THE EFFECTS OF MNEMONICS ON LETTER RECOGNITION AND LETTER SOUND ACQUISITION OF AT-RISK KINDERGARTEN STUDENTS

A Dissertation

by

TERESA WHITE

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

December 2006

Major Subject: Curriculum and Instruction

THE EFFECTS OF MNEMONICS ON LETTER RECOGNITION AND LETTER SOUND ACQUISITION OF AT-RISK KINDERGARTEN STUDENTS

A Dissertation

by

TERESA WHITE

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Approved by:

Chair of Committee, Mark Sadoski
Committee Members, William Rupley
John Helfeldt
John Hoyle
Head of Department, Dennie Smith

December, 2006

Major Subject: Curriculum and Instruction

ABSTRACT

The Effects of Mnemonics on Letter Recognition and Letter-Sound Acquisition of At-Risk Kindergarten Students. (December 2006)

Teresa White, B.S., University of New Orleans;

M.Ed., University of Saint Thomas

Chair of Advisory Committee: Dr. Mark Sadoski

This study examined the effectiveness of embedded picture mnemonic alphabet cards on the acquisition of letter name and letter sound knowledge with at-risk kindergarten students in a rural Texas public school. The study compared student achievement against a zero baseline when the student(s) are trained using a dissassociated picture mnemonic to an embedded picture mnemonic. A secondary area of investigation was the "Degree of Difficulty in Learning Letter Names" theory proposed by Treiman, Tincoff, Rodriguez, Mouzaki, & Francis. The theory states that consonant letter names can be divided into three categories based on phoneme characteristics: Easy to learn letters have a consonant-vowel pattern (the letter name for "D" is /d/ /e/); hard letters have a converse pattern of vowel-consonant (the letter name for "M" is /e/ /m/); and the other category has no phoneme pattern reflective to the letter name (the letter name "W" is "double" "you").

Students were randomly selected to either the treatment or the control group and after a ten-day (two week) training period, the students were given one week with no intervention then administered a posttest, followed by another week with no intervention

followed by a post-posttest. The purpose for this assessment design was to determine if the training had an effect on long-term memory.

Results revealed that children taught with the embedded picture mnemonics learned more letter name associations than did the control group. The embedded picture mnemonic had a positive effect on long term memory reflecting an increase from a moderate effect sizes for letter naming (d = .69) on the first week post test to a large effect size for letter naming (d =1.12) on the second week post test. The results also revealed inconclusive support for Treiman's et al. (1998) degree of difficulty in learning letter names theory.

ACKNOWLEDGEMENTS

This dissertation was brought to completion with the generous help and prayers from my family. I would like to thank my parents, Ken and Cathy Shaffer, for their continual prayers and support; my sister Lea Ann Franklin and her family, who faithfully and enthusiastically volunteered their skills to proofread and edit the text; my brother Thad Shaffer, who spent many patient hours with me working on power point presentations and graphics; and my husband, Mark White who always wants the best.

I would also like to acknowledge and thank my chair, Dr. Mark Sadoski, who spent many afternoons conferencing with me on the direction of this study and helped to keep me focused. To my committee; Dr. William Rupley, Dr. Jack Heldfelt, and Dr. John Hoyle, I give recognition for offering assistance and encouragement as this research developed.

This study would not have been possible without the all the kindergarten students, their parents, and the kindergarten teachers and office staff from Eastside Elementary, Hearne ISD, who participated and assisted in this study. They reinforced in me the amazing power of collaboration and persistence. Thank you!

Above all, I thank God. I am very thankful for the many prays offered by family and friends for the successful completion of this project. All the blood, sweat, and tears of the past four years are being graciously wrapped and humbly offered for the greater glory of God.

TABLE OF CONTENTS

Page

ABSTRACT iii

ACKNOWLEDGEMENTS v

TABLE OF CONTENTS vi

LIST OF TABLES viii

LIST OF FIGURES ix

CHAPTER

I INTRODUCTION 1

The Study 1
Alphabetic Principle 1
Letter Shapes 2
Letter Name Knowledge 2
Phonological Awareness 3
The Purpose of the Study 3
Picture Mnemonics 3
Degree of Difficulty in Letter Names 4
Theoretical Framework 5

II REVIEW OF LITERATURE 7

Background Information 7
Degree of Difficulty in Learning Letter Names 7
Alphabetic Principle 8
Mnemonics Used for Learning Letter Names and Sounds 10
Dual Coding Theory (DCT) 13
Embedded Picture Mnemonics 15
Summary 18

III METHODOLOGY 19

Overview and Research Questions 19
Research Questions 19
Setting and Participants 20
Independent Variables 21
Embedded Picture Mnemonic 21
Disassociated Picture Mnemonic 23

CHAPTER Page

Degree of Difficulty in Learning Letter Names 24
Dependent Variables 25
Data Collection Procedure 25
Qualifying Assessment 26
Follow-Up Assessment 26
Analysis Procedure 27

IV RESULTS 29

Research Question 1 29
Letter Names 29
Research Question 2 30
Letter Sounds 31
Research Question 3 32

V DISCUSSION AND SUMMARY 37

Overall Conclusion from Study 37
Letter Name Knowledge 37
Letter Sound Knowledge 38
Degree of Difficulty in Learning Letter Names 39
Implications for Instruction 40
Limitations and Recommendations for Future Research 41
Summary 44

REFERENCES 45

APPENDIX A 52

APPENDIX B 55

APPENDIX C 56

APPENDIX D 57

APPENDIX E 59

VITA 63

LIST OF TABLES

TABLE Page

1. Descriptive Statistics for Week One Testing on Letter Naming..... 30
2. Descriptive Statistics for Week Two Testing on Letter Naming..... 30
3. Descriptive Statistics for Week One Testing on Letter Sounds..... 31
4. Descriptive Statistics for Week Two Testing on Letter Sounds..... 31
5. Week One Wilcoxon Ranks Results..... 33
6. Week Two Wilcoxon Ranks Results 34
7. Level of Significance..... 35

LIST OF FIGURES

FIGURE Page

1. Differences in Means between Treatment and Control Groups in Degree of Difficulty Categories of Easy, Hard and Other for Week One 36

2. Differences in Means between Treatment and Control Groups in Degree of Difficulty Categories of Easy, Hard and Other for Week Two 36

CHAPTER I

INTRODUCTION

It has been suggested over time that "a picture is worth a thousand words," implying that human memory capacity is greater for pictures than for words. Questions remain, however, concerning the potential of pictures to support language learning. Paivio's (1971, 1986) dual coding theory provides a useful theoretic framework which supports the superiority of pictures over printed words as memory aids. This study extends the limited body of evidence that embedded picture mnemonic alphabet training contributes to facilitating the acquisition of letter-name knowledge as well as to letter-sound knowledge necessary for beginning reading. In addition, this study further investigated Treiman, Tincoff, Rodriguez, Mouzaki, & Francis's (1998) conceptual "degree of difficulty" idea of learning letter names.

The Study

This study sought to find a theoretically based, successful intervention tool for kindergarten students who have not yet fully learned the alphabetic principle.

Alphabetic Principle

The alphabetic principle is based on the foundation that all words within our English writing system are based on a limited set of graphic symbols. Adams (1990) defines the alphabetic principle as understanding that letters have corresponding sounds that create words when they are combined. Understanding the alphabetic principle involves comprehending that words are made up of letters from the alphabet and these

---

This dissertation follows the style of *Reading & Writing Quarterly*.

letters are approximately matched to the sounds of our English language. In other words, the graphic units of the alphabet are related to the phonological structure of words (Liberman & Shankweiler, 1985).

Letter Shapes

The research of Gibson and Levin (1975) indicates that the shapes of letters are learned by distinguishing one character from another by its individual spatial features. For some children, discriminating among these features is a source of disorientation, confusing the eye. While most letters remain the same no matter at what angle they are viewed; there are the exceptions, for example if the letter ”M” is turned upside down, it becomes the letter “ W.” In addition to learning letter forms, children must also learn to visually discriminate between upper and lower case letters.

To read, children must be able to interpret graphic symbols, learning what makes one letter distinguishable from every other letter, and attentively notice individual letter features, even when some of the differences are very small. Besides distinguishing letters shapes, children need to learn letter names and letter sounds.

Letter Name Knowledge

The letter is the basic unit of writing in Standard English, and while not sufficient in itself for reading success, familiarity with the letters of the alphabet is important for developing decoding skills. Snow, Burns, and Griffin (1998) reported “the strongest predictor (of early reading success) on its own is letter identification” (p. 21). The National Committee on the Prevention of Reading Difficulties in Young Children (Snow et al., 1998) specifies kindergarten accomplishments to include recognizing and naming

all uppercase and lower case letters of the alphabet. Research provides ample evidence that limited letter knowledge is a roadblock in learning to read. (Adams, 1990; Pressley, 1998).

Phonological Awareness

Phonological awareness is a general term describing a child's awareness that spoken words are made up of sounds (Torgeson, Wagner, & Roshotte, 1997). Phonemic awareness, a subset of phonological awareness, refers to the specific understanding that spoken words are made up of individual phonemes. This skill requires the ability to segment speech into separate words or sounds, analyzing the different parts of natural speech.

The Purpose of the Study

The purpose of this study was to expand the limited body of evidence that embedded picture mnemonic alphabet training contributes to the acquisition of letter-name knowledge as well as letter-sound knowledge necessary for beginning reading. In addition, this study further investigated Treiman's et al. (1998) conceptual "degree of difficulty" idea of learning letter names.

Picture Mnemonics

Mnemonic instruction is a memory enhancing strategy designed to improve the storage and retrieval of information from long term memory. Mastropieri and Fulk (1990) discuss the role of mnemonic instruction to enhance academic performance with learning disabled (LD) students. They concluded the factors that make learning more memorable:

> …it is known that effective elaborative techniques facilitate the recall of information. Moreover, it has been seen that when information is more meaningful, it is more memorable. Additionally, when information is made concrete, it is more memorable than when it is abstract. Finally, it has been seen that when information is encoded effectively, direct retrieval routes are established and thus new information is more readily recalled. …Each of these variables – elaboration, meaningfulness, concreteness, and effective encoding – contributes towards a theoretical framework for explaining why mnemonic instruction….facilitates the performance of LD students. (p. 119)

Ehri, Deffner, and Wilce (1984) explain in their research that integrated picture mnemonics were effective in teaching kindergarten students to learn letter-sound associations. They state "integrated pictures were effective because they linked two otherwise unconnected items in memory. The shapes of letters included in pictures reminded learners of previously seen pictures with those shapes whose names began with the relevant letter sound" (p. 880).

