The Effects of a Model, Lead, and Test Procedure to Teach Letter Name and Sound Identification to Elementary School Students with Learning Disabilities[1]

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Abstract

The purpose of this study was to assess the model, lead, and test (MLT) procedure on the letter name and sound identification performance for two elementary students. The two participants were diagnosed with learning disabled in math, reading, writing and communication. One of the two students also had behavior goals. The study took place in a resource classroom located in a public school in the Pacific Northwest. A multiple-baseline across letter sets was employed to assess the effectiveness of the model, lead, and test procedure. The behavior measured was correct letter name and sound identification. The results showed mastery of all letters of the alphabet by the participants when the model, lead, and test procedure was employed. The present outcomes replicate those of previous research and were easy to implement and assess by the classroom personnel.

Key words: Learning disabilities, elementary school students, flashcards letter identification, letter names, letter sounds,

INTRODUCTION

Reading is one of the most important skills a child can learn in elementary school (Adams, 1990). Fletcher, Foorman, Francis et al. (1998) reported that on average, children who were poor readers in the third grade never "caught up" to their peers' reading ability. Because of this, 74% of those who were poor readers in third grade remained poor readers by the ninth grade (Cunningham and Stanovich, 1997; Fletcher et al., 1998). Low student achievement on standardized testing can be traced back to the student inability to read at grade level. The lack of reading ability does not only affect students during reading and writing language arts classes; but it is a necessity in order to achieve academic standards in all subject areas. Instead of

portraying a reading problem in a student, the reading inability portrays a highly underachieving child in all academic areas (Atkinson, 1998). Over one third of students have severe reading difficulties (Adams, 1990; S. Shaywitz, Escobar, B. Shaywitz, Fletcher, and Makuch, 1992).

Learning letter names and letter sounds plays an important role in the early stages of literacy. The ability to recall letter names and sounds helps children to decode and spell words (Francis et al. 1998). Knowing the letter names specifically helps children to become better at letter sounds because many letters of the alphabet contain their letter sound in the letter name. (Catts and Kamhi, 2005; Share, 2004; Treiman, Tincoff, Rodriguez, Mousaki, and Francis, 1998). In combination, knowing the letter names and corresponding letter sounds allows students to store letter identification information, which can later be applied to sounding out and reading words.

Students with learning disabilities and developmental delays may require specially designed instruction in order to become successful at reading (Daly, Chafouleas, and Skinner, 2005; Lerner and Johns, 2011). The model, lead and test procedure, based on Direction Instruction, allows for both repeated practice of a new skill and teacher led/supervised instruction (Carnine, Silbert, and Kameenui, 1997; Marchand-Martella, Slocum, and Martella, 2004). The model portion of the procedure allows for students to see and hear a complete and correct example of the skill being taught. The lead allows the students to answer without fear of being incorrect and the test allows for teachers to gage student progress and ability/inability. For students with learning disabilities and developmental delays, the model, lead and test procedure creates a systematic, repetitive learning system that helps to develop important academic skills, such as a precursor to reading, like letter identification.

Flashcards that employ model lead and test error correction have also been effective in improving basic skills in a wide range of curricular areas such as math (Hayter, Scott, McLaughlin, and Weber, 2008), sight words (Ruwe, McLaughlin, Derby, and Johnson, 2011), and spelling (Kaufman, McLaughlin, Derby, and Waco, 2011). For example, Hayter et al. employed a model lead and test procedure to teach a student with autism his location in the school (e.g. classroom, hallway, cafeteria, etc.). Ruwe et al employed a model lead and test procedure are part of the DI flashcard intervention with middle schools students with intellectual disabilities. They reported increased accuracy in sight word recognition and generalization to words read in context after training. Glover, McLaughlin, Derby, and Gower, (2010) implemented a DI flashcard intervention with its model, lead, and test error correction with two students with learning disabilities. Glover et al. were able to increase the students' accuracy in math facts. Treacy, McLaughlin, Derby, and Schlettert, (2012) employed DI flashcards with model, lead, and test error correction with two students with severe behavior disorders. They were able to increase the math performance for both participants enrolled in a self-contained special education classroom.

