The Differential and Delayed Effects of Model-Lead-Test and Tracing Procedure with Fading Procedure to Teach Drawing of Shapes for Two Preschool Students with Developmental Delays

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ABSTRACT

The purpose of this study was to determine the effectiveness of a model, lead, and test (MLT) error correction in conjunction with tracing and a fading procedures for teaching shape drawing to two students with developmental delays. Both of our participants were enrolled in a special education preschool classroom. A multiple baseline across shapes and participants was employed to evaluate of the effectiveness of our two intervention procedures. The results for the participants indicated that the use of MLT with the tracing and fading procedure was effective in producing the skill of drawing shapes. Data collection was very practical and easy to implement in a preschool classroom setting.

Keywords: model, lead, and test, fading, shapes, drawing, preschool students, single case design

I. INTRODUCTION

As students progress in school and academics, the ability to draw shapes is a necessary skill and one that contributes to math, reading, and writing. Math requires shapes from the lower grades all the way up to high school and beyond. Recognizing shapes and being about to draw them helps children to identify letters, which in turn helps them with writing and reading later on. "Letters are made up of circles, triangles and lines – think of the circles in b, d, g, p, q, or the parts of a triangle found in k, v and w" (Allan, 2010). Drawing the curved lines of a circle or oval shape helps children to write letters such as f, u, m, n, j, and the lines in squares help to write i, l, k, p, q and so on. This is exceptionally important for preschoolers to have incorporated in their day at school because "often, recognizing the shapes in the letters helps a child to recognize the letter too, important for developing reading skills" (Allan, 2010).

Employing model-lead-test error correction is one of the simplest ways to reduce errors. For special education preschoolers, Direct Instruction (DI) or explicit instruction can be one of the most successful strategies in teaching a wide range of skills. Direct Instruction (DI) is a model for teaching "that emphasizes well-developed and carefully planned lessons designed around small learning increments and clearly defined and prescribed teaching tasks" (NIFDI, 2012). It is based on the theory that "clear instruction eliminating misinterpretations can greatly improve and accelerate learning" (NIFDI, 2012). Direct Instruction has been called the "dirty little secret" of the educational establishment. This method, "rich in structure

and drilling and content, is the opposite of the favored methods of today's high-paid education gurus, and contradicts the popular theories that are taught to new teachers in our universities" (Lindsay, 2012). Direct Instruction should be no secret at all, for it has been proven in the largest educational study ever and continues to demonstrate remarkable success at low cost when it is implemented.

Several authors have employed model, lead, and test to teach students a wide range of skills. For example, Peterson, Weber, McLaughlin, and Anderson, (2008) employed a MLT procedure to teach a single student with autism where she was in the school (e. g. hallway, classroom, etc.). Shouse, Weber, McLaughlin, & Riley (2011) employed a MLT procedure to teach a preschooler her colors. Herberg, McLaughlin, Derby, and Gilbert (2011) were able to teach a preschooler shapes and his ability to recall them later using DI flashcards with its MLT error correction procedure. Herberg et al. had to modify her prompts from "What shape is this?" to "Is this a triangle." Recently, *Al-Dahri, McLaughlin, Derby, Belcher, and Weber (2013) employed a MLT procedure coupled with a reward to teach a preschool student rote and rational counting. They also found maintenance of treatment effects over time for both forms of counting. However, when they attempted to teach number recognition with MLT + rewards, they had to reduce the number of letters taught and were only successful with three of the five numbers.*

The purpose of the present research was three fold. First we wanted to evaluate the efficacy of employing a package set of procedures (MLT + tracing and rewards) to teach two preschool students with developmental delays their shapes. Second we wanted to replicate and extend our prior research employing MLT. Second we want to partially replicate our previous research evaluating the effectiveness of MLT with young students with

II. Materials and Method

Participants and Setting

There were two participants in this study. Participant 1 was a five-year-old boy with developmental delays. Participant 2 was a four-year-old boy with developmental delays as well. Each was diagnosed with developmental delays. Each participant had an IFSP with goals for the areas of social, adaptive, pre-academic, communication, and occupational therapy. The setting of this study was in a self-contained special education classroom in an elementary school in the Pacific Northwest. There were seven additional students, a certified teacher and two instructional assistants in the classroom. The study took place in a resource room across the participants' preschool classroom. During the research there were two people present in the room, both researchers. One researcher completed the intervention and the other took data.