Degree of Difficulty in Letter Names

Learning letter-name and letter-sound relationships are not easy for all beginning readers. This difficulty may be caused by letter names not always corresponding with the letter sound. There have been several research studies that demonstrate how children use their knowledge of letter names to inform them of the letter sounds (Treiman et al., 1998; Thompson, Fletcher-Flinn, and Cottrell, 1991). If children rely on the initial sound in the letter name as the cue for the letter sound, they are likely to make errors, such as, /duh/ for 'W'. Thompson et al. (1991) found that alphabet letters can be classified as compatible or incompatible with the acrophonic principle. Thompson et al. (1991) defines the acrophonic principle as "the initial pronunciation element in the spoken name of the letter is taken as the corresponding phoneme for that letter" (p. 22). According to

this finding, 17 letters of the alphabet have names incompatible with their sound (c, f, h, m, s, g, l, r, w, y, e, x, a, i, u, q). Treiman et al. (1998) found that letters of the alphabet could be segregated by the location of the phoneme when saying the letter name. The letter is considered easier to learn when the phoneme is located in the initial location of the letter name (b, c, d, g, j, k, p, t, v, z). The letter is considered more difficult to learn when the phoneme is located in the final position when stating the letter name (f, l, m, n, r, s, x). There are a few exceptions which are classified as others because the phoneme is not heard when pronouncing the letter name (h, q, w, y).

Theoretical Framework

It is important to offer a theoretical framework for understanding the use of picture mnemonics in developing the alphabetic principle and the role that it plays in beginning reading. This study is grounded in the theoretical framework of Paivio's (1971, 1986) dual coding theory.

Thomas Aquinas wrote, "Man's mind cannot understand thoughts without images of them" and "without image, thinking is impossible" (cited in Benson, p.141). Paivio's (1971, 1986) dual coding theory supports the superiority of pictures over words as memory aids. Many studies show recognition memory for pictures to be extraordinary. For example, Shepard (1967) showed 612 different pictures to study participants, and when tested immediately after viewing, the participants correctly recalled more than 98% of the pictures. When tested a week later, the participants were able to recall more than 85% of the pictures. How information is stored in memory is the sum of Dual Coding Theory (DCT) (Sadoski, Paivio, & Goetz, 1991).

Paivio's (1971, 1986) DCT recognizes verbal and non-verbal codes, which are separate yet interconnected systems. As described by Sadoski and Paivio (2001), there are three types of mental or cognitive processing for the two codes: representational, which is a *direct* activation of verbal or non-verbal representations; referential, which is the activation of the verbal system by the non-verbal system (or vice versa) or activation *between* the verbal and non-verbal systems; and associative, which is the activation of representations *within* the same verbal or non-verbal system. A given task may require any or all three forms of processing. These cognitive strategies are important to facilitate storage and retrieval of information from long term memory. In this study the technique of embedded picture mnemonics was investigated which facilitates the use of within and between code processing. These issues will be further discussed in the following chapter through the review of literature.

CHAPTER II

REVIEW OF LITERATURE

Background Information

In 2000, the National Reading Panel (NRP) released the largest, most comprehensive evidence-based review of literature designed to help identify key skills and methods central to reading achievement. The report also focused on a number of "topics for intensive study" including alphabetics, posing the question: to what extent do mnemonics devices "speed up the process of learning letter shapes, sounds, and names and facilitate their application in reading" (p .2-136). In another federally funded study, the President's Commission on Excellence in Special Education (NIFL, 2001) specifically stated that reading was an area particularly in need of early intervention, maintaining that approximately 80% of children experiencing academic difficulty encounter reading problems so significant that they could not read or understand grade-level material (Lerner, 2003). In this review of literature, Treiman's et al. (1998) degree of difficulty in learning letter names was explored and studies investigating the alphabetic principle and studies of embedded picture alphabet mnemonic strategies to support learning the alphabet principle with students at risk of failure were examined.

Degree of Difficulty in Learning Letter Names

Treiman et al. (1998) wanted to know if all letter names were equally difficult for children to learn. In pooling data from three large scale surveys, their two part study examined letter-sound knowledge in training pre-school children in mapping letter-sound associations. The authors found systematic differences among letter sounds that

were easier or less easy to learn. Their findings revealed that children generally learn letter names more quickly when the associated phoneme is at the beginning of the letter name (“*B”* /b/ /e/) in contrast to when the associated phoneme is located at the end of the letter name (“*F”* /e/ /f/). In addition, they also found that children had more difficulty mastering letter-sound associations for letters with more than one sound (such as the letter *C*) than with letters with a single sound association (such as the letter *B*). This study revealed that children with “normal” levels of letter-naming knowledge and phonological awareness do not strictly memorize the paired association of letter to sound. Rather, they utilize what they already know about a letter name and use the sound of the letter name to make a link with the letter and sound, thus making a more rapid recall of the letter name and sound.

Alphabetic Principle

Learning to read English involves learning how an alphabetic writing system works (Ball & Blachman, 1991). The alphabet principle states that there is a correlation between letters (graphemes) and sounds (phonemes). In other words, the child or learner must understand that spoken words are broken down into smaller units (phonemes) and “that the phoneme is the unit in the speech stream represented by the symbols in the alphabetic script” (Ball & Blachman, 1991, p. 51). For children just beginning to learn to read, alphabet letter names are intangible and their sounds abstract, and the association between the letter shape and its name has relatively no meaning to the child whatsoever. Without the awareness of the phonemic structures of words, spelling is equivalent to a collection of odd shapes or arbitrary symbol strings which are almost impossible to

remember (Ehri, 1991). When a letter name is paired with something that has meaning, it becomes much easier to remember.

Facilitating the association of phonemes to graphemes provides practical value for children to learn, know, and remember letter names. According to Raschke, Alper, and Eggers (1999) children must make approximately 42 different grapho-phonemic correspondences to learn all the sounds associated with the individual names of the letters of the alphabet. Durrell (1958) states, "Since most letter names contain the sound of the letters, the ability to name letters should aid in establishing relationships between the phonemes of the spoken word and the printed form of the word" (p. 5). This assumption has ties to the acrophonic principle; the sound of the letter is extracted from the letter name. Consequently the sound most commonly associated with that specific letter is the first sound of the letter name. Venezky (1975) explains how several letter names deviate from this principle. In analyzing the English alphabet, Venezky (1975) stated that "sixteen English letters follow the acrophonic principle, while f*, h, l, m, n, r, s, w, x,* and *y* do not. It should be noted further, however, that the names for all five of the vowels plus those for *c* and *g* do not contain the sound which is traditionally introduced first for those letters in reading programs" (p. 14-15).

A review of the literature by Smith, Simmons, and Kameenui (1998) reported a trend in research suggesting that rapid letter naming may significantly effect the ease of reading acquisition, especially in the areas of coding (decoding and encoding) and automaticity. For most children, especially children with learning disabilities (LD), an organized instruction that centers on sounds, letters, and the relations between sounds

and letters provides the most beneficial student gains in alphabet knowledge (NIFL, 2001). This is further supported by Agramonte and Belfiore (2002), who stated "the acquisition and fluency of letter name-sound associations become essential as building blocks in the process of learning to read" (p. 182), and knowing the letter names and how to produce those letters enables children to use inventive spelling, which also helps them to develop their awareness of phonemes and ultimately recognize words (Clarke, 1988).

Mnemonics Used for Learning Letter Names and Sounds

In 1975, Isgur conducted a very small controlled study evaluating the effectiveness of what he coined the "object-image-projection" (OIP) method of teaching LD children letter-sound correspondence and eventually to segment and blend sounds to read text. Isgur used a modified multiple baseline-across-subjects design evaluating the effectiveness of a specific mnemonic technique for all 26 letters of the English alphabet. With this type of design there is no control or treatment groups, rather the experimenter is evaluating if and when the set criterion is met. In this study, the criterion was knowing all 26 letters which were tested three letters per day. Although he only evaluated ten subjects, his study reported 100% success. These surprising results were replicated with 50 additional LD individuals ranging in age from preschool through elementary (including special education students) yielding the same results.

The method included short 5-10 minute training sessions per letter involving the participant seeing an actual object (mittens) and naming the object. After naming, the participants traced the letter on the object with their index finger while saying the initial

sound of the object, then the object's name (/m/ "mitten"). The participants then moved to the imagining step where they closed their eyes while horizontally tracing the target letter four times, repeating the initial sound and the object's name. During this time the teacher is saying, "Imagine the mittens, imagine them behind the letter, see and feel the mittens." The final step involves the student looking at text, seeing the target letter in print, tracing over the letter four times, yet not touching it, and repeating the initial sound and the target word. The author of this study provided an illustration of the mnemonics used for all 26 letters of the alphabet. Interestingly, these are the same mnemonics used in later studies of this technique.

Most commercial alphabet learning materials contain a picture mnemonic to help facilitate the learning of alphabet letters. An example of this might be a card with the upper case and lower case letter *A a* and underneath or to the right side is a picture of an apple. This type of mnemonic is designed to offer a learning strategy which can enhance learning and later recall of that specific information. Bellezza (1981) identifies a mnemonic device as a "strategy for organizing and or encoding information with the sole purpose of making it more memorable…The essential part of learning with a mnemonic device is to associate the information to be remembered with one or more cognitive cueing structures" (p. 252). In the example of the picture mnemonic alphabet card, a child would associate the letter A a with the picture and verbalized word "apple." If a picture and a letter are to be associated in memory, a composite, interacting image of the two referents should be formed (Bower, 1972).

Ehri et al. (1984) examined the effectiveness of picture mnemonics on obtaining letter-sound knowledge. They conducted two experiments using picture mnemonics to help pre-readers learn letter-sound associations. In the first experiment, 20 first grade students were randomly split into a control group and treatment group. The treatment group was taught letter-sound associations using integrated picture associations (the shape of the picture included the letter: e.g. the letter *f* drawn as the stem of a flower with the name of the picture "flower" beginning with the target letter sound). The control group was taught using disassociated pictures, where the picture was distinctly separate from the letter and bore no resemblance to the letter. A total of 17 lower-case consonants were evaluated. The training for both the control and treatment groups was conducted in a classroom environment, and lasted approximately 20 minutes for six days. The second experiment had a sample size of twenty-five kindergarten and five pre-kindergarten students and evaluated only five consonant letters. The sample was randomly divided into three groups: control group A – disassociated picture/letter cards; control group B – no picture, letter only cards; treatment group – integrated picture mnemonic alphabet picture cards. This experiment was conducted in a lab setting and lasted six days.