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The purpose of this study was to evaluate the effects of the model, lead, and test procedure. This study was to examine the efficiency of this procedure with special education students. The study used a multiple-baseline approach across three sets of letter flashcards to evaluate the effects of a model, lead, and test procedure. An additional purpose was to extend and replicate our previous research (Brasch, Williams, and McLaughlin, 2007; Erbey, McLaughlin, Derby, and Everson, 2011; Hayter et al., 2008; Kaufman et al., 2011; Romjue, McLaughlin, and Derby, 2011; Treacy et al., 2012) with flashcards with model, lead, and test error correction with a different population of elementary students who read well below grade level.

METHOD

The participants of this study were two first grade students, one male and one female. Each had an Individualized Education Plan (IEP) and received special education services for specific learning disabilities. The male participant, participant 1, age 7, was given the *Woodcock-Johnson Brief Battery Form A*, (Woodcock, McGrew, and Mather, 2008). He scored in the low to low average range for all three areas of reading, math and writing. He was pulled out of school the previous year and it was evident that he had missed previous important concepts and had gaps in important academic areas. He had reading, writing, math, communication and behavioral goals stated on his IEP. Participant 2 was diagnosed with fetal alcohol syndrome and had learning disabilities in reading, writing, math and communication. She worked at a kindergarten level across the board for reading, writing and math. Both participants were also seen as at risk students due to poverty and economic background.

The study took place in a resource room in a public elementary school in the Pacific Northwest. The two students were removed form their general education classroom and brought to the resource room from 9:30 – 9:55 a.m. each day for reading. They also came to the resource room from 10:45 – 11:10 a.m. for math. There was only one resource teacher present in the room during the time of the study. The two students worked at a square table in the middle of the room. During their resource time, the room was typically quiet, with no more than two other students working with an instructional aid at another table. Data were gathered every day that the student's were present, at 9:30am.

Twenty-seven letter flashcards (including both forms of a, "a" and "a") were used during this study. Two data sheets were used for each participant, one for the primary data collector and one for inter-observer agreement data. The primary data sheet is displayed in *Figure 5*. The inter-observer agreement data collection sheet is displayed in Figure 6.

The dependent variable was the number of correctly identified letter names and sounds. These sounds were gathered from a pretest assessment. The number of letter sounds answered correctly was the major dependent variable. A correct was defined as correctly stating the letter name and corresponding most common letter sound within 5

seconds. If the student took longer than 5s or mispronounced the sound, an error was scored.

Data were taken using a data collection sheet. The primary data collector presented the flashcards to the participant and then placed them in a pile for correct and a pile for incorrect. The data was then transferred onto the data sheet, giving a tally in the "correct" column for correctly identified letter names and sounds and a tally in the "errors" column for incorrectly identified letter names and sounds. The data sheet is seen in Figure 5.

Reliability was taken during 29% of the sessions for Participant 1 and across baseline and intervention for both participants. The formula used to determine the inter-observer reliability was calculated by dividing the number of agreements by the sum for agreements plus disagreements and multiplying by 100. Inter-observer reliability data were taken independently by the master teacher, who simultaneously recorded the participants' accuracy of letter name and sounds identified correctly on the flashcards. The inter-observer reliability data during baseline was 99% for participant 1 and 30% for participant 2. Participant 1's inter-observer agreement averaged 99% across all three sets and Participant 2's inter-observer agreement averaged 99.3% across all three sets.

Experimental Design and Conditions: A multiple baseline design (Kazdin, 2010) across sets and participants was used to evaluate the effectiveness of the model, lead, and test procedure. A description of each follows.

Pre- and post testing. The participant was given a pre- and posttest containing 26 capital letters and 28 (both forms of "a" and "g") lowercase letters. The participant was instructed to give the letter name, letter sound and a corresponding word starting with that letter for each letter on the test. The researcher did not correct the participant.

Baseline. The participants were presented with two sets of flashcards for each session during baseline. The sets alternated between Set A and Set B, Set A and Set C, Set B and Set C, etc. The participant was asked to give the letter name and sound for each card presented. The participant was not corrected for errors or rewarded for correct responses but was encouraged and praised for effort. For participant 1, one session of baseline was completed for Set A, seven sessions of baseline were taken for Set B and twenty-four sessions of baseline were taken for Set C. For participant 2, two sessions of baseline were taken for Set A, four sessions of baseline were taken for Set B, and eight sessions of baseline were taken for Set C.

