabilities. They reported improvements in correct rates and decreases for errors when DI flashcards were employed. A more recent study employing high students with intellectual disabilities, Hayter, McLaughlin, Weber, and Scott, (2007) found that employing flashcards allowed these students to acquire their basic math facts. Brasch, Williams, and McLaughlin, (2008) also employed Direct Instruction flashcards to improve the math performance of two high school students enrolled in a special day school for students with behavior disorders. Also, the ratio of known to unknown facts could be decreased without a decrease in performance.. Recent research in preschool settings (Fitting, McLaughlin, Derby, & Belcher, 2012; Herberg, McLaughlin, Derby, & Gilbert, 2011; Higgins, McLaughlin, Derby, & Long, 2012; Mangundayo, McLaughlin, R. Williams, & Toone, 2013) has also found that DI flashcards can be implemented and assessed with positive student outcomes in such skills as letter naming, teaching colors, and teaching shapes. Each of these studies reported that these procedures were easy to implement and evaluate in classroom settings

Reading racetracks are an instructional approach that employs error correction, timing, and drill and practice procedures (Rinaldi & McLaughlin, 1996; Rinaldi, Sells, & McLaughlin, 1997; McLaughlin, Weber, Derby, Hyde, Violette, Barton, ….. Arkoosh, 2009). This strategy utilizes

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drill and practice sheets that resemble an automotive racetrack, self-graphing, and teacher employed consequences. Typically, these practice sessions employ a Direct Instruction flashcard procedure. After this and then students are tested by going around the 28-cell racetrack. A series of studies have found that reading racetracks are effective in improving sight word vocabulary. For example, Rinaldi and McLaughlin (1996) found that with elementary-aged students with learning disabilities, reading racetracks were effective in teaching students sight words. Rinaldi, Sells, and McLaughlin (1997) found that reading racetracks to be effective with special and general education elementary students. For example, Falk, Band, and McLaughlin, (2003) have shown using a reading racetrack with a flashcard procedure was effective in improving fluency of sight words for the three students with mild disabilities. The participants improved their sight words by doing reading racetracks and the flashcards together. The students reported that they enjoyed being timed and seeing how many words they could say correctly in a minute. Racetrack procedures have also been effective in teaching math facts (Beveridge, Weber, & McLaughlin, 2005) and spelling words (Arkoosh, Weber, & McLaughlin, 2009; Verduin, McLaughlin, & Derby, 2012).

There were three purposes in the present case report. The first purpose was to improve the accuracy of labeling colors and shapes with a single elementary student with developmental delays. A second purpose was to determine if a reading racetrack procedure could be modified to teach verbal labeling with a preschool student. The final purpose was to combine direct instruction flashcards with a racetrack procedure in a specialized special education classroom setting.

Methodology

Participant and Setting

The participant of the study was a male kindergartener child with disabilities. The participant was labeled as developmentally delayed 6-year old with IEP goals to improve in the areas of academic, self-help, communication, fine motor and gross motor skills. There are many communication goals due to his first language is Russian, and expressive language in English has shown to be quite difficult. The test results of the *Brigance Diagnostic Inventory of Early Development* (Brigance, 1991) for general knowledge skills found him to be at a 2.5-3-year-old level. This student was chosen because he could not orally identify any colors or shapes. When prompted, the participant was able to point to the correct one, but could not verbally say their names.

The study took place in the special education classroom at an elementary school in the Pacific Northwest. The participant was in the morning session of kindergarten with 9 other students who went full days, along with one teacher, three aids, and the researcher. The class was a special education room with a wide variety of students with disabilities, ranging from Down syndrome to Cerebral Palsy. Data were collected at the

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beginning of the day during free play. Sessions lasted approximately 10 to 15 minutes at an isolated table of the classroom. This was done to reduce the distraction in the classroom. These data were gathered as part of the university's efforts to provide documentation for the State of Washington and the National Council of Teacher Education (NCATE) as to their ability teacher preparation candidates to positively effect student learning (McLaughlin, B. Williams, R. Williams, Peck, Derby, Weber, & Bjordahl, 1999).

Materials

This study required flash cards, a racetrack with each section containing a piece of Velcro. For each 1"x1" square a colored circle or an outline of a shape was drawn and a piece of Velcro to stick to the note card and racetrack were employed.