The results of Ehri et al.'s (1984) study indicated that children taught with integrated picture-mnemonics learned more letter-sound associations and more letter-picture associations than did the other two groups, which did not differ from each other. They found that "integrated pictures were effective because they linked two otherwise unconnected items in memory. The shapes of the letters included in pictures

reminded the learners of previously seen pictures with those shapes whose names began with the relevant letter sound" (p.880).

Dual Coding Theory (DCT)

In both the Isgur (1975) and the Ehri et al. (1984) studies, the authors evaluated the effectiveness of utilizing an alternative to direct visual-language learning of grapheme-phoneme associations. Both studies employed Paivio's (1971, 1986) dual coding principles. The embedded picture mnemonic is a known common object, the name of which allows the elicitation of letter-sound associations. Proposed in 1971 by Paivio, DCT is built on the assumption that information is processed and stored in memory by two separate but interconnected codes – one verbal (linguistic information - "logogens"), the other nonverbal (nonlinguistic information -"imagens"). Both verbal and non-verbal systems can be activated independently, yet there are interconnections between the two systems that allow connections between the two codes (Paivio, 1971, 1986; Sadoski & Paivio, 2001).

Paivio (1971, 1986) identifies three distinct levels of processing that can occur within and between the verbal and nonverbal codes: representational, referential**,** and associative. As described by Sadoski and Paivio (2001), representational processing involves the *direct* connections between incoming stimuli and either the verbal or non-verbal codes; a verbal stimulus directly activates verbal memory codes or nonverbal stimulus activates nonverbal memory codes. Referential processing refers to the building of connections *between* the verbal and non-verbal codes. Associative processing refers to

the activation of informational units *within* either of the systems. A given task may require any or all three forms of processing.

The superiority of pictures used in verbal memory tasks is explained by DCT on the basis of two important assumptions. The first is that the two codes (verbal and non-verbal) produce additive effects. This means if some piece of information is coded both verbally and nonverbally, the probability of retrieval is doubled. The second assumption states the ways in which pictures and words activate the two codes differently. It is believed that pictures are far more likely to be stored both visually and verbally. That is, we remember the picture and its spontaneously associated name. For example, the picture mnemonic of a cowboy boot with the letter *b* layered over top of the boot provides adequate cueing in both verbal and non-verbal memory. It is also generally believed that the primary codes for concrete concepts are learned before, or more easily than, abstract concepts. This is because the concrete concepts are processed and stored as images and verbal representations, whereas abstract concepts are primarily stored as verbal representations, which have less access to the nonverbal code (Sadoski et al., 1991).

Teachers occasionally use pictures early in children's literacy development to support recognition and understanding of words. There is some controversy over the benefit of using pictures to learn sight words (for review see Sadoski, 2005). However, there does not appear to be any controversy over the benefit of using pictures to teach the letters of the alphabet. Children learn to use the alphabetic symbols by combining their oral language with pictures and print. When it comes to children learning the

alphabetic principle, involving memory of abstract concepts, two codes are better than one!

In both the Isgur (1975) and the Ehri et al. (1984) studies, the visual association is based on the *form similarity to the alphabet letter*, which conjures up the target visual mnemonic image which triggers the spoken name of the target object, with the first phoneme being associated with the letter. This process utilizes representational, referential, and associative pathways to elicit the target sound for the specific letter. Without recognizing these processes, both authors articulated the dual coding cognitive process involved in this mnemonic method of learning grapheme-phoneme associations.

Embedded Picture Mnemonics

Various types of mnemonics have been investigated for their effectiveness in facilitating pre-readers' understanding of letter-sound relationships. The following studies followed Ehri et al. (1984) in investigating the effectiveness of embedded picture mnemonics on acquiring letter-sound knowledge, and then generalized that information to beginning reading.

Fulk, Lohman, and Belfiore (1997) found that the use of integrated picture mnemonics was an effective instructional technique to teach letter-sound associations and letter recognition to three transitional first-grade students with special needs. A multiple-baseline-across-students design was used to evaluate the effectiveness of an integrated picture mnemonics intervention for learning 20 consonant alphabet letters. Therefore, no control or treatment groups were used; rather, the number of training sessions was recorded until mastery. Mastery was reached by two of the three students

during the baseline sessions before the end of the study. Although the third student did not reach complete mastery, all three displayed increased letter recognition skills after the picture mnemonic intervention. The researchers provided two explanations for the success of the integrated picture mnemonics intervention technique:

1. Integrating a picture into the form of the letter provides a strong link between the visual stimulus and the verbal response, which allows a meaningful connection to be made between information that was previously unrelated.
2. Provides students with an effective strategy to transform previously unknown material into known material.

Raschke et al. (1999) used an alphabet mnemonic system with ten 5- and 6-year-old students diagnosed with various learning disabilities. With the alphabet mnemonic system all letters were introduced using a visual mnemonic paired with a verbal mnemonic. An example for the letter *b* would include a picture of a bee and the phrase, "A bee goes buzz." Each letter was presented by pairing the upper case and lower case letters together. Six of the students recognized all 26 letters within one school year, but other benefits were also reported for all of the children. The mnemonic system made learning the letters fun; provided a set of consistent cues for the teacher to use; encouraged higher levels of thinking; problem solving and understanding; and enabled students to generate their own mnemonic devices when they experienced difficulty recalling information.

Agramonte and Belfoiore (2002) extended the research work of Fulk et al. (1997) by investigating the effects of mnemonics on the production of new words beginning with

target letter-sounds learned by at-risk urban kindergarten students (without any special needs). The integrated picture mnemonic strategy was assessed with a multiple-baseline-across-students design with a criterion level of 19/21 letters said correctly. Results of this study reported that all three students increased in both the number of consonant sounds spoken and named correctly. In addition, two of the three students were able to generalize the newly acquired letter-sound knowledge to the production of new words (beyond the mnemonic target word).

In the most recent study, Sener and Belfiore (2005) extended Argamonte and Belfiore's (2002) work by evaluating the effectiveness of mnemonic training on three Turkish ELL (English language learner) fourth grade students in producing new words beginning and ending with the target letter sounds of 21 lower case English consonant letters. As in the previous studies, the consonant letter was fully integrated into the picture mnemonic. Again, a multiple baseline-across-students-design was used to establish the effectiveness of the mnemonic strategy. The study yielded similar results, stating "mnemonics were especially appropriate in the area of alphabetic understanding" (p. 113). The effectiveness of learning letter-sound relationships with the use of integrated picture mnemonics creates a single stimulus versus two separate stimuli in the form of an unknown letter and a known picture. The integrated mnemonic creates the connection the child needs to bring together the visual symbol of the letter with its name and sound. Without some kind of connections, there can be no understanding.

Summary

In summary, the results of several studies support that knowledge of letter names play an important role in reading acquisition and that learning letter names and grapho-phoneme associations are strongly assisted by embedded letter mnemonics. Numerous researchers (Adams, 1990; Ball & Blachman, 1991; Bradley & Bryant, 1983; Chall, 1967 & 1983; Bond & Dykstra, 1967; Invernizzi, Meier, Swank, & Juel, 1997; McBride-Chang, 1999; Pennington & Lefly, 2001) have shown that preschool children's knowledge of letter names is among the best predictors of their future success in learning to read. To assist at-risk kindergarten students in acquiring letter name and letter sound knowledge, the use of an embedded mnemonic device can be useful to connect the relatively abstract letter name and sound together.

The purposes of this study was to evaluate the use of embedded picture mnemonic alphabet training as it contributes to facilitating the acquisition of letter-name knowledge, as well as to letter-sound knowledge necessary for beginning reading. In addition, this study further investigated Treiman et al.'s (1998) conceptual degree of difficulty idea of learning letter names.

CHAPTER III

RESEARCH METHODOLOGY

Overview and Research Questions

The purpose of this study was to investigate the effectiveness of embedded picture mnemonic alphabet training in the acquisition of letter-name and letter-sound knowledge of at-risk kindergarten students. This section presents the methods that were used to investigate the research questions and describes the setting and participants. The embedded picture mnemonic training procedure is then illustrated, as is the disassociated picture mnemonic that served as the comparison. Finally, the assessment tool for the study, Marie Clay's (1996) Observation Survey Letter Identification Task, is presented, and specific procedures for data collection are explained.

Research Questions

This project addresses two research questions:

1. Does using an embedded picture mnemonic promote the acquisition of letter-names more effectively than using disassociated letter/picture mnemonics?
2. Does using an embedded picture mnemonic promote the acquisition of letter-sound associations more effectively than using disassociated letter/picture mnemonic?
3. Is the construct of the conceptual degree of difficulty for learning letter names (Treiman, et al., 1998) supported with category 1 (easy: d, g, v) being learned more easily than category 2 (hard: N, n, l,) and/or category 3 (most difficult: q, h)?

The *Observation Survey Letter Identification Task* (OSLIT) of Marie Clay's *An Observation Survey of Early Literacy Achievement* (OS) (Clay, 1996) is used both as a qualifying assessment and as a posttest following ten days of alphabet letter training. The resulting assessment scores from the OSLIT provide the necessary data to address the research questions.

Setting and Participants

Participants for this study were 32 at-risk kindergarten students from lower socioeconomic status (SES) families. All 32 students attended East Side Elementary in Hearne, Texas, a K-2 campus housing five different kindergarten classrooms. The city of Hearne is located in the center of a triangle formed by Dallas/Fort Worth, Houston, and San Antonio, Texas. Hearne is approximately 25 miles north of Texas A&M University. East Side Elementary School has approximately 385 students in pre-k through second grade, and 88% of the student population is economically disadvantaged. This percentage is based upon the number of students eligible for free and reduced lunch prices and other forms of public assistance (Texas Education Association, 2004-05).