Model, lead, and test. The sessions of intervention lasted approximately five minutes for each participant. For Participant 1, intervention on Set A began on the second session because his pre-test and baseline data showed how weak he was in letter identification. For Participant 2, she started intervention on Set A after the second session of baseline. Each session, during intervention on Set A, the participants were presented with Set A and Set B or Set A and Set C, alternating between the two. When

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the participant mastered Set A, which required three consecutive data sessions worth of 100% correct responses, the participant was moved to intervention on Set B and was tested alternately on Set A and Set C.

At the end of the set of letter flashcards, the first author would go over the incorrectly answered cards with the model, lead, and test procedure. The researcher would first model the correct letter name and correct most common sound. The researcher would then lead the student in saying the letter name and letter sound correctly. Then, the researcher would again test the student on the name and sound. The researcher would also provide the participant a word example (i.e. "apple" for "a") to help them remember the most common sound for that letter.

FINDINGS AND COMMENTS

The results for Participant 1 can be seen in Figures 1 and 2, while the results for Participant 2 can be seen in Figures 3 and 4.
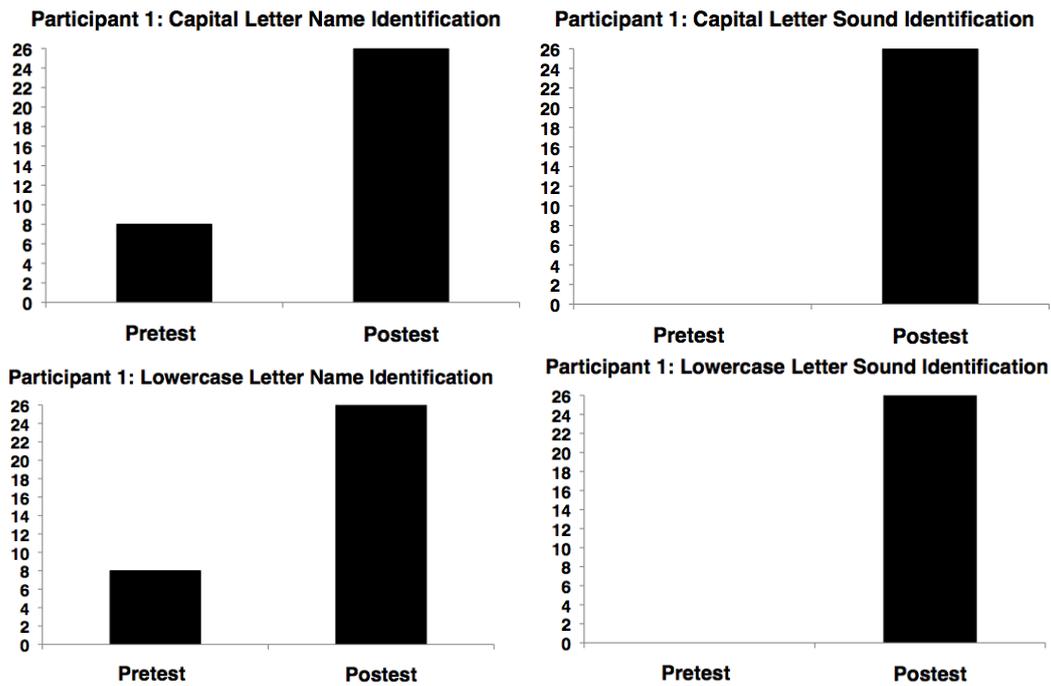

Figure 1: Pre- and Posttest Results for Participant 1

Participant 1
    Pre-testing. Participant 1 was given a pre- and post-test of twenty-six capital letters and twenty-eight lowercase letters (both forms of "a" and "g"). On the pre-test, he was able to correctly identify the letter name for eight capital letters and eight lowercase letters. He was unable to identify any sounds or corresponding words that started with the letter for any of the capital or lowercase letters. The results of Participant 1's pre-test can be seen in *Figure 1*.