Dependent Variable and Measurement Procedures

The dependent variable was number of correct and errors. These data were gathered after the oral prompt "what color (shape)?" Responses were scored based on the auditory recognition of first author and had to occur within 5 seconds of the prompt. For a correct to be recorded, the participant has to verbally make the correct color or shape. An error was defined as the participant saying an incorrect color or shape (e. g. "black" for blue, or "square" for triangle). In addition, any response made after 5s had elapsed was scored as an error. Finally, a non-response by the participant was also scored as an error. These data were collected four days a week for approximately five weeks of school when the other students were arriving in the classroom. Data collection was terminated when the school year ended.

Experimental Design and Conditions

A multiple baseline design (Barlow, Nock, & Hersen, 2008; Kazdin, 2011; McLaughlin, 1983) across sets of shapes and colors was used. A description of the various conditions follows.

Baseline. The baseline consisted of showing the participant a flash card with a color or shape on the front. The participant was then asked, "what color?" or "what shape?" The number of sessions for baseline ranged from 3 to 13 sessions. No feedback was provided during baseline.

DI flashcards and a racetrack procedure. Direct Instruction teaching procedures were used to present and teach the name of each color or shape. Each color or shape was presented in a model, lead, test format (Carnine, Silbert, & Kameenui, 1997). The first author prompted, "what color?" or "what shape?" If the participant responded incorrectly the researcher said, "This color is ____. What color?" If he said the correct response, the card was placed two cards back in the deck. The deck of flashcards was gone through four to five times each session. If he said, "I don't know" then the first author said, "Yes you do, what color (shape)?" Next, the color and shapes were removed from the cards and placed on the racetrack. They were attached by Velcro. After all the colors and shapes are attached, in random order, the participant was allowed to drive

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a toy car around the track and said the color or shape that he passed (See images 2 and 3). If he made an error, the car is stopped, and the first author said, "This color (shape) is____, what color?" He was required to say the correct answer and then allowed to continue around the track. After going around the track once completely with less than two errors, data were then collected on the next trial. He was asked for each color or shape individually to attach it back on the cards. Then the whole deck was gone through once with his answers recorded with a + for correct and a – for an incorrect response. For the answer to be counted as correct, he has to respond when prompted within 5 seconds. Every morning started out with the colors and shapes on little cards, connected by Velcro, an additional five seconds to respond.

Interobserver Agreement and Fidelity of Implementation of the Independent Variables

Interobserver agreement was checked one time for each intervention, and once during the initial baseline. The responses were rechecked by an instructional aid within the classroom. The responses made orally by the participant and she was asked to mark whether she heard the correct letter or shape. The number of agreements was divided by the number of agreements and disagreements and multiplied by 100. Reliability of measurement was 100%. Reliability as to the implementation of the various experimental conditions was taken twice. The second author came to the classroom and used a description of the various experimental conditions. Reliability was 100% on each occasion.

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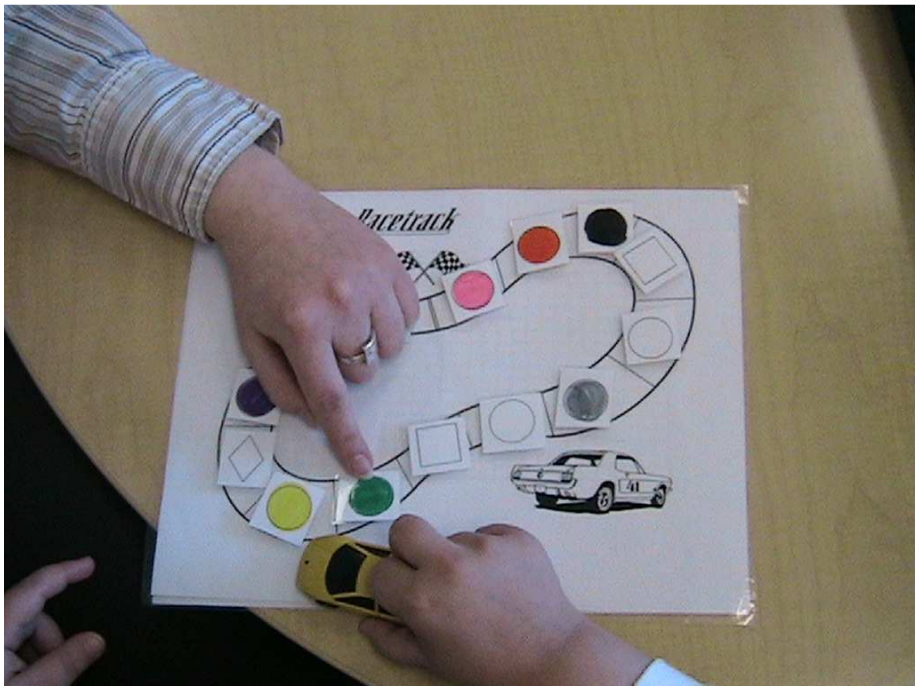