Students were selected for the study based on their score from the Marie Clay OSLIT administered during the first week of school. The 32 students eligible for this study were unable to identify the eight target letters and exhibited no letter-sound knowledge. The lack of alphabet knowledge possessed by these students is consistent with research indicating a connection between children of low SES and low skill levels in alphabet knowledge and in print and word concepts (Adams, 1990; Roseberry-McKibbin, 2001; Snow et al., 1998).

The qualifying phase of the study was conducted over the first four days of the 2006-2007 school year. All East Side Elementary kindergarten students were individually administered Marie Clay's OSLIT which asked them to produce, for each of the 26 letters of the alphabet (both upper and lower case), the letter name, the letter sound, and a word beginning with that particular letter. Those students who exhibited very little letter name knowledge, no letter sound knowledge, and could not produce a word beginning with the correct letter sound qualified for the study.

From the five different kindergarten classrooms, a total of 32 students were eligible: 11 girls and 21 boys. Of the 32 participants, 19 (59%) had attended pre-kindergarten at Eastside with their ages ranging from five to six years at the time of the study. Thirty-one of the 32 participants were native English speakers from lower socio-economic (SES) families. The students were randomly assigned to either the control or treatment groups (See Appendix A for permission letter to collect data from Eastside Elementary in Hearne ISD, and a passive acceptance letter to parents).

Independent Variables

The independent variables in this study are: (a) embedded picture mnemonics (treatment) versus disassociated picture mnemonics (control), and (b) letter difficulty (easy, hard, and other).

Embedded Picture Mnemonic

The treatment was embedded picture mnemonics (Appendix B). The mnemonic is considered embedded because the target letter is set within a picture. The mnemonic picture form envelops the shape of the letter, thus providing a concrete associative to an

abstract letter shape and letter name. The mnemonic picture object has the target phoneme in the initial position of the word, reinforcing the letter sound.

The researcher pulled three to four students at a time to conduct the treatment training, meeting outside the classroom to limit distractions. The researcher/trainer presented eight 8.5 x 11 inch grey-scale embedded picture mnemonic cards (Appendix B). On each of these cards, the target letter was fully integrated into a picture of a common object that began with the initial sound of the target letter.

To standardize instruction to the multiple groups, cards with the embedded picture mnemonic illustrations were presented to groups of three or four participants according to a brief script (Appendix E). In following this script, the researcher stated the letter name, the letter sound, and the name of the illustrated item beginning with each of the targeted letter phonemes. The participants were asked to look at the picture mnemonic and repeat the information: name of picture, letter name, and letter sound. The researcher/trainer then affirmed the participant's correct answer as each of the participants responded individually. The student's attention was then again directed to the letter "within" each of the pictures, with the researcher again giving the students the name of the letter. The participants were then again asked to give the name of the picture and the name of the letter and letter sound.

Due to the extreme lack of alphabet knowledge of the participants in this study, the researcher/trainer spent the second day of training explaining and showing the participants the difference between a letter name, a letter sound, and a word with the target letter phoneme in the initial position of the word. The focus of the remaining eight

days of training concentrated on student's acquiring letter name and letter sound knowledge utilizing the training script for each of the eight cards.

The researcher/trainer presented one new letter Monday through Thursday, reviewing the previous day's letter(s) before adding the new letter. Friday was used to review the four letters learned that week. This process was repeated with a new set of four letters the next week. On the final Friday of training, all eight letters were revisited. The total training time did not exceed five minutes per session and averaged three minutes per day for a total of 10 days.

Disassociated Picture Mnemonic

The disassociated picture training cards used with the control group had the same named object for each alphabet letter as in the mnemonic picture cards; however, the pictures were presented separately from the letter in such a way that the letter shape did not form part of the pictured object (Appendix C).

The control group, trained by their classroom teacher, used disassociated picture mnemonic alphabet cards (Appendix C) to learn the eight target letters, which were similar to the phonics cards contained in the Scott Foresman Early *Reading Intervention* curriculum the district adopted for kindergarten. The commercial curriculum provides teachers with an alphabet card package to facilitate learning letter names, letter sounds, and letter shapes. The teachers training the control group using specifically designed disassociated picture mnemonic cards; each letter on an 8.5 x 11 inch card with a colored picture cue mnemonic placed above the 250 point font letter.

A brief training meeting with the teachers occurred during pre-service days in late August to review the training procedure. During the meeting, the five kindergarten teachers were provided a training notebook containing a laminated copy of the eight disassociated alphabet training letters, as well as a standardized script (Appendix E). The training procedure and script was reviewed and rehearsed. The teachers agreed not to address any of the target alphabet letters during regular classroom instruction over the four week research study period. Teachers were observed during the first week of training to ensure adherence to the script and to address the issue of reliability.

During the 10 days of student training, the teachers pulled small groups of three or four study participants and spent no more than five minutes teaching four letter cards during the first week, and the remaining four cards the second week. Fridays were used to review the letters learned that week, and on the final day of the training, the teachers reviewed all eight letters.

Degree of Difficulty in Learning Letter Names

The theoretical construct of the degree of difficulty in learning letter names was evaluated by including three letters from the easy and hard categories, and two letters from the other category. As stated earlier, letters are categorized by the placement of the consonant phoneme when saying the letter name. For example, the letter M has an initial vowel sound preceding the consonant sound (/e/ /m/) thus placing that letter in the hard category. Letters with an initial consonant phoneme followed by the vowel phoneme (/j/ /a/) would be easy. Those letters with no phoneme association in the letter name are categorized as other (/double/ /u/). The eight training letters were selected after the data

had been collected from the qualifying phase. Based on the students' responses, all the misidentified or unknown letter names were identified and from that list the letters were delineated into degree of difficulty categories. A total of eight letters were selected for training: three from the easy and hard categories, and two from the other category.

Dependent Variables

The OSLIT provided both dependent variables for this study. The OSLIT was used to determine participants and to determine the target letters to be used in training. The OSLIT is widely used by researchers and by Reading Recovery practitioners throughout Texas and across the country. Its widespread use is generally directed at young children (five to seven years old) to identify and remediate reading difficulties. The OSLIT is an empirical observation instrument that was designed to yield scores on tasks essential to effective literacy. The OSLIT, which tests all 28 lower case (san serif "a" and "g") and 26 upper case letters randomly, has a reliability of .95 (Clay, 1996).

Data Collection Procedure

Two parent volunteers were recruited and trained to assist with assessment. The parent volunteers and the researcher met four times to review the assessment script, to determine how to record participant's responses, and to practice administering the assessment. The volunteers were required to meet 90% reliability with the researcher based on a simple agreement formula. To maximize consistency, the same volunteers assisted the researcher in administering the qualifying assessment and the two follow-up assessments.

Qualifying Assessment

In the qualifying phase, the potential sample participants were individually asked to complete the OSLIT by identifying the letter's alphabet name, acceptable phoneme for that letter, and a word beginning with the letter's sound (Appendix D). As previously noted, in order to participate in the present study, the students could not know either the letter name or the letter sound for the eight target letters. Thirty-two students were selected based on these criteria.

Follow-Up Assessment

The OSLIT was modified in the follow-up testing phase of the study, reducing the selection of random upper and lower case letters, yet including the eight target letters, for a total of 32. This total is in contrast to the 54 letters tested in the qualifying phase. Identifying the 54 letters takes time, and this change in number of letters assessed was made because the students had a difficult time focusing and paying attention. Another modification was that the participants were not required to generate a word beginning with the target letter sound. This modification was made due to the student's extreme lack of phoneme isolation skills, which are required to produce a word with a target initial phoneme.

One week after the completion of the ten day training period, participants in both the control and the treatment groups were administered this modified follow-up OSLIT assessment. Students were individually pulled from class for approximately two minutes to conduct the assessment. Because the assessment tool had been modified, the script used to standardize the assessment administration had also been modified from the

original used in the qualifying phase of the study (Appendix E). The dependent measure in this study was the number of correct responses made by participants on the letter-name and letter-sound association of the target letters identified in training.

Two weeks following the completion of the ten day training sessions, the tasks were administered again. Due to the historically high absentee rates on Fridays, the follow-up assessments were given on Thursdays.

Analysis Procedure

One-way analysis of variance (ANOVA) was used to test the differences between groups on each of the dependent variables: letter name and letter sound. Based on the assessment given at week one (posttest) and at week two (post-posttest), a set of repeated measures analyses of variance (RM-ANOVA) were used to analyze the data on the first research question.

In addition to evaluating the *p* value to determine statistical significance, Cohen's *d* was used to assess effect size. Effect sizes were calculated and reported in their respective categorical levels of negligible ($d = 0.20$), moderate ($d = 0.50$), and large effect sizes ($d = 0.80$).

The Wilcoxon Signed Ranks Test, a non-parametric analysis, was used to address the second research question. To determine whether or not the three categories of difficulty in learning letter names were different enough to generalize to a larger population, this test analyzed matched pairs for the categories of easy-to-hard, easy-to-other, and hard-to-other. This test was selected because of the categorical nature of the

data and because it does not require a normally shaped sample distribution or a large sample size.

CHAPTER IV

RESULTS

Research Question 1

To answer the first research question, does using an embedded picture mnemonic promote the acquisition of letter-names more effectively than using disassociated letter/picture mnemonics; a mixed factorial analyses of variance (ANOVA) was conducted. Descriptive statistics for the dependent variables are illustrated in Tables 1 and 2. Although the sample size training was N=32, excessive absenteeism on the dates during of testing eliminated a total of seven participants from the study resulting in an N=25.

Letter Names

The mixed-factorial analysis of variance (ANOVA) was conducted with letter name scores for the two testing dates (time) as the within-subjects factor and treatment group as the between-subjects factor (Table 1 and Table 2). A significant difference was found for treatment group, $F\ (1, 23) = 7.54$, $p < .012$. The effect of time and the interaction of time and treatment group were not significant. The effect sizes of the differences for each testing date (week1 & 2) are given in Table 1 and Table 2. The effects were moderate ($d = .69$) and large ($d = 1.12$), respectively, favoring the embedded mnemonics group.