Baseline. The results of Participant 1's baseline are displayed in *Figure 2*. During the one session of baseline for Set A, the participant correctly answered one letter name and sound out of nine total letters. During the two sessions of baseline for Set B, the participant answered on average, two out of nine letters correctly. During the eleven sessions of baseline for Set C, the participant ranged from correctly identifying one out of nine letters to eventually correctly identifying eight out of nine letters. The student generalized the information and learned sounds through reading in class as well as practicing on his own with the alphabet song.
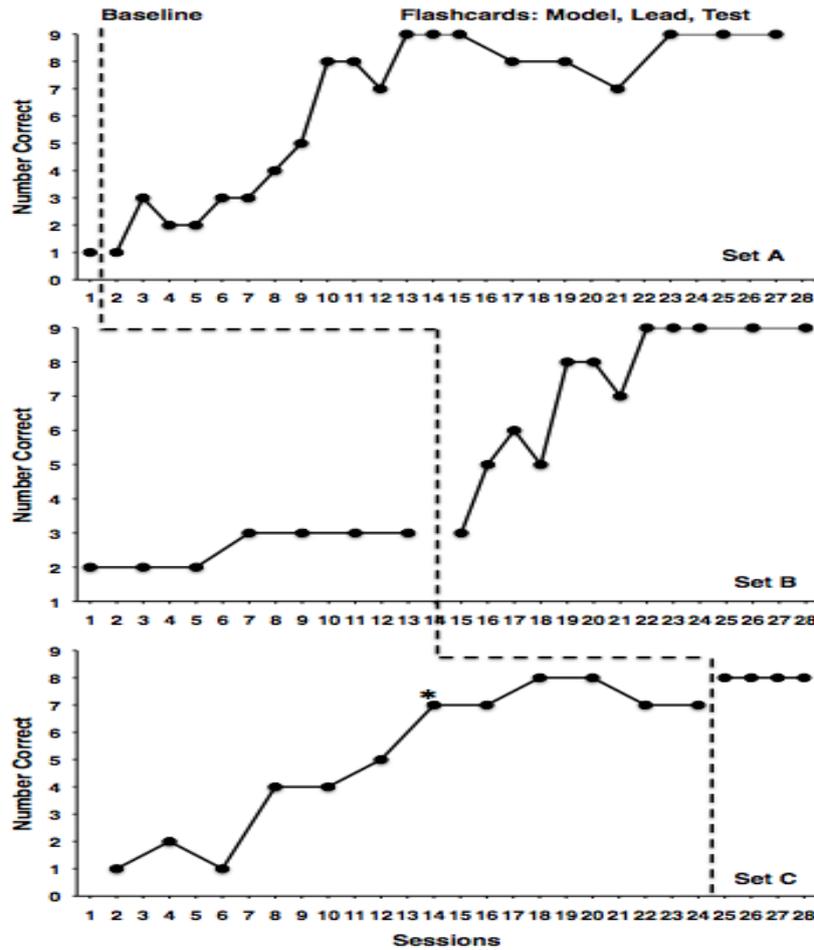

Figure 2. Baseline and Flashcards with Model, Lead, Test Results for Participant 1.

Model, Lead and Test

Set A. The results of Participant 1's intervention are displayed in *Figure 2*. During intervention on Set A, the correctly identified letters ranged from 1 – 9 (M=4.8). The implementation of the model, lead, and test procedure showed the participant's ability to identify the letter names and sounds of the nine letters in Set A. The participant was able to master Set A letters after 14 sessions of intervention. During maintenance, the participant was able to correctly identify between 7 and 9 of the Set A letters. He dipped down to correctly identifying 7 out of 9, only once, immediately following the Thanksgiving break.

Set B. During intervention on Set B, the correctly identified letters ranged from 5 – 9 ($M = 7.3$). The implementation of the model, lead, and test procedure showed the participant's ability to identify the letter names and sounds of the nine letters in Set B. The participant was able to master Set B after twenty-four sessions of intervention. During maintenance, the participant was able to correctly identify all nine of the letter flashcards for the remainder of the study.