Figure 1. The first author presenting flashcards (top image) and using the racetrack to teach colors (bottom).

Figure 2. Having the participant drive his little car around the track during the DI flashcard and reading racetrack phase.

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Findings

The overall results revealed an increase in the acquisition and fluency of oral labeling of colors and shapes are displayed in Figure 1. For Set 1 (upper panel), the number of corrects in baseline was low (*M* = 1.0) while his errors were high (*M* = 3.0). When DI flashcards and the modified racetrack procedure were implemented his performance improved. His corrects increased (*M* = 3.76; range 3 to 4) and his errors decreased (*M* = .023; range 0 to 1). For Set 2, his baseline performance indicated a few corrects (*M* = .0625; range 0 to 1) and a large number of errors (*M* = 3.843; range 3 to 4). For Set 3 in baseline his performance mirrored that of the other two baselines. His corrects were low (*M* = 0.30; range 0 to 2) and his errors were high (*M* = 4.69; range 3 to 5).

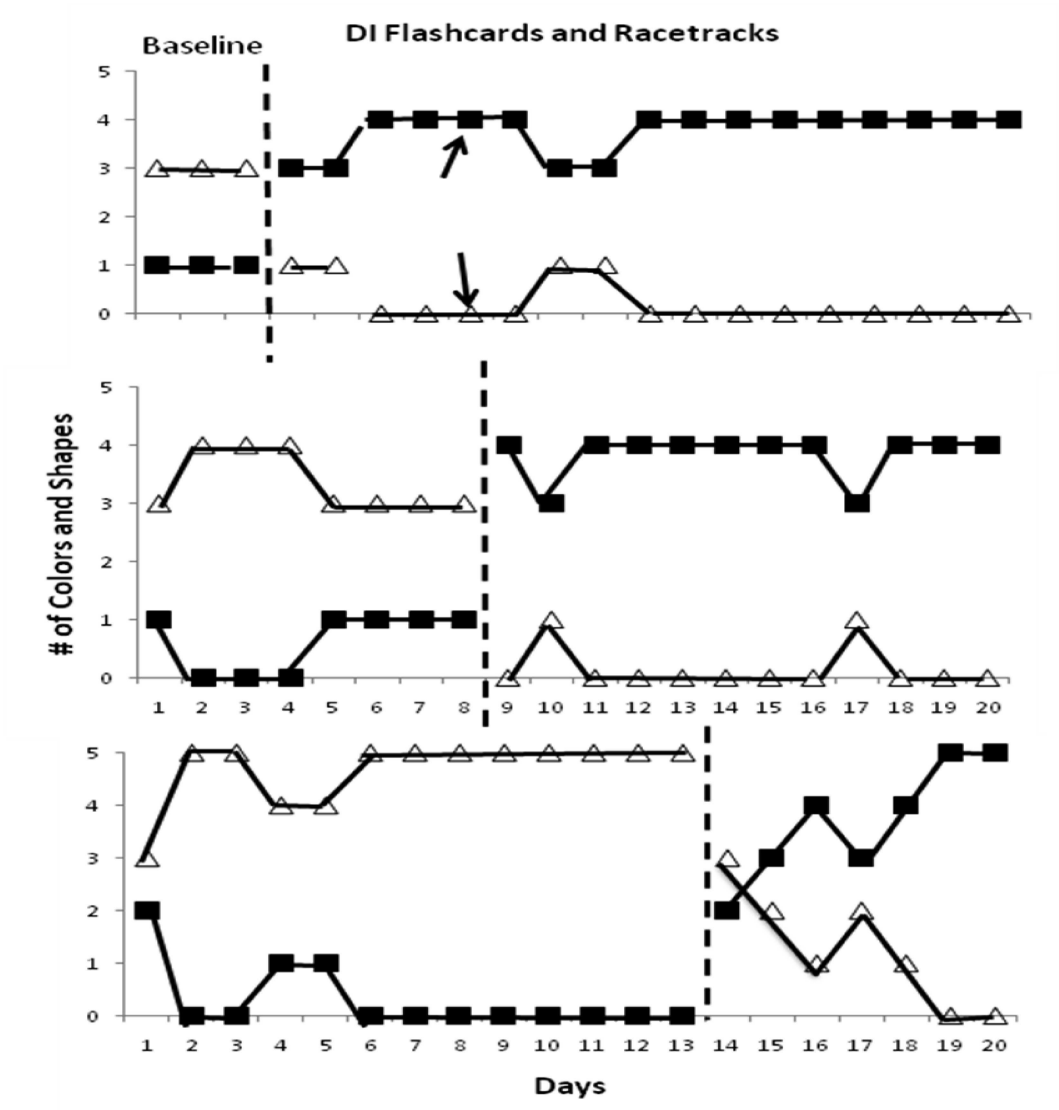

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Figure 3. The number of correct and errors for baseline and DI flashcards and the racetracks procedure.

Conclusion

The use of direct instruction flashcard procedures and the modified racetrack procedure increased the skill of labeling shapes and sizes. This was replicated across three sets of shapes or colors. Each time the intervention was introduced, the participant's performance improved. His corrects increased and his errors decreased. When one examines the data in Figure 1, there was only one overlapping data point from baseline to the intervention. This finding indicates a very powerful outcome for both corrects and errors for our participant (Barlow, Nock, & Hersen, 2008).

Suggestions and Recommendations

The present case report partially replicates the findings of our previous research with DI flashcards (Brasch et al., 2008; Fitting et al., 2013; Hayter et al., 2007; Higgins et al., 2013; O'Loughlin, McLaughlin, Derby, & Rinaldi, 2014). The modification of the reading racetrack procedure (Rinaldi & McLaughlin, 1996; Rinaldi et al., 1997) to teach a child colors and shapes was successful. It appears that one could employ a racetrack like procedure to teach a wide range of skills. It appears that aspects of Direct Instruction as suggested by Lignugaris/Kraft, (2004), can successfully be applied to new content. In this case it was teaching of colors and shapes to a primary student with developmental delays and a student with English