The Effects of Model, Lead, and Test with Reward To Teach a Preschool Student with a Developmental and Language Delays to Demonstrate an Understanding of Number Quantity

Anna Mortensen[1], T. F. McLaughlin[2], Jennifer Neyman[3], Barb Girshick[4]
[1]*amortensen@zagmail.gonzaga.edu*, [2]*mclaughlin@gonzaga.edu*, [3]*neyman@gonzaga.edu*
[1,2,3] Department of Special Education, Gonzaga University and [4]Early Childhood Special Teacher Spokane Public Schools
USA

ABSTRACT

The purpose of this study was to teach a 4-year-old preschooler with developmental disabilities number quantity. Demonstrating an understanding in number quantity is a component part in the hierarchy of math in the public schools. A student must obtain this skill before moving on to a general education classroom kindergarten. This study was also carried out to support the math skills and the student's transition to kindergarten in the following year. The model, lead, and test error correction strategy from direct instruction was paired with a reward to teach our participant number quality. A multiple baseline design across three groups of number was employed to evaluate our intervention. The overall results indicated increases in student performance during model, lead, and test with a reward.

Keywords: model, lead, and test, error correction, rewards, numeracy, number quantity, preschooler, developmental delays

I. INTRODUCTION

For children birth to 6 with developmental disabilities, early intervention is the best-researched and effective practice designed to decrease the effects of disabilities of students later in life (Heward, 2013). Therefore preschool students with disabilities are by law entitled to valuable teaching strategies in an early developmental preschool (Howard, Williams, &Lepper, 2010). These early childhood interventions emphasize the importance of teaching children functional goals that are otherwise learned in a natural environment (Shouse, Weber, McLaughlin, & Riley, 2012). The functional goals are in a hierarchy order that encourages acquisition of simplest skills at the base and building on that to more complex skills. These students who will be successful in life will be the ones that were able to grasp the basic concepts in early intervention and build on them. Number quantity is a crucial skill for any child to have. It is one of the basic skills needed in order to advance in math skills and be ready for and successful in kindergarten and beyond. For children number quantity is a complex skill that requires the student to process what is being asked and then be able to know what the number means and be able to count out that many and stop. This is a skill that once obtain the student will be able to tell how many items need to be added or subtracted to get to a certain number. This skill can attribute to fluency in math skills such as addition and subtraction problems.

According to Cole and Dale (1986), young children with developmental disabilities

respond well to a direct instruction method. These techniques utilize repetition and frequent practice in order to master a skill or materials. In addition, these procedures allow for increasing the opportunities for students to respond (Blackwell & McLaughlin, 2005; Heward, 1994, 2013).When errors occur, direct instruction provides information to the student as to which problems they missed and what is the correct answer. Another reason why students with disabilities respond well to this type of instruction is because material and information are introduced in small amounts at a time and they are able to organize information in logical sequences, which build on each other (Hayter, Scott, Weber, & McLaughlin, 2007; Higgins, McLaughlin, Derby, & Long, 2012; Marchand-Martella, Slocum, & Martella, 2004). Such students need systematic early intervention. This suggestion has a great deal of support from the empirical literature (Howard et al., 2010; Slavin, 1999).

Recently, several studies have been conducted to evaluate the use of model, lead, and testing with as well as without a reward. Crowley, McLaughlin, and Kahn, (2013) employed DI flashcards and error correction to teach two elementary school students with autism sight words. Shouse et al., 2012 were able to teach a preschool student with developmental delays their colors. When these procedures were withdrawn, student performance continued to be accurate. Peterson, McLaughlin, Weber, and Anderson, (2007) employed a model, lead, and test procedure with visual prompts to teach a single 13 year-old student with autism his location in various parts of his school building.

The purpose of this study was to teach a 4-year-old preschooler with developmental disabilities number quantity. Demonstrating an understanding in number quantity is a component part in the hierarchy of math. A student must obtain this skill before moving on to a general education classroom kindergarten. This study was done to support the math skills and the student's transition to kindergarten in the following years.

II. Materials and Method

Participant and Setting

The participant is a 4-year-old boy who attended a public school preschool in the Pacific Northwest. He had been diagnosed as developmentally delayed as well as speech delays. He also had difficulty in the areas of math. On the *Battelle Developmental Inventory* (BDI-2™) (Newborg, 2004), he scored at the one percentile in the cognitive domain. Since he will be attending kindergarten in a year and needs to be up to standard on his math skills, so that he will be able to be successful in kindergarten.

The study took place in a CAPE (Corporative Approach to Preschool Education) program in the Pacific Northwest. There were 17 preschool students in the classroom. Six of the students were on IEP's and the rest were head start students. One head start teacher, one head start teacher aid, the special education teacher and a student teacher were all present in the classroom. Bryan, the participant was taken out of the classroom to a room across the hall to limit the distractions taking place in the classroom.