Set C. During intervention on Set C, the number of correctly identified letters was 8. The implementation of the model, lead, and test procedure showed the participant's ability to identify the letter names and sounds of the eight out of the nine letters (excluding the sound of "y") in Set C. The participant was unable to completely master Set C after four sessions of intervention, however he consistently got eight out of the nine flashcards correct. In Figure 2, there is an * above data point number 12. This signifies the day that Participant 1 learned the alphabet song. From that point, he consistently sung the song during class and informed the master teacher and researcher that he sang it at home as well. He was able to learn the letter names from the song as well as generalize the letter sounds also.
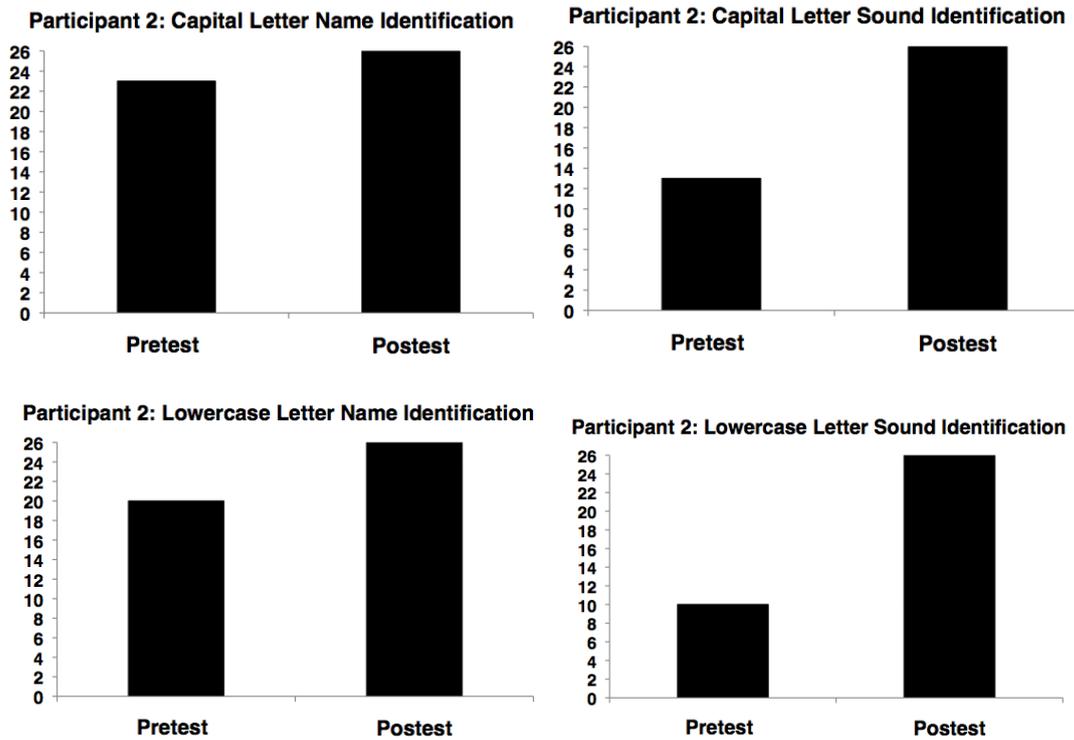
Figure 3: Pre- and Posttest Results for Participant 2.

Posttest. Participant 1 was given the same test as the pre-test, with twenty-six capital letters and twenty-eight lowercase letters (both forms of "a" and "g") on the final day of the study. On the posttest, he was able to correctly identify the letter name for all twenty-six capital letters and all twenty-eight lowercase letters. He was able to identify twenty-two of the sounds of capital letters and all twenty-eight sounds of the lowercase letters. Participant 1 was also able to give a correct corresponding word for

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seventeen of the capital letters and twenty of the lowercase letters. The results of Participant 1's posttest can be seen in *Figure 1*.

Participant 2

Pre-test. Participant 2 was given a pre- and post-test of twenty-six capital letters and twenty-eight lowercase letters (both forms of "a" and "g"). On the pre-test, she was able to correctly identify the letter name for twenty-four capital letters and twenty lowercase letters. She was able to identify thirteen of the capital letter sounds and ten of the lowercase letter sounds. She was also able to identify seven corresponding words for the capital letters and ten corresponding words for the lower case letters. The results of Participant 2's pretest are displayed in Figure 3.