Materials

The materials that were used were two blank pieces of computer paper, one for the pretest given at the beginning of each session and another for the posttest that was introduced a couple weeks into the intervention to see how they grew throughout the sessions while the skill were being taught. These two tests consisted of the instructor asking the student to draw their best circle, square, triangle, and then "x". All of the shapes to trace were drawn on half sheets of letter paper. These required black, grey, and yellow markers to draw the shapes for a fadeout procedure. The dots (to connect) were drawn with a pencil. The student needed a pencil to trace and a rubber grip was added to promote the appropriate grasp.

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Dependent Variables, Measurement, and Inter-observer Agreement

All data were scored using the same measurement procedure. One point was given for drawing the shape using semi straight/straight lines and drawing the correct number of angles for each shape. A zero was given if the participants were unable to draw the shapes using semi straight/straight lines with the correct number of angles.

Data were collected as a permanent product from the student's pre-test, tracing, and the post-test for each session. Then after each session, the researchers took the pre-test specifically and determined whether the shapes were drawn correctly or incorrectly. Then the researchers imputed this information into the table in a document, as seen in Figures 1 and 2. These were the data that were graphed.

Inter-observer agreement data, this research project had two researchers who were available for every session and determined the stipulations for each shape to have to be counted as correctly drawn by each participant. There data were collected for every session and when calculated was 100% for each participant

Experimental Design and Conditions

A single subject, multiple baseline design (Kazdin, 20111, McLaughlin, 1986) across two participants and three different shapes was used to evaluate the effectiveness of our intervention. Each participant received two days of baseline. Each set was introduced in a staggered fashion and the introduction of a new shape what dependent on each participant's success with the previous shape.

Baseline. During baseline, a curriculum based assessment (CBA) was given which involved the student being asked to draw their best circle, triangle, square, and "x" on a magnadoodle made available to them. Each answer was recorded on a piece of paper the researchers had that could not be seen by the participants. Then the first pre-test for each participant was also used as baseline data. Participants were not given any feedback regarding the accuracy of their responses during this time. However, they were encouraged to try their best and verbal praise was given for participation.

MLT and tracing fade-out procedure. Two sets, consisting of three shapes each, were created specific to each participant. The order of sets (aka shapes) was dependent on each participant's performance during baseline and their individual IEP goals. For Participant 1, set 1 was a square, set 2 was a triangle, and finally set three was an "x". The first set was distinctly chosen because of the participant's IEP goal to be able to draw a square. For Participant 2, set 1 was a triangle, set 2 was a square, and finally set three was an "x". The first set was distinctly chosen because of the participant's IEP goal to be able to draw a triangle.

At the beginning of each session, the researcher gave the participant a blank sheet of computer paper to complete a pre-test. The researcher asked the participant, "Draw me your best square." "Draw me your best triangle.", etc. This continued through all of the shapes and then the student was given a half piece of paper with set 1's shape drawn on it with a thick black marker to trace. The participants started by listening to the researcher model tracing the shape with a finger while stating the drawing descriptor. For an example, the triangle descriptor is, "Down the slide, across, and up the ladder." After the model, the researcher and the participant traced together and then the participant did so independently. After this was completed the participant was given a pencil with a rubber grip to promote correct grasping of a pencil while he works. The participant then traced the black lined triangle. As he successfully traced the shape, the researcher allowed the participant to then move on to trace grey, dark yellow, and light

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yellow lined shapes. Then dark dots and light dots were connected. After the shape in set 1 was mastered, the participant was allowed to move on to the next set. About half way through the intervention, a post-test was added for the researchers use to view the progress of the student throughout each session individually.