Table 1. Descriptive Statistics for Week One Testing on Letter Naming

IV	N	Mean	Std. Deviation	Cohen's *d*
Embedded Mnemonic	13	3.54	2.757	
Disassociated Mnemonic	12	1.75	2.137	
Total	25	2.68	2.594	.69

Note. IV = independent variable, N = sample size

Table 2. Descriptive Statistics for Week Two Testing on Letter Naming

IV	N	Mean	Std. Deviation	Cohen's *d*
Embedded Mnemonic	13	4.38	2.364	
Disassociated Mnemonic	12	1.42	2.021	
Total	25	2.96	2.638	1.12

Note. IV = independent variable, N = sample size

Research Question 2

To answer the second research question, does using an embedded picture mnemonic promote the acquisition of letter-sound associations more effectively than using disassociated letter/picture mnemonic; a mixed factorial analyses of variance (ANOVA) was conducted. Descriptive statistics for the dependent variables are illustrated in Tables 3 and 4. Although the sample size training was N=32, excessive absenteeism on the dates during of testing eliminated a total of seven participants from the study resulting in an N=25.

Letter Sounds

A similar mixed-factorial ANOVA was conducted with letter sound scores for the two testing dates (time) as the within-subjects factor and treatment group as the between-subjects factor (Table 3 and Table 4). A significant main effect was found for time, $F= (1, 23) = 4.47$, $p < .046$, but the main effect of treatment group and the interaction between time and treatment group were not significant. These results showed that letter sound scores for both groups were significantly lower in week two than in week one. Table 3 and Table 4 show that there were severe floor effects for this variable. However, the effect size favoring the embedded mnemonics group was moderate for week one ($d = .64$).

Table 3. Descriptive Statistics for Week One Testing on Letter Sounds

IV	N	Mean	Std. Deviation	Cohen's *d*
Embedded Mnemonic	13	1.38	2.142	
Disassociated Mnemonic	12	.33	.778	
Total	25	.88	1.691	.64

Note. IV = independent variable, N = sample size

Table 4. Descriptive Statistics for Week Two Testing on Letter Sounds

IV	N	Mean	Std. Deviation	Cohen's *d*
Embedded Mnemonic	13	.54	1.941	
Disassociated Mnemonic	12	.08	.289	
Total	25	.32	1.406	.33

Note. IV = independent variable, N = sample size

Research Question 3

Research question three asked whether, is the construct of the conceptual degree of difficulty for learning letter names (Treiman, et al., 1998) was supported with category 1 (easy: d, g, v) being learned more easily than category 2 (hard: N, n, l,) and/or category 3 (most difficult: q, h). The Wilcoxon signed ranks test was used to compare the categories. Table 5 and Table 6 provide the rankings for the category comparisons for testing week 1 and testing week 2, respectively.

The Wilcoxon test statistics for the comparison of the three categories for testing week 1 revealed that the Hard to Easy categories (Z =-.94), and the Other to Hard categories (Z=-1.85), were not significant at the .05 level. However, the comparison of the Other to Easy categories (Z=-2.27) were significant at the .05 level. Combining the descriptive and statistical data for week 1, there was no noted difference in acquisition of letter name knowledge between the hard and easy categories or the other to hard categories, yet there was a noted difference between the easy and other categories.

The Wilcoxon test statistics for the comparison of the three categories for testing week 2 revealed the Hard to Easy categories (Z=-.1.25) were not significant at the .05 level, yet the comparison of the Other to Hard categories (Z=-3.26), and the Other to Easy categories (Z=-2.72) were both significant at the .05 level. Combining the descriptive and statistical data for week 2, there was no noted difference in acquisition of letter name knowledge between the hard and easy categories, yet there was a noted difference between the other and hard categories, as well as the easy and other categories. The Critical values for the Z scores are represented in Table 7.

Table 5. Week One Wilcoxon Ranks Results

		N	Mean Rank
Hard to Easy	H < E	6	6.08
	H > E	4	4.63
	H = E	15	
	Total	25	
Other to Easy	O < E	13	9.46
	O > E	4	7.50
	O = E	8	
	Total	25	
Other to Hard	O < H	9	7.89
	O > H	4	5.00
	O = H	12	
	Total	25	

Table 6. Week Two Wilcoxon Ranks Results

		N	Mean Rank
Hard to Easy	H < E	2	6.25
	H > E	7	4.64
	H = E	16	
	Total	25	
Other to Easy	O < E	12	7.83
	O > E	2	5.50
	O = E	11	
	Total	25	
Other to Hard	O < H	13	7.00
	O > H	0	0.00
	O = H	12	
	Total	25	

Table 7. Level of Significance

Level of Significance for a Non-Directional Test				
--	.05	.02	.01	.001
$Z_{critical}$				
1.654	1.960	2.326	2.576	3.291

Figure 1 illustrates the difference between the two independent variables, embedded picture mnemonic group and the disassociated picture mnemonic group, across the three degrees of difficulty in learning letter name categories for testing week one. Figure 2 shows the differences in the mean scores between the treatment and control groups across the degrees of difficulty in letter name categories for testing week two. These graphs were provided to display the magnitude of difference between the mean scores for the different categories at the two test dates.

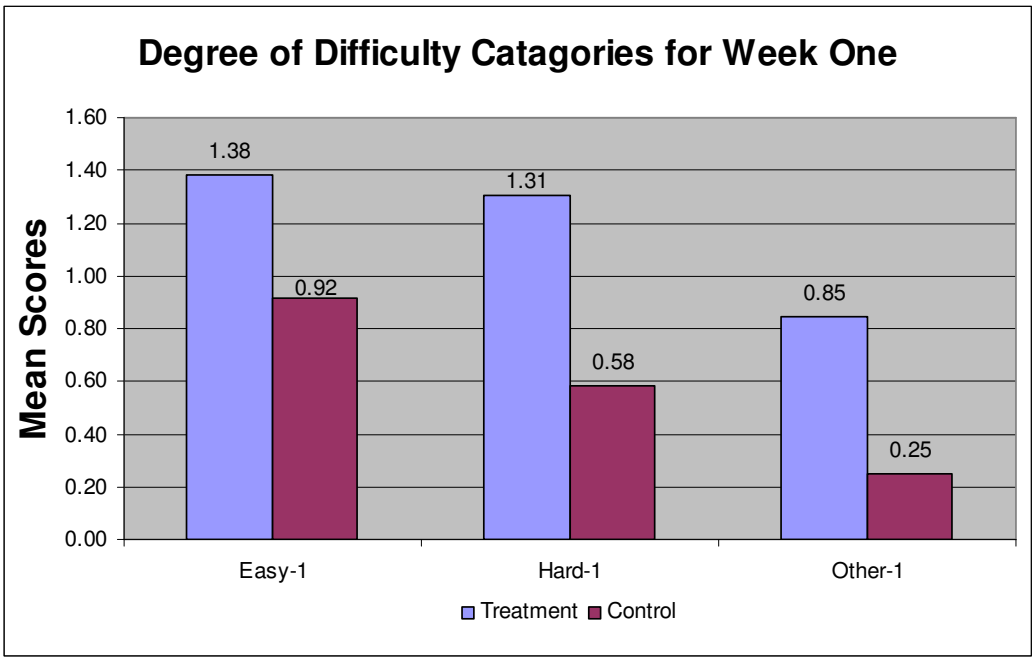


Figure 1. Differences in Means between Treatment and Control Groups in Degree of Difficulty Categories of Easy, Hard and Other for Week One

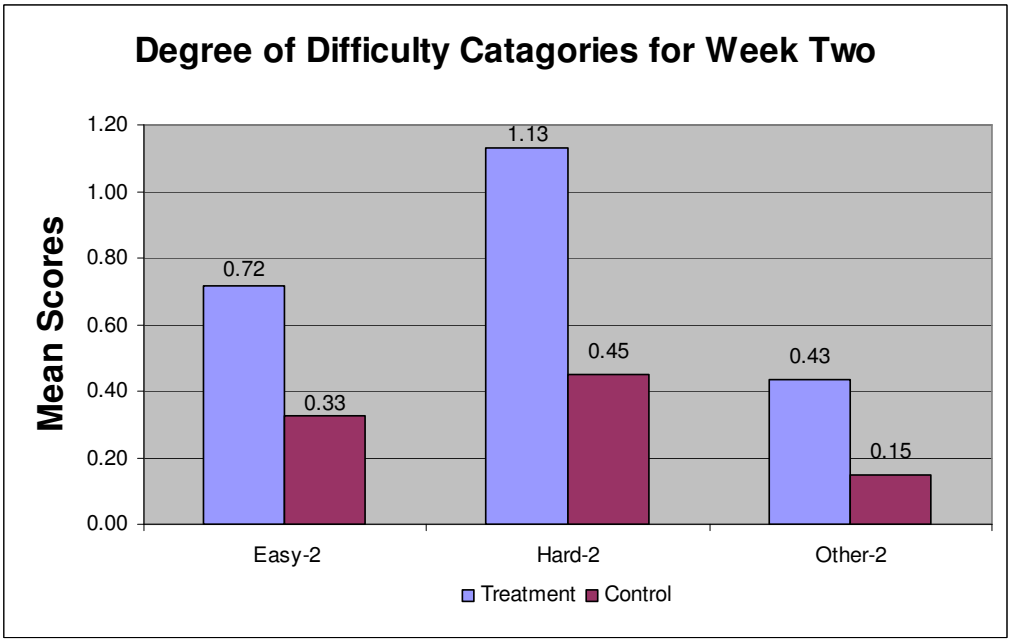


Figure 2. Differences in Means between Treatment and Control Groups in Degree of Difficulty Categories of Easy, Hard and Other for Week Two

CHAPTER V

DISCUSSION AND SUMMARY

This final chapter discusses the conclusions, limitations, implications, and recommendations that can be drawn from the study by answering the research questions.

Overall Conclusion from Study

The first research question asked whether using an embedded picture mnemonic would promote the acquisition of letter-name and letter-sound associations more effectively than using disassociated letter/picture training cards. After analyzing the data, the results clearly show that embedded picture mnemonics significantly increase the acquisition of letter name knowledge, but not for letter sound knowledge.

Letter Name Knowledge

Adams (1990) points out that a beginning reader must know each letter as a "discrete, self-contained," visual pattern that can be printed or pointed to "one-by-one." Alphabetic understanding is the child's ability to "map" the printed symbol to speech, establishing a clear link between letter and sound (Adams, 1990, p. 247).