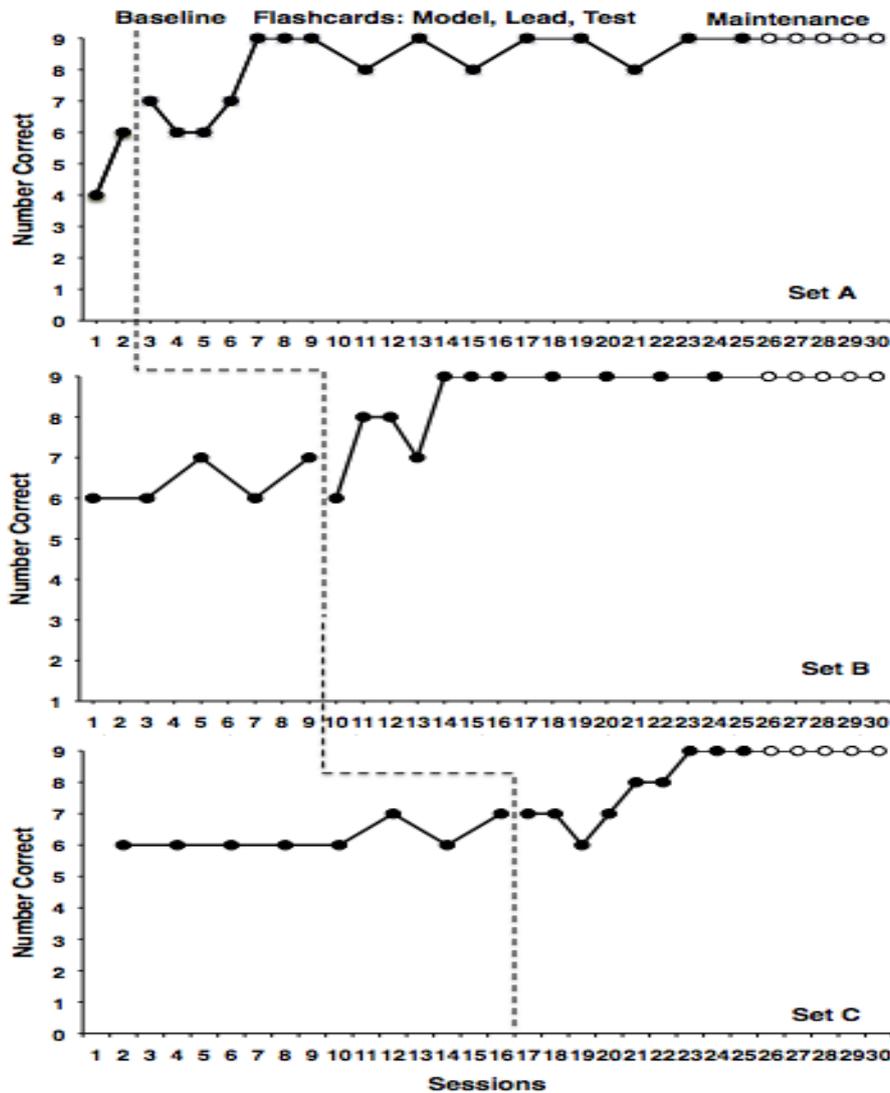**Figure 4:** Baseline and Model, Lead, Test Intervention Results for Participant 2.

Baseline. The results of the number of letter names and sounds correctly identified per set using a multiple baseline design across three sets of flashcards for

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participant 1 is shown in *Figure 4*. During the two sessions of baseline in Set A, letter names and sounds identified correctly ranged from 4 to 6 ($M = 5$). During the five sessions of baseline in Set B, the number of letters identified correctly ranged from 6-7 ($M = 6.4$). During the eight sessions of baseline in Set C, the number of letters identified correctly ranged from 6 to 7, ($M = 6.25$).

Model, lead, and test. The results of participant 2's intervention are displayed in Figure 4. For Set A, she correctly identified letters ranged from 6 to 9 (M = 7.6). The implementation of the model, lead, and test procedure showed the participant's ability to identify the letter names and sounds of the nine letters in Set A. The participant was able to master Set A letters after seven sessions of intervention. During maintenance, the participant was able to steadily correctly identify eight or nine of the letter flashcards.

For Set 1, Participant 2 the correctly identified letters ranged from 6 –9 with a mean of 8.0. The implementation of the model, lead, and test procedure showed the participant's ability to identify the letter names and sounds of the nine letters in Set B. The participant was able to master Set B after seven sessions of intervention. During maintenance, the participant was able to steadily correctly identify all nine of the letter flashcards.