Materials

The materials used were a variety of manipulative including blocks, cars, and color chips. The reward box included items that were preferred for the student. Items like cars, SpongeBob stickers, and mini puzzle pieces. These rewards were part of the ongoing preschool classroom routine.

Dependent Variable

The dependent variable was whether the student was able to providethe correct amount of objects when asked. A correct response was defined by when the participant handed the amount asked for and did so counting each

block as he handed them to the first author. For example when he was prompted, "Hand me 3" he was required to count out 1,2,3 and stop and not continue. An incorrect response was scored if our participant did not respond, if he grabbed a handful of blocks and put it in the first author's hand, or failed to engage in 1:1 counting.

Data Collection

The measurement system used for data collection was a sheet that listed the numerals 1-8 and with a space for recording his response given. The question was asked and then once the object(s) were handed to the first author, the first author then counted the blocks and this was recorded on the data sheet.

Experimental Design and Conditions

The design was a multiple baseline design across sets (Kazdin, 2011; McLaughlin, 1983). Sets 1 and 2 contained three numbers while Set 3 had two numbers. In order to go onto the next set the previous set must be mastered. Mastered was defined as receiving correct on all three numbers for three consecutive days.

Baseline. The study started with first taking the participant into a separate room where the objects were already out and ready to go. The participant was allowed to bring a friend. This friend excelled in math and was able to be a peer model. During baseline the student was asked to hand the first author one through eight objects. No prompts, feedback or praise was given during baseline. Because of speech delays the participant was given extra wait time as used in classroom procedures. The number of sessions in baseline ranged from

Model, lead, and test + reward (MLT + reward). For the intervention the students came into the separate classroom. They both sat down across from the first author. First the first author gave the participant a pretest. Then it moved to working on the target goal for that day. First the correct answer was modeled for the participant. After it was modeled the participant was instructed to lead with the teacher through the correct answer. Once this was completed the first author instructed the participant to perform the task independently. If the participant had the correct answer then this was changed to the next number. If the participant made an error, then the correct answer was modeled and then the participant and the first author went through the correct answer again and then the participant was tested on the correct answer. This procedure was repeated until the participant made the correct answer. When the correct answer was given three times consecutively the teacher moved to the next number. After the session was completed the student was allowed to pick a toy out of the toy box for his compliance. This condition was in effect for 3 to 12 sessions.

Reliability of Measurement

Inter-observer agreement was 100% through all sessions. Later during data collection, a third party came into to gather inter-observer agreement. When this occurred, the first author sat across from the participant and the second observer could make a simultaneous but independent recording. The first and fourth authors were positioned so that simultaneously so that it was scored independently. These data were scored point by point. The mean agreement was 100%.

III. Results

Our results are displayed in Figure 1. The average performance for baseline in Set 1 was 44% for correct responses with a range of 33% to 66%. During MLT + reward, our participant was able to obtain mastery for Sets 1 and 2.The average score was 80% correct, with a range of 66% to 100%.

For Set 2, the average for baseline was 40% for correct responses with a range of 0% to 33%. During the use of model, lead, and test

ISSN 2350 – 7756

+ reward, the performance of our participant increased to a mean of 85% (range of 33% to 100%).

For Set 3 there were only two numbers instead of three. For baseline the average or mean performance was 25%. The range for the results was 0% to 50%. In intervention the mean score increased to 75% with a range of 50% to 100% (See Figure 1).

IV. Discussion

This case report examined the effects of using a model, lead, and test procedure with a reward on a four-year-old male preschooler with developmental disabilities. This method was shown to be effective method for our participant. The student showed increases in the amount of correctly answered problems from the first session to the last session. In the duration of that time that the study took place the participant was able to also increase his 1:1 correspondence counting skills as well as improving his number quantity skills. The student really enjoyed stickers and toys; this was used for reinforcements because the student would at times become noncompliant. Finally, through out the study the student would get distracted and try to play games with the first author. This would include giving back the wrong amount of blocks because he wanted to trick the first author. It is believed that the student was able to correctly identify all the number quantities but would like to trick the teacher instead of answering the question correctly. These results are seen in parts of the maintenance in Set 1. Also the student would lose interest in the study because he wanted to play with the toys in the room. It was therefore important for the first author to stay animated and have reminders for the rewards the student could receive if the task was completed. Also because he would become noncompliant when asked to come with the research, he was allowed to pick a friend to come with. This friend was the same one throughout the entire study and was also used as a peer model.