III. Results and Discussion

The number of times the participant drew the shapes correctly during baseline and across the Model-Lead-Test procedure and Fading-out procedure implementation were shown in the graphs for each student.

Participant 1. Baseline showed a lack of knowledge/skill to draw a square, triangle, and "x". The student could not draw these shapes if asked to. The first shape introduced was a square, of which was a goal on his IEP. Then once that shape was mastered, he moved onto drawing a triangle. The student made progress with the intervention and has maintained the ability to draw a square and triangle. The student seemed to make faster progress concerning the second shape (see Figure A).

Participant 2. Baseline showed a lack of knowledge/skill to draw a circle, square, triangle, and "x". The student could not draw these shapes if asked to. The first shape introduced was a triangle, of which was a goal on his IEP. Then once that shape was mastered, he moved onto drawing a square. The student made progress with the intervention and has maintained the ability to draw a triangle and a square. The student seemed to make faster progress concerning the first shape (see Figure B).

Being able to draw basic shapes can be very challenging for some children. Nonetheless, in today's primary classrooms drawing shapes remains essential and is crucial to a student's ability to progress in their future schooling. The results of the MLT procedure and the fading procedure proved effective in improving the participants' ability to draw shapes after the intervention had been in effect for at least two sessions. An exception to this was with Participant 2 and the shape of an "x." There was not a clear functional relationship established between Model-Lead-Test, the fading procedure and the participant's mastery of shapes. Clearly some additional research needs to occur to determine what was responsible for the delayed effects of MLT with tracing and fading.

With the implementation of the intervention and even during baseline, both students showed enthusiasm about the individualized intervention procedures and the attention they received from the researchers. However, Participant 1 was sometimes in cooperative. He would throw tantrums and refuse to participate in the study all together. Throughout the intervention, the students were very compliant, worked well with the researcher and responded well to instruction. If there were any behaviors, they were dealt with in a quick and efficient manner. Their positive results clearly indicated that with the proper intervention it could greatly increase the learning capacity of a child with learning difficulties.

Our intervention (MLT and our fading procedure) was practical. Data collection was very brief and did not take a great deal of extra classroom time. If another instructor or parent wanted to employ these procedures, it would not take a great deal of time out of their classroom day. Learning and then mastering the techniques of MLT with fading took a minimal amount of time. The ongoing data collection system fit well into the ongoing classroom routine. However, this preschool classroom has been long been the setting for several research projects (Caletti, McLaughlin, Derby, & Rinaldi, 2012; Chandler, McLaughlin, Neyman, & Rinaldi, 2012; Ehlers, McLaughlin, Derby, & Rinaldi, 2012; Rauch, McLaughlin, Derby, & Rinaldi, 2012). Therefore, this classroom with its strong

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emphasis on data collection, implementation of behavior management procedures may not be typical. Additional research in a different type of classroom appears needed.

MLT plus tracing and fading were inexpensive to put into practice. The materials needed could be found around the house or in a typical classroom. The researchers were very pleased with the intervention outcomes and the educational experience. The MLT and fading out procedure were shown to be invaluable teaching techniques that could be used with other students with disabilities.

Finally, we were able to partially replicate and extend our previous research (Aldahri, et al., 2013; Herberg et al., 2011; Peterson et al., 2009; Shouse et al., 2012) employing MLT with various modifications to another population and in a different classroom. It appears that additional research with a different research would be needed before one could make strong statements regarding the efficacy of MLT, tracing, and fading with preschool students with developmental delays. This will have to be determined in future research.

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Table 1. Data Collection Form for Participant 1.

Session #	Shapes Correct	Shapes Incorrect
1		triangle, square,
2		triangle, square,
3	x	triangle, square
4	x	triangle, square
5	x	triangle, square
6	square	triangle, x
7	square	triangle, x
8	square	triangle, x
9		triangle, square, x
10	square, x	triangle
11	square, x	triangle
12	x	triangle, square
13	square, x	triangle
14	triangle, square	x

IOA = 100%

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Table 2. The data collection form implemented with Participant 2.