Set C. During intervention on Set C, the correctly identified letters ranged from 6 –to9 (M=7.8). The implementation of the model, lead, and test procedure showed the participant's ability to identify the letter names and sounds of the nine letters in Set C. The participant was able to master Set C after eight sessions of intervention. During maintenance, the participant was able to correctly identify 100% of the letters for the remainder of the study.

Posttest. Participant 2 was given the same test as the pre-test, with twenty-six capital letters and twenty-eight lowercase letters (both forms of "a" and "g") on the final day of the study. On the posttest, she was able to correctly identify the letter name for all twenty-six capital letters and all twenty-eight lowercase letters. She was able to identify 26 of the sounds of capital letters and all 28 sounds of the lowercase letters. Participant 1 was also able to give a correct corresponding word for 17 of the capital letters and twenty-three of the lowercase letters. The results of Participant 2's posttest can be seen in Figure 3.

CONCLUSIONS AND RECOMMENDATIONS

The study showed that the effects of the model, lead, and test procedure increased both participants' ability to identify letter names and sounds over the course of twenty-eight sessions for Participant 1 and thirty sessions for Participant 2. The graphs attached show an increasing trend in the amount of correctly identified words in Set A, Set B and Set C over the course of the study for both participants. Participant 1's results can be seen in Figure 2 and Participant 2's results can be seen in Figure 4. The results in Figure 1 illustrate that Participant 1 showed an increase in the number of

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letter names and sounds identified correctly on the pre- and posttest from the beginning of the study to the end of the study. Figure 3 shows the same data for Participant 2.

The strengths of the study were the model, lead, and test procedure, the consistency of the sessions and the use of both a male and female participant. The participants enjoyed the use of flashcards and the model, lead, and test procedure. The participants looked forward to the one-on-one attention from the researcher and the ability to increase their correct letter identification over time. The participants, especially Participant 2, were able to generalize the letter sounds across the three sets. They were also both able to generalize the letter names and sounds from lowercase to capital letters.

A weakness of the study was the small number of students. The study would have been stronger had additional first grade boys and girls been taught letter identification using the model, lead and test procedure. Another weakness of the study was that the researcher did not incorporate a letter-word correspondence (i.e. letter name "a", letter sound "/æ/" and word that starts with letter "a" is "apple"). Although the students practiced identifying words that began with the various letters, it was not a part of the model, lead, test procedure and the participants were not tested and held accountable for knowing a corresponding word for each letter. Lastly, the study could have been stronger had the researcher included both forms of "g" ("g" and "**g**"). The "g" formed this way is more commonly seen in print and many elementary school students do not recognize it. Had the two types of "g" been included in the study, the participants could have differentiated between both types of "g" and both types of "a" but also learned that they are the same letter and make the same sound.

The present outcomes replicate our previous research employing a model, lead, and test error correction procedure with DI flashcards (Brasch et al., 2007; Glover et al., 2010; Herberg, McLaughlin, Derby, and Williams, 2011; Ruwe et al., 2011) or with racetrack like interventions plus flashcards (Erbey et al., 2011; Green et al., 2010; Kaufman et al., 2011) with a different group of students. This adds to the confidence an educator has as to whether or not to employ any or all of these procedures.

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D.I. Flashcards - Letter and Sound Identification

(Lower Case)

(Participant's Name)

Date	Session	IOA (Y/N)	Condition	Set A Corrects	Set A Errors	Set B Corrects	Set B Errors	Set C Corrects	Set C Errors
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
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	35								

Figure 5: Data Sheet

Frequency Over Time Recording Sheet

Participant ____

Inter-Observer Agreement Data Sheet

Date	Session	IOA (Y/N)	Condition	Set 1 Corrects	Set 1 Errors	Set 2 Corrects	Set 2 Errors	Set 3 Corrects	Set 3 Errors
	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								
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Figure 6: Inter-observer Agreement (IOA) Data Sheet

Öğrenme Engelli İlköğretim Öğrencilerine Harf ve Sesi Tanımayı Öğretmek İçin Bir Model