Learning the names of printed letters is an abstract process of sound-symbol learning because there is nothing intrinsic about the visual symbol (letter/grapheme) that evokes the actual letter name or sound (Windfuhr & Snowling, 2001). With moderate effect sizes for letter naming (d = .69) from the first week, and a large effect size for letter naming (d =1.12) at the second week, the data supports Ehri's et al. (1984) findings that embedded picture mnemonics provide a connection in memory specifically for the visual image of the object and its associated letter name. The data suggest that

children learn and retain letter names by associating the salient letter character with a concrete picture object. In addition, the data further supports their hypothesis that formation of a word referent for a visual image of the object is helpful in storing these alphabetic symbols in memory and suggests the visual image of the object minus the name would not provide the same access to memory since, "letters enter memory by being processes as symbols for sounds in pronunciations" (Ehri, et. al., 1984, p. 124).

In this study, the students showed an overall increase in the ability to produce the target letter names; however, due to time constraints and the student's developmental literacy background, it cannot be concluded that the child's ability to name a letter transferred to their ability to associate the name and symbol with a sound or phoneme. Hecht, Burgess, Torgesen, Wagner, & Roshotte (2000) similarly concluded that letter naming develops before recall of letter sounds. This supports Torgesen, et al. (1997), who concluded that kindergarten is a critical learning period, during which letter-name recall is a more sensitive predictor of literacy skills.

Letter Sound Knowledge

Learning the target letter names was the first task measured; the second was the student's ability to create the appropriate letter sound to match the target letters. Based on research, it was expected that the study participants would be able to use the knowledge of letter names to assist in learning the letter sounds (Ehri, 1983; Roberts, 2003; Stage, Sheppard, Davidson, & Browning, 2001; Treiman, 1994; Treiman, et al. 1998; Treiman, Weatherston, & Berch, 1994). The data supports the findings of Ehri and Wilce (1979) that the students had difficulty in learning letter-sound relations when they

did not yet know the letter names. The results concur with Ehri (1983) in finding the task of teaching letter-sound associations almost impossible for the children who could not identify the letter names. The students in the present study were identified through the qualifying phase to have no alphabet knowledge on the eight training letters, and at the conclusion of the data collection for the study, the findings are supportive of the evidence that knowing letter-names is superordinate and assists in learning letter-sounds.

Degree of Difficulty in Learning Letter Names

The secondary research question posed by this study asked whether the conceptual degree of difficulty construct for learning letter names (Treiman, et al., 1998) was supported with category 1 (easy: d, g, v) being learned more easily than category 2 (hard: N, n, l,) and/or category 3 (other: q, h). The data does not reveal complete support for this theory.

If children pay attention to what a letter name sounds like, it may help them to tackle phonemes more successfully because the names of many letters actually contain the phoneme they represent. This is the basic premise Treiman et al. (1998) researched and used to develop their degree of difficulty in learning letter names theory. Confirmed by their research findings, they found consonant letters of the alphabet can be broken into three categories: easy, hard, and other. The letters in the easy category would be learned prior to those letters in either the hard or other categories, and the letters of the hard category would be learned prior to the other category.

The easy category contains letters that have a consonant-vowel (CV) relationship, meaning when the letter name is pronounced, two distinct phonemes are

heard. For example, in saying the letter name “B,” a consonant /b/ is followed by a long vowel /e/. The hard category consists of letters with a vowel-consonant (VC) relationship. In this category the letter name has the short vowel sound followed by the consonant phoneme (“M,”= /e/ /m/). Having a vowel sound as the initial phoneme, requiring the learner to jump over the initial phoneme to get to the second phoneme, is why these letters are categorized as hard to learn. The last category is other, where letters whose name does not give any indication of the associated phoneme are grouped. In this study the letters Q and H were used.

The Wilcoxon analysis for testing week one and testing week two did not show a significant difference in the rate of learning the easy and hard letters. This does not support the degree of difficulty theory. However, the categorical differences favoring hard over other, and easy over other, did show significance revealing some support for Treiman’s et al (1998) theory.

Implications for Instruction

The overriding results from the study indicate those students in the treatment or embedded picture mnemonic training group performed significantly better than the control or disassociated picture mnemonic group on learning letter names. Including an embedded picture mnemonic training component to classroom alphabet instruction may offer an alternate memory strategy to those students struggling to remember letter names through repetitive, more abstract drills. As stated earlier in Chapter II, a mnemonic device is a strategy for organizing and/or encoding information. It is believed the reason for the significant differences in learning letter names between the treatment and the

control groups is that the embedded picture mnemonic training cards represent the transition from picture (a mnemonic) to picture-letter (still maintaining its mnemonic, concrete quality), to transitioning to the abstract letter. Construction of the embedded picture mnemonic training cards (computer-generated by graphics from the *ClickArt 6500 Classic Image Pak* from Broderbund, Inc.) are relatively simple to create and should encourage teachers who have avoided use of this type of strategy because they do not consider themselves artistically inclined.

By and large, this study further supports the use of embedded picture mnemonics, and advances to the research which states, "paired-associate learning in children is much improved when learners create or are provided with concrete, meaningful, interactive, and imaginable connectives that link the stimulus and response terms in memory." (Ehri, et al., 1984, p. 881). By integrating pictures and abstract letter symbols, the brain is better able to retain the information in long term memory. These principles are consistent with DCT (Sadoski & Paivio, 2001).

Limitations and Recommendations for Future Research

The following list reflects major limitations encountered during this study tied to specific areas for further research.

1. *Sample size*. The most obvious limitation of the study is the small sample size. This small sample size was, in large part, due to the excessive absenteeism characteristic of the school district, and more specifically at Eastside Elementary. In addition to increasing the sample size, broadening research in the area of embedded picture mnemonics to include sample populations from middle class

SES groups, special needs, English as a second language, and older children who are not reading, and possibly transferring over to the adult illiterate populations are needed to enhance the pool of research in the area of mnemonics and alphabet knowledge.

2. *Phonemic Awareness.* Phonemic awareness refers to the conscious awareness of the sound structures of speech (Torgesen, et al., 1997). This awareness is part of what permits the child to understand the alphabetic principle – the fact that the sounds in oral language (phonemes) can be represented with letters (graphemes). The children in this study displayed a large deficit in phonemic awareness. In extending this current study, future research needs to include an additional baseline characteristic of the student's ability to segment and blend phonemes.
3. Research has found multi-sensory approach is better for young children between the ages of 4-8 (Schiller, 2001). This study incorporated students visualizing the picture mnemonic and the alphabet letter which integrates visual and auditory learning. Kindergarten aged children think concretely, not abstractly. With this in mind, maximized learning can occur by providing students with concrete experiences to associate with abstract concept learning. Opportunities exist for the development and analysis of combining principles of tangible, multi-sensory learning with embedded picture mnemonics. "Air Writing," a technique where children use their whole arm and hand to draw the letter in the air, adds a kinesthetic element to learning. By coupling air writing with embedded picture mnemonics, students may remember even more letters. However, to control for

the number of variables, this study did not employ this technique; yet is an area for further exploration.

4. *Amount of time spent on each letter.* The short length of time spent on this intervention (10 days, with an average of 3 minutes of instruction) should be noted. In a standard kindergarten classroom, students will generally spend a week learning different characteristics of a single letter, spending anywhere form twenty to thirty minutes on letter instruction. In this study the students were given eight letters to learn in two weeks. Research utilizing a more realistic instructional training schedule would generalize the methodology to classroom teachers more seamlessly.
5. *Teacher control*. Although the intervention or treatment procedures were followed reliably in that the researcher was the trainer, control for the teachers was monitored only once early in the program. Classroom curricula for alphabet instruction were not monitored or any supplemental literacy activities focusing on alphabet knowledge. However, teachers were asked to modify any letter introduction not to include the 8 training letters.
6. *Future research* needs to explore the specific ways in which the benefits of embedded picture mnemonics results in students' transferring that knowledge to beginning reading by possibly incorporating this into a longitudinal study.

The need for research is critical and will serve as a basis for change in curriculum and classroom teaching methodology.

Summary

The purpose of this study was to examine the impact of embedded picture mnemonics (EPM) on the acquisition of letter name and letter sound knowledge with at-risk kindergarten students. After only two weeks of EPM training, the treatment group performed significantly better than the control group. When learning any new piece of information, it is easier if it is associated with something known. In this study, embedded picture mnemonics were used to tie letter name information more closely to the learners existing knowledge of common objects thus facilitating learning.

The results of this study have advanced the credibility of using embedded picture mnemonics in early childhood classrooms as an instructional tool to build students alphabet knowledge. The long term retention and retrieval of specific alphabet letters utilizing EPM, evidenced by a large effect size two weeks after the completion of training, contributes to advancing dual coding theory principles in early literacy. If future studies are developed to explore the relationship between EPM and emergent reading skills, then educators may be encouraged to implement EPM into the early childhood curriculum.

REFERENCES

Adams, M. J. (1990). *Learning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.

Agramonte, V. & Belfiore, P. (2002). Using mnemonics to increase early literacy skills in urban kindergarten students. *Journal of Behavioral Education, 11*, 181-190.

Ball, E. W., & Blachman, B. A. (1991). Does phoneme awareness training in kindergarten make a difference in early word recognition and developmental spelling. *Reading Research Quarterly, 24*, 49-66.

Bellezza, F.S. (1981). Mnemonic devices: Classification, characteristics, and criteria. *Review of Educational Research, 51*, 247-275.

Benson, P.J. (1997). Problems in picturing text: A study of visual/verbal problem solving. *Technical Communication Quarterly, 6*, 141-169.

Bond, G. L., & Dykstra, R. (1967). The cooperative research program in first-grade reading instruction. *Reading Research Quarterly, 2*, 5-42.

Bower, G.H. (1972). Mental imagery and associative learning. In L.W. Gregg (Ed.), *Cognition in learning and memory* (p. 51-88). New York: Wiley.

Bradley, L., & Bryant, P. (1983). Categorizing sounds and learning to read: A causal connection. *Nature, 301*, 419-421.

Burns, M.S, Griffin, P., & Snow, C.E. (Eds.). (1999). *Starting out right: A guide to promoting children's reading success*. Washington, DC: National Academy Press.

Chall, J.S. (1967). *Learning to read: The great debate.* New York: McGraw-Hill.

Chall, J.S. (1983). *Stages of reading development.* New York: McGraw-Hill.

Clarke, L. (1988). Invented versus traditional spelling in first graders' writing: Effects on learning to spell and read. *Research in the Teaching of English, 22*, 281-309.

Clay, M. M. (1996). *An observation survey of early literacy achievement.* Portsmouth, NH: Heinemann.