Session #	Shapes Correct	Shapes Incorrect
1		triangle, square, x
2	square	triangle, x
3		triangle, square, x
4		triangle, square, x
5		triangle, square, x
6		triangle, square, x
7	triangle	square, x
8		triangle, square, x
9	triangle	square, x
10	triangle	square, x
11	square, x	triangle
12	triangle, square	x
13	triangle, square	x
14	triangle, square, x	

IOA = 100%

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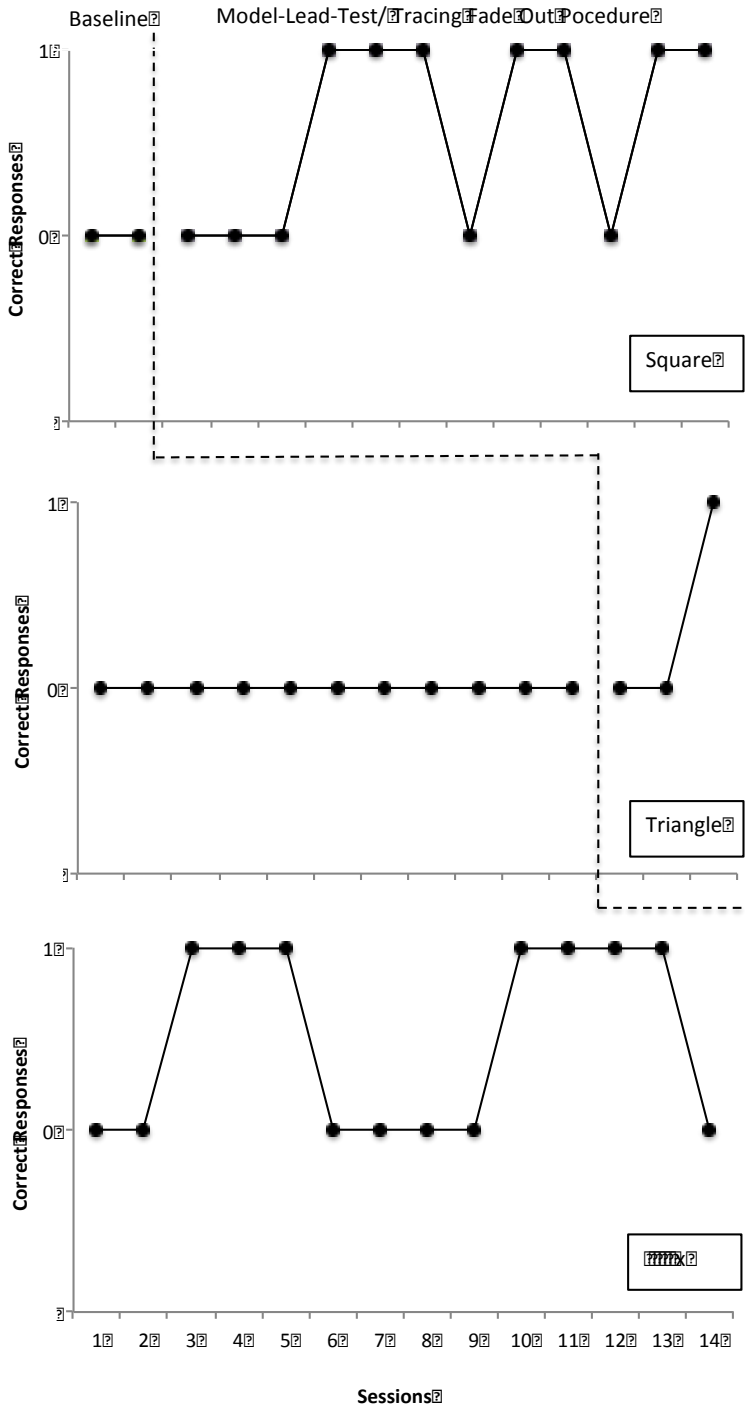

Figure 1. The number correct during basline and MLT for squares, triangles and x's with Partiipant 1..