as a second language. The use of racetracks has been replicated in our work several times (Anthony, Rinaldi, Hern, & McLaughlin, 1999; Arkoosh, et al., 2009; Beveridge et al., 2006; Hyde, McLaughlin, & Everson, 2008; McLaughlin, et al., 2009; Printz, McLaughlin, & Band, 2006). We urge other researchers at other institutions employ and evaluate racetrack like procedures to add further additional strength as to the positive outcomes of employing such systematic instructional formats or procedures.

There were limitations in the present case report. First, we were unable to collect follow up data due to the closing of school for the academic year. Since we only employed a single student, additional replications of these procedures are warranted. Also, follow up data should be collected over time and if possible across classroom settings. This would add strength for the efficacy of these procedures (Cooper et al., 2007; Barlow et al., 2008; McLaughlin, 1983). Since we combined two procedures (DI flashcards and a reading racetrack), we do not know the contributions of each intervention. However, the first author and the classroom teacher felt that neither required that much additional time nor effort. An addition study where these two procedures were alternated and then combined could do much to begin to answer such a question.

The cost of this study was minimal; it took a racetrack and note cards. The Velcro was very beneficial and most schools have it on hand. It is suggested that the colors and shapes, along

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with the racetrack are laminated to make sure they hold up to being used daily. Another aspect that makes reading racetracks very attractive and practical is the fact that after the initial session, daily sessions were easy to implement, manage, and carry out. Flashcards could offer individualized instruction for an entire classroom in less than 10 minutes of daily classroom time. The teacher could employ racetracks in small groups to build many forms such that support for spelling and math facts. This could be especially valuable in grades one and two when students are expected to learn and remember sight words that do not follow the phonetic rules. Finally, data collection and instruction was carried out at a time of the school day so that our participant did not miss any instructional time. It took place as the students arrived to school and many of them ate breakfast. The use of Velcro allowed the colors or shapes to be placed on the racetrack and they were able to stay attached to the track.

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