The present outcomes replicate previous research showing the efficacy of employing model, lead, and test error correction with a reward for students with disabilities (Bulkley, McLaughlin, Derby, & Carosella, 2012; Peterson, McLaughlin, Weber, & Anderson, 2008) as well as with preschool students with developmental delays (Dundon, McLaughlin, Neyman, & Clark, 2013; Shouse et al., 2011). The more differential effects found in Higgins et al., 2012 were not found in the present research. However, the participants in the Higgins et al. research displayed more severity with respect to social as well as academic skills.

Strengths of the study were several. The materials needed were limited to things that were already in the classroom. The only thing needed was a tub of items that the student could count which can be found any classroom. This also made the study extremely inexpensive. The only material that was provided by the first author was the data sheet and the reinforcement toys, which were inexpensive dollar store items. Due to these facts mentioned above, the study could be successfully implemented into the classroom setting, as well as implemented with other students. Since number quantity is a perquisite to further mathematical development and is a component part for this student to be successful in kindergarten and beyond. Another strength was that it was done across three sets.

The limitations to this study were that it was only employed a single participant. Due to time and the limited students available, only one child was able to participate in the study and evaluated using the model, lead and test procedure. Preschool only occurs Monday through Thursday, which limits the time the student can work with the first author. In addition, the way the C.A.P.E program is set up, the preschoolers were only in class for

three days a week for an entire month. The other days were needed for home visits to each student's home. However, this did not appear to impede our participant's ability to obtain the information and generalize it to other times of the school day. Lastly, Set 3 was not yet at mastery level andour participant was unable to learn all numbers in that set. We felt with additional time, he would master these numbers.

ACKNOWLEDGMENT

This research was completed in partial fulfillment for an Endorsement in Special from the Department of Special Education at Gonzaga University and the Office of the Superintendent of Public Instruction for the State of Washington. The authors would like to express their appreciation to the participantand his legal guardian for allowing her to complete this project. Requests for reprints should be addressed to Anna Mortensen, Department of Special Education, Gonzaga University, Spokane, WA 99258-0025 or via email at amortensen@zagmail.gonzaga.edu

REFERENCES

Blackwell, A., & McLaughlin, T. F. (2005). Using guided notes, choral responding and response cards to increase student performance. *International Journal of Special Education, 20*(2), 1-5. Retrieved from: http://www.internationaljournalofspecialeducation.com/issues.cfm

Bulkley, L., McLaughlin, T. F., Neyman, J., & Carosella, M. (2012). The effects of a model, lead, and test procedure to teach letter name and sound identification to elementary school students with learning disabilities. *Electronic International Journal of Educational Research, 3*(4), 50-64. Retrieved from: http://www.e-ijer.com/

Cole, K. N., & Dale, P. S. (1986). Direct language instruction and interactive language instruction with language delayed preschool children. *Journal of Speech and Hearing Research, 29*, 206-217.

Crowley, K., McLaughlin, T. F., & Kahn, R. (2013). The effects of direct instruction flashcards, reading racetracks on sight word skills for two students with autism. *Journal of Developmental and Physical Disabilities, 26*,297-311.

Dundon, M., McLaughlin, T. F., Neyman, J., & Clark, A. (2013). The effects of a model, lead, and test procedure to teach correct requesting using two apps on an ipad with a 5-year-old student with autism spectrum disorder. *Educational Research International, 1*(3), 1-10. Retrieved from: http://www.erint.savap.org.pk/nextissue.html

Hayter, S., McLaughlin, T. F., Weber, K. P., & Scott, E. (2007). The use of a modified direct instruction flashcard system with two high school students with developmental disabilities. *Journal of Developmental and Physical Disabilities, 19*, 409-415.

Heward, W. L. (1994). Three low-tech strategies for increasing the frequency of active student response during group instruction. In R. Garner, III, D. M. Sainato, J. O., Cooper, T. E., Heron W. L., Heward, J., Eshleman, & T.A. Grossi (Eds.), *Behavior analysis in education: Focus on measurably superior instruction*. Pacific Grove, CA: Brooks/Cole.

Heward, W. L. (2013). *Exceptional children: An introduction to special education*. (10th. ed.). Upper Saddle River, NJ: Prentice-Hall/Pearson Education.

Higgins, M., McLaughlin, T. F., Derby, K. P., & Long, J. (2012). The differential effects of direct instruction flashcards on sight-word identification for two preschool students with autism spectrum disorders. *Academic Research International, 2*(3), 394-402. Retrieved from: http://174.36.46.112/~savaporg/journals/issue.html

Howard, V. F., Williams, B. F., &Lepper, C. (2010). *Very young children with special needs: A Foundation for educators, families, and service providers* (4th. ed.). Upper Saddle River, NJ: Merrill/Pearson Education.

Kazdin, A. E., (2011). *Single-case research designs: Methods for clinical and applied settings* (2nd ed.). New York, NY: Oxford University Press.