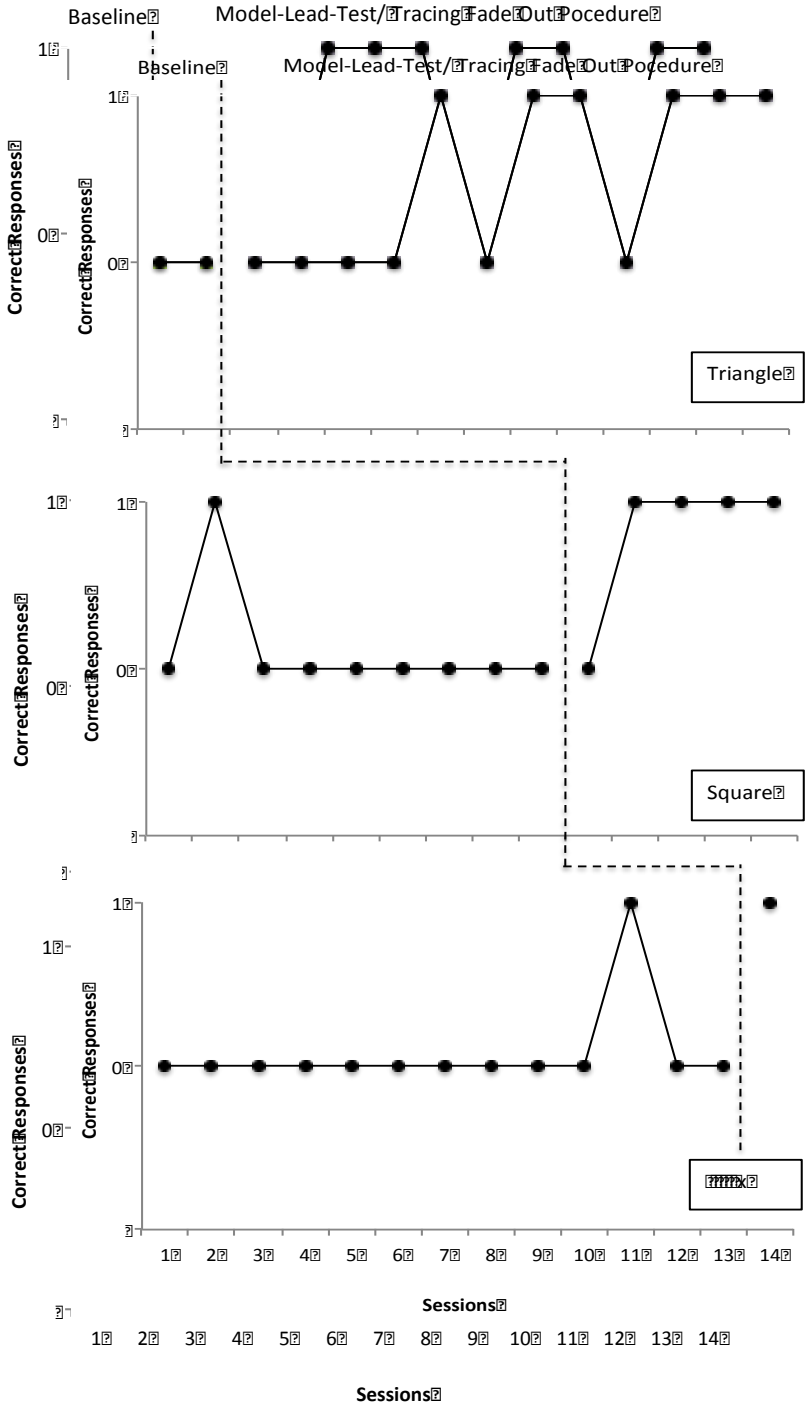

Figure 2. The number of correct shapes during baseline and MLT + Fading for triangles, squares and x's for Participant 2.