Durrell, D.D. (1958). Success in 1st grade reading. *Journal of Education, 40,* 1-6.

Ehri, L. C. (1983). A critique of five studies related to letter name knowledge and learning to read. In L. Gentile, M. Kamil, & J. Blanchard (Eds.), *Reading research revisited* (p. 47-63). Columbus, OH: Merrill.

Ehri, L.C. (1991). Development of the ability to read words. In R. Barr, M.L. Kamil, P.B. Mosenthal, & P.D. Pearson, (Eds.) *Handbook of reading research,* Vol. II (p. 383-417). White Plains, NY: Longman.

Ehri, L., Deffner, N., & Wilce, L.S. (1984). Pictorial mnemonics for phonics. *Journal of Educational Psychology, 76,* 880-893.

Ehri, L., & McCormick, S. (1988). Phases of word reading: Implications for instruction with delayed and disabled readers. *Reading and Writing Quarterly, 14,* 135- 163.

Fulk, B.M., Lohman, D., & Belfiore, P.J. (1997). Effects of integrated picture mnemonics on the letter recognition and letter-sound acquisition of traditional first grade students with special needs. *Learning Disability Quarterly, 20,* 33-42.

Gibson, E., & Levin, E. (1975). *The psychology of reading.* Cambridge, MA: MIT Press.

Hecht, S., Burgess, S., Torgesen, J., Wagner, R., & Roshotte, C. (2000). Explaining social class differences in growth of reading skills from beginning kindergarten

through fourth-grade: The role of phonological awareness, rate of access, and print knowledge. *Reading and Writing: An Interdisciplinary Journal, 12*, 99-127.

Invernizzi, M., Meier, J. D., Swank, L., & Juel, C. (1997). *PALS: Phonological awareness literacy screening.* Charlottesville, VA: University Printing Services.

Isgur, J. (1975). Establishing letter-sound associations by an object-imaging-projection method. *Journal of Learning Disabilities, 8,* 16-20.

Lerner, J. (2003). *Learning disabilities: Theories, diagnosis, and teaching strategies* (9th ed.). Boston: Houghton Mifflin.

Liberman, I. Y., & Shankweiler, D. (1985). Phonology and the problems of learning to read and write. *Remedial and Special Education, 6,* 8-17.

Mastropieri, M.A., & Fulk, B.J.M. (1990). Enhancing academinc performance with mnemonic instruction. In T.E. Scruggs and B.Y.L. Wong (Eds), *Intervention research in learning disabilities* (p. 102-122). New York: Springer-Verlag.

Mastropieri, M.A., & Scruggs, T.E. (1988). Increasing content area learning of LD students: Research implications. *Learning Disabilities Research, 4,* 17-25.

McBride-Chang, C. (1999). The ABC's of the ABC's: The development of letter-name and letter-sound knowledge. *Merrill-Palmer Quarterly, 45*, 285-308.

National Institute for Literacy (2001). *Put Reading First: The Research Building Blocks for Teaching Children to Read.* Retrieved March 24, 2006. http://www.nifl.gov/partnershipforreading/publications/PFRbooklet.pdf (1.25MB)

National Institute of Child Health and Human Development (2000). *Report of the National Reading Panel, Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Retrieved May 16, 2005. http://nichd.nih.gov/publications/nrp/smallbook.htm

Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart, & Winston.

Paivio, A. (1986). *Mental representations: A dual coding approach*. New York: Oxford University Press.

Pennington, B.F., & Lefly, D.L. (2001). Early reading development in children at family risk for dyslexia. *Child Development, 72*, 816-833.

Pressley, M. (1977). Imagery and child's learning: Putting the picture in developmental perspective. *Review of Educational Research, 47*, 585-622.

Pressley, M. (1998). *Reading instruction that works: The case for balanced teaching.* New York: Guilford.

Raschke, D., Alper, S., & Eggers, E. (1999). Recalling alphabet letter names: A mnemonic system to facilitating learning. *Preventing School Failure, 43*, 80-83.

Roberts, T.A. (2003). Effects of alphabet-letter instruction on young children's word recognition. *Journal of Educational Psychology, 95,* 41-51.

Roseberry-McKibbin, C. (2001). Practical strategies for speech-language pathologists. Retrieved on September 17, 2006 from: http://216.239.51.104/search?q=cache:kkkjopbvAxwJ:wwwasha.org/about/publications/leader-

online/archives/2001/011106_5.htm+low+SES+reading+early&hl=en&gl=us&ct=clnk&cd=5

Sadoski, M. (2005). A dual coding view of vocabulary learning. *Reading & Writing Quarterly, 21,* 221-238.

Sadoski, M. & Paivio, A. (2001). *Imagery and text: A dual coding theory of reading and writing.* Mahwah, NJ: Lawrence Erlbaum Associates.

Sadoski, M., Goetz, E. T., & Avila, E. (1995). Concreteness effects in text recall: Dual coding and context availability? *Reading Research Quarterly, 30*, 278-288.

Sadoski, M., Paivio, A., & Goetz, E. T. (1991). A critique of schema theory in reading and a dual coding alternative. *Reading Research Quarterly, 26*, 463-484.

Schiller, P. (2001). Brain research and its implications for early childhood programs. *Childhood Information Exchange, 140,* 14-18.

Scruggs, T.E. & Mastropieri, M.A. (1989). Mnemonic instruction of LD students: A field-based evaluation. *Learning Disabilities Quarterly, 12,* 119-125.

Sener, U. & Belfiore, P.J. (2005). Mnemonic strategy development: Improving alphabetic understanding in Turkish students, at-risk for failure in EFL settings. *Journal of Behavioral Education, 14,* 105-115.

Shepard, R.N. (1967). Recognition memory for words, sentences, and pictures. *Journal of Verbal Learning and Verbal Behavior, 5*, 201-204.

Singer, H., Samuels, S.J., & Spiroff, J. (1973). The effects of pictures and contextual conditions on learning responses to printed words. *Reading Research Quarterly, 4*, 555-567.

Smith, S.B., Simmons, D.C., & Kameenui, E.J. (1998). Phonological awareness: Synthesis of the research. In D.C. Simmons (Ed.), *What reading research tells us about children with diverse learning needs: The bases and basics (p. 129-140).* Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Snow, C. E., Burns, M. S., & Griffin, P. (eds.) (1998) *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.

Stage, S.A., Sheppard, J., Davidson, M.M., & Browning, M.M. (2001). Prediction of first-graders' growth in oral reading fluency using kindergarten letter fluency. *Journal of School Psychology, 39,* 225-237.

Thompson, G.B., Fletcher-Flinn, C.M., & Cottrell, D.S. (1991). Learning correspondences between letters and phonemes without explicit instruction. *Applied Psycholinguisitcs, 20,* 21-50.

Torgesen, J. K., Wagner, R. K., & Rashotte, C. A. (1997). Prevention and remediation of severe reading disabilities: Keeping the end in mind. *Scientific Studies in Reading, 1,* 217-234.

Treiman, R. (1994). To what extent do orthographic units in print mirror phonological units in speech? *Journal of Psycholinguistic Research, 23*, 91-110.

Treiman, R., Tincoff, R., Rodriguez, K., Mouzaki, A., & Francis, D. J. (1998). The foundations of literacy: Learning the sounds of letters. *Child Development, 69,* 1524-1540.

Treiman, R., Weatherston, S., & Berch, D. (1994). The role of letter names in children's learning of phoneme-grapheme relations. *Applied Psycholinguistics, 15,* 97-122.

Venezky, R.L. (1975). The curious role of letter names in reading instruction. *Visible Language, 9,* 7-23.

Windfuhr, K.L., & Snowling, M.J. (2001). The relationship between paired associate learning and phonological skills in normally developing readers. *Journal of Experimental Child Psychology, 80,* 160-173.

APPENDIX A

PARENT CONSENT FORM
TEXAS A&M UNIVERSITY

The Effects of Mnemonics
on Letter Recognition and Letter-Sound Acquisition of
At-Risk Kindergarten Students

Background Information:

I am conducting a study looking at how alphabet picture card training contributes to learning letter-names as well as letter-sounds which is necessary for beginning reading. I invite your child to participate in this research. Your child was selected as a possible participant because of the score received on a Letter Identification test (the Marie Clay Observation Survey sub-tests: Letter Identification).

This study is being conducted by: Teresa White M.Ed. under the direction of Dr. Mark Sadoski.

Procedures:

If you allow your child to be in this study, he or she will be placed in either the "control" group or the "treatment" group. If selected for the control group, the students will continue with the standard district approved curriculum regarding alphabet instruction. If selected for the "treatment" group, the students will participate in two weeks of five (5) minute daily alphabet training sessions which will include investigating the shape and sound of the target letter(s), and generating words that begin with the target alphabet sound(s). The training will extend for two weeks, after which students in both the "control" group and the "treatment" group will be tested on the Marie Clay Observation Survey sub-test: Letter Identification; Letter-Sound Knowledge; and the Ohio Word List. Then, four week after the beginning of the study, the students will be tested again on the same Marie Clay Observation Survey sub-tests. The students in the "treatment" group will have one additional to evaluate if the mnemonic picture information they learned was retained in long-term memory. All of the training and testing will not interfere with the Language Arts instructional block the teachers currently have. The "treatment" group training will be conducted as a pull-out program from one of the ancillary classes.

Risks and Benefits of Being in the Study:

The study has no risks. The direct *benefits to your child* for participating are: potentially increasing their letter-name knowledge, letter-sound knowledge, and transferring that knowledge to their reading and writing.

Confidentiality:

The records of this study will be kept private. In any sort of report that may be published, I will not include information that will make it possible to identify your child in any way. The participating students will be assigned a number and that number is how they will be identified, not by their name. *Research records will be kept in a locked file; I am the only person who will have access to the records*.

Voluntary Nature of the Study:

Your child's participation in this study is entirely voluntary. Your decision whether or not to allow him or her to participate will not affect your child's or your own current or future relations with Spring Branch ISD or Texas A & M University. If you decide to allow participation, you are free to withdraw your child from the study at any time without penalty. Should you decide to withdraw your child from the study, data collected about him or her maybe relevant to the study and possibly used in the final analysis.

Contacts and Questions

If you have questions now or later, you may contact Teresa at (281) 807-1408. You may also contact Texas A & M Institutional Review Board at (979) 458-1467 with any questions or concerns.