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Genişletilmiş Özet

Problem: Öğrenme engelli çocuklar genellikle okuma-yazmaya çaba sarf ederler. Gerçekte, bu çocukların karşılaştığı zorluklardan biri okumadır Zorluk harf adı ve sesten oluşan bir formda oluşabilir. Eğer böyleyse, bir kelimeyi gördüklerinde sesini veremez ya da okuyamazlar ama tahmin etmeye çalışırlar Tahmin etmeye çalışmak öğrencilerin okuduğunu anlama ve akıcılığını etkiler. Aydınlatma Kartları (flashcards) matematik ve okuma-yazma öğretiminde yaygın olarak başarılı bir şekilde kullanılmaktadır. Aydınlatma kartları uygulama prosedürü olan doğrudan bir araçtır. Bu prosedür modelli, (rehberli ve test işlemli) hata düzeltmeyi içerir. Hata kartları, kartların (flashcards) en üstüne yerleştirilir, böylece öğrenci hata kartı eşliğinde doğru cevabı söylerken geniş bir pratik alanına sahip olur. Öğretmenler, öğrencilere, hatalarını düzeltmeleri için doğru performansı söyleme yoluyla yardım ederler. Bu model (rehber-test prosedürü) doğru cevap için öğretmen gerektirir. Sonrasında, öğrenci ve öğretmen doğru cevabı birlikte pratik hale getirirler. En sonunda ise, doğru cevabı söyleyen öğrenciye aydınlatma kartı (doğru kart) gösterilir. Eğer öğrenci doğruyu söylemişse, sonraki kartlara geçilir, yanlış ise işlem doğruyu yapıncaya kadar tekrar edilir.

Yöntem: Katılımcı olarak iki öğrenme engelli ortaokul öğrenciisi alındı. According to the *Woodcock-Johnson Brief Battery Form A'ya göre*, herbir katılımcı okumada sınıf düzeyinin altındaydı. Yapılan işlemin (prosedürün) etkililiğini değerlendirmek için harf ve ses gruplarının desenlendiği setler kullanıldı. Uygulama öncesi ve sonrası olmak üzere ön test ve son test verileri toplandı.

Bulgular: Başlangıçta herbir katılımcı harf ve sesleri doğru bir biçimde tanımlayamadılar. Model uygulanmaya başlandıktan sonra herbir öğrencinin performansında artışlar meydana gelmeye başladı. Öyle ki ön ve son test puanları arasında anlamlı artışlar oldu. Özellikle ikinci katılımcıda davranışın devamı kalıcılaştı. Ortaya çıkan sonuçlar önceki aydınlatma kartlı çalışmaları (alanyazındaki) benzeşik bir nitelik göstermektedir. Yapılan işlemler, bir özel eğitim ortaokulunda uygulama ve

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değerlendirme açısından kolaydı. Son olarak, öğretmen ve öğrenciler aydınlatma kartlarını kullanırken zevk aldılar ve onların katkılarından da etkilendiler.

Sonuç ve Öneriler: Çalışma gösterdi ki, uygulanan model (rehber-test prosedürü) her iki katılımcının (birinde 28 ders diğerinde 30 derste) harf ve sesleri tanımak yeterliğini artırmaktadır. Bu sonuçlar, uygulanan modelin aynı zamanda, özel eğitim sınıflarında uygulanabileceğini göstermektedir. Çünkü işlemler oldukça kolaydır. Katlımcılar aydınlatma kartlarının kullanımından hoşlanmışlardır. Ayrıca, katılımcıların, bir karttan diğerine geçilirken yoğunlaşan dikkatleri bağlamında meraklandıkları ve giderek harf tanımlamada doğruyu yapmalarıyla ilgili olarak da bir yeterlilik kazandıkları görülmüştür. Çalışmanın bir zayıflığı az sayıda öğrenciyle çalışılmış olmasıdır. Çalışma birinci sınıftaki kız ve erkeklerde yapılabilir. Gelecekte, bu modeli normal eğitim ortamlarında ve farklı değişkenler bağlamlı işleyen başka araştırmalar yapılabilir.

Anahtar kelimeler: Hata düzeltme, Aydınlatma kartları, Harf ve sesler, Ortaokul öğrencileri, Öğrenme engelliler

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