McLaughlin, T. F. (1983). An examination and evaluation of single subject designs used in behavior analysis research in school settings. *Educational Research Quarterly, 7*, 35-42.

Newborg, J. (2004). *Battelle Developmental Inventory* (BDI-2™) (2nd ed.). Rolling Meadows, IL: Riverside Publishing.

Peterson, L., McLaughlin, T. F., Weber, K. P., & Anderson, H. (2008). The effects of a model, lead, and test technique paired with visual prompts with a fading procedure to teach "where" to a 13-year-old echolalic boy with autism. *Journal of Developmental and Physical Disabilities, 20,* 31-39.

Shouse, H., Weber, K. P., McLaughlin, T. F., & Riley, S. (2012). The effects of model, lead, and test and a reward to teach a preschool student with a disability to identify colors. *Academic Research International, 2*(1), 477-483.Retrieved from: http://174.36.46.112/~savaporg/journals/issue.html

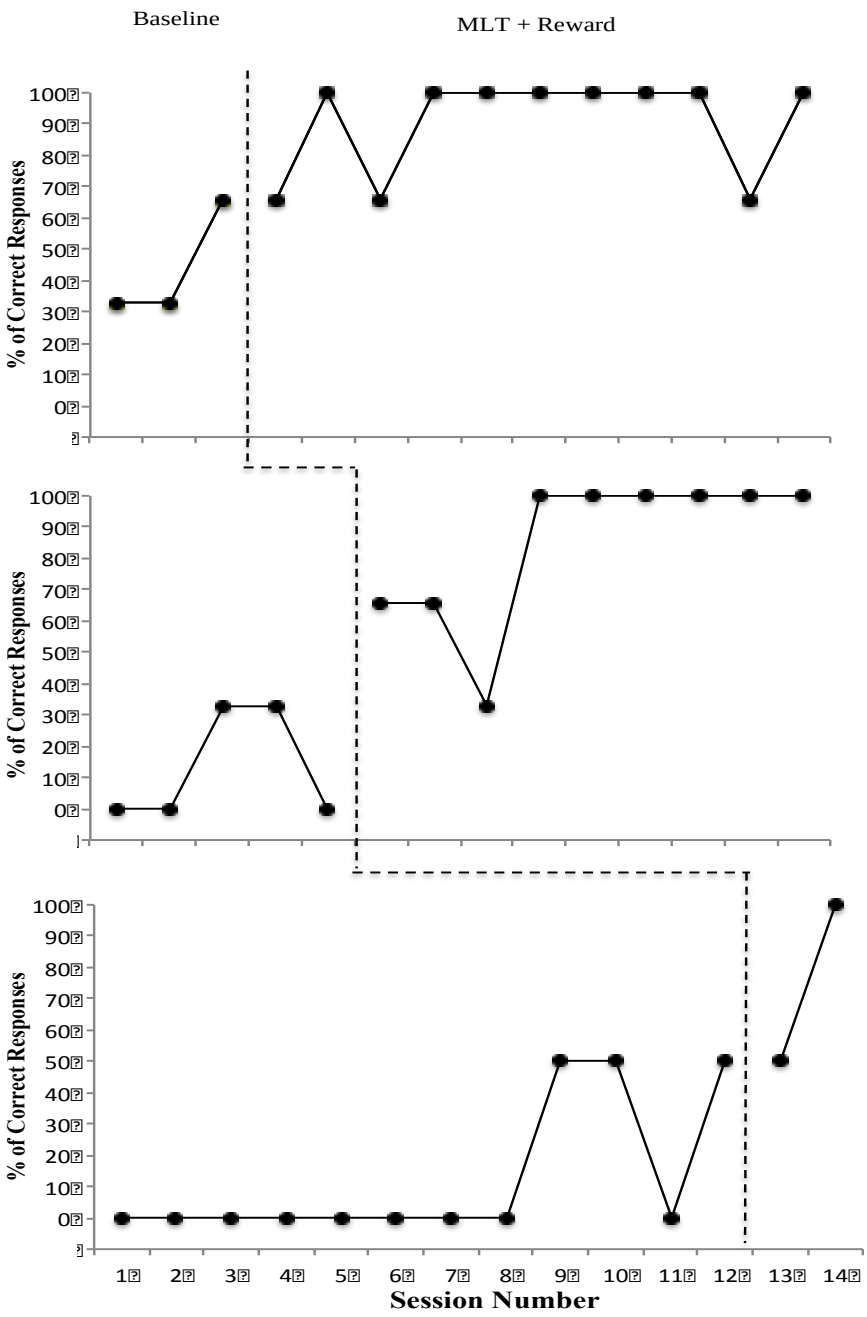

Figure 1. The percent of correct responses for Sets 1, 2, and 3 for baseline and MLT + Reward.