You will be given a copy of this form to keep for your records.

Statement of Consent:

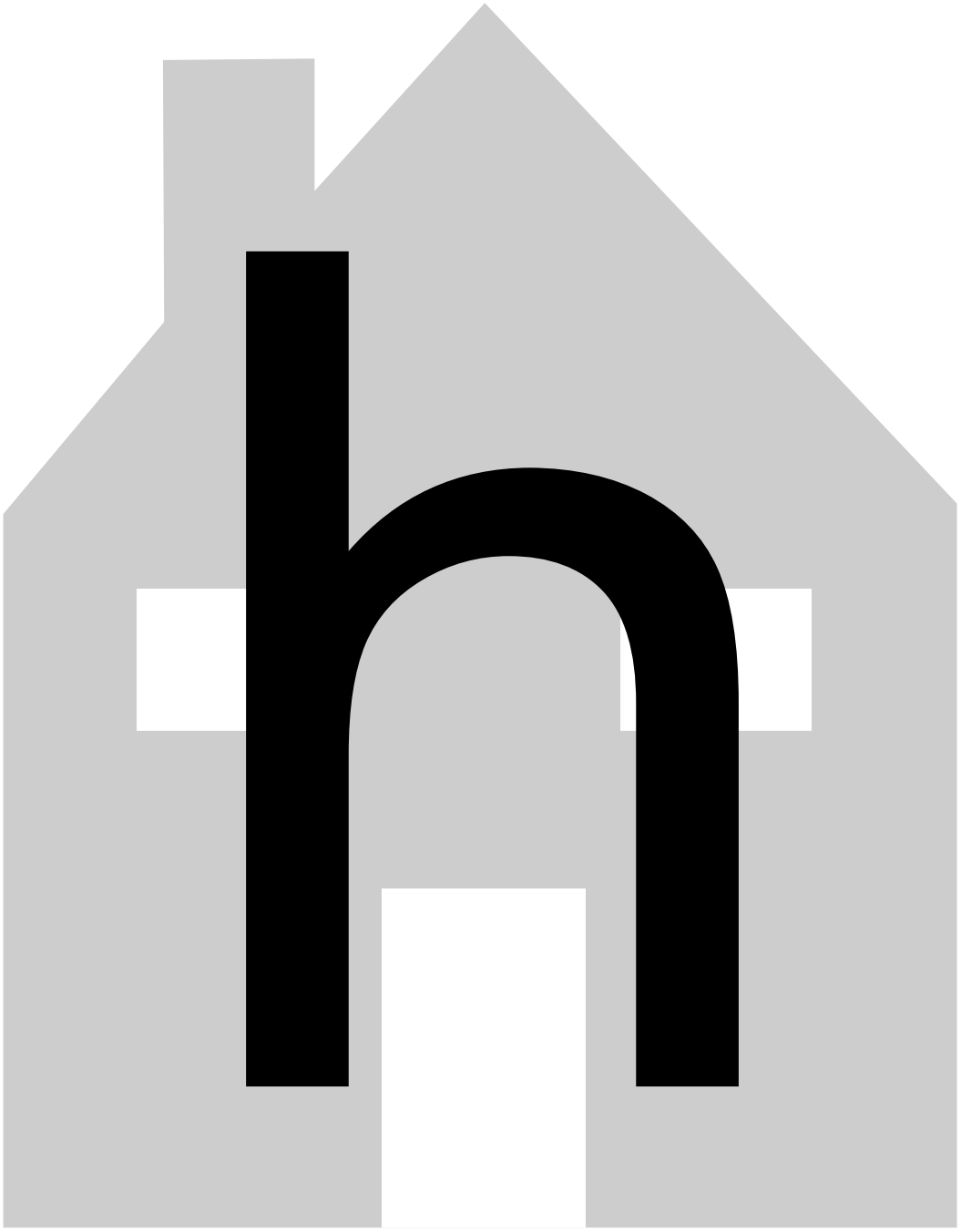
I have read the above information. My questions have been answered to my satisfaction. I give consent for my child to participate in the study.

_____	_____
Signature of Parent or Guardian	**Date**
_____	_____
Signature of Study Participant	**Date**
_____	_____
Signature of Researcher	**Date**

ADJUSTED PARENT LETTER TO ENCOURAGE PARTICIPATION

APPENDIX B

SAMPLE EMBEDDED PICTURE MNEMONIC TRAINING CARD



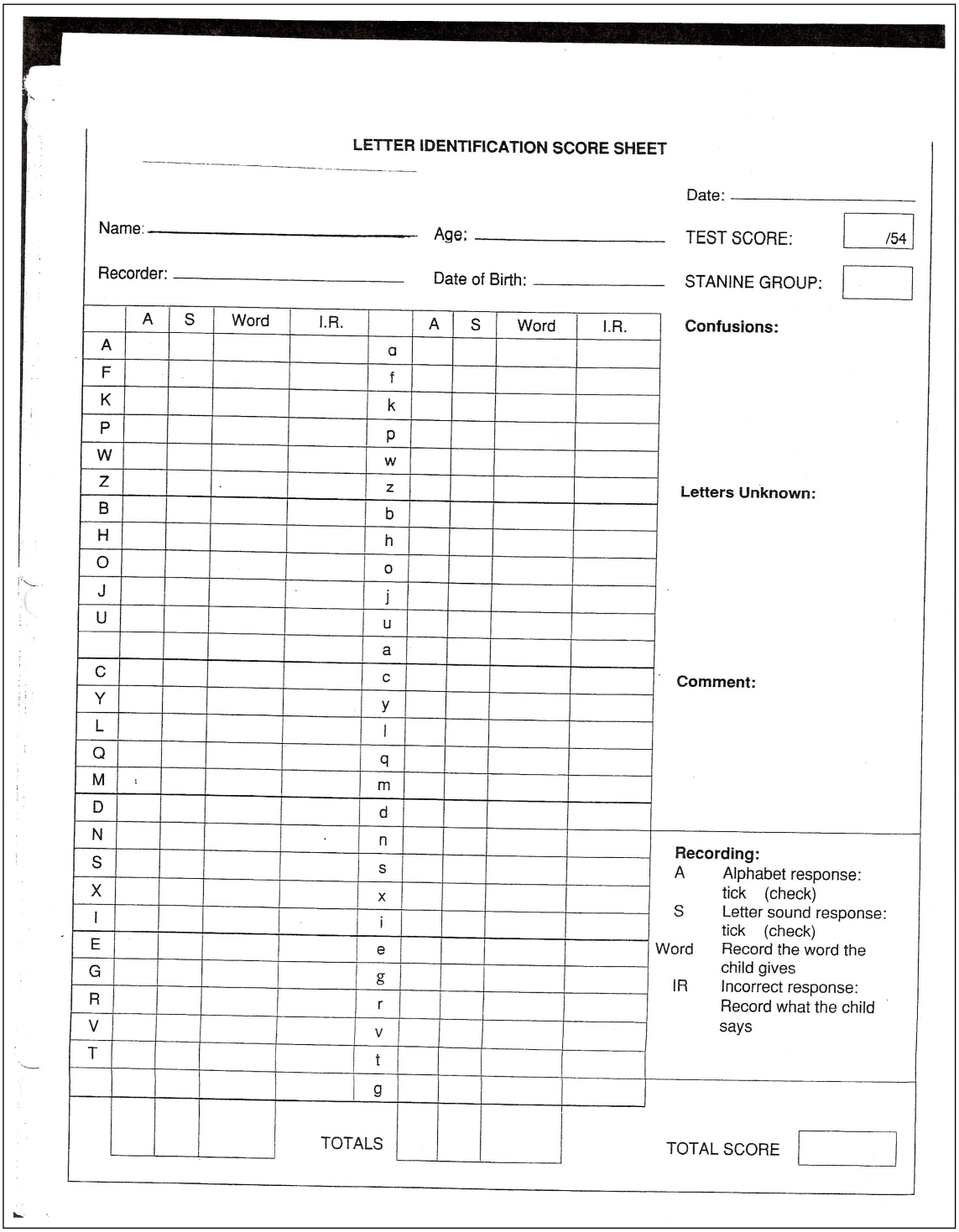
APPENDIX C

SAMPLE DISASSOCIATED PICTURE MNEMONIC TRAINING CARD

h

APPENDIX D

LETTER IDENTIFICATION SCORE SHEET



LETTER IDENTIFICATION SCORE SHEET

Date: _____

Name: _____ Age: _____ TEST SCORE: /54

Recorder: _____ Date of Birth: _____ STANINE GROUP:

	A	S	Word	I.R.		A	S	Word	I.R.
A					a				
F					f				
K					k				
P					p				
W					w				
Z					z				
B					b				
H					h				
O					o				
J					j				
U					u				
					a				
C					c				
Y					y				
L					l				
Q					q				
M					m				
D					d				
N					n				
S					s				
X					x				
I					i				
E					e				
G					g				
R					r				
V					v				
T					t				
					g				
				TOTALS					

Confusions:

Letters Unknown:

Comment:

Recording:

A Alphabet response: tick (check)

S Letter sound response: tick (check)

Word Record the word the child gives

IR Incorrect response: Record what the child says

TOTAL SCORE

LETTER TEST SHEET

A	F	K	P	W	Z
B	H	O	J	U	
C	Y	L	Q	M	
D	N	S	X	I	
E	G	R	V	T	
ɑ	f	k	p	w	z
b	h	o	j	u	a
c	y	l	q	m	
d	n	s	x	i	
e	g	r	v	t	g

APPENDIX E

INITIAL ASSESSMENT SCRIPT

Initial Assessment Script

"We are going to play the alphabet game today! You are going to tell me the letter name, the sound of that letter, and a word that begins with that letter."

*If you do not know the letter name or forget the letter sound, or do not know a word for that letter you can tell me "**pass**" at any time.

"You will go across the page, and when you get to the last letter, move the cover down to the next row."

Ready, begin!

TREATMENT GROUP SCRIPT

Treatment Script

"We are going to learn some letters of the alphabet. You are going to look at a picture while I tell you the letter name, the sound that letter makes, and the name of the picture you see, then I want you to say it back to me!"

Students respond as a group, then individually.

"Good job!"

"Now I want you to look *INTO* the picture, do you see the letter '___'?"

Can you tell me the name of the picture?
Can you tell me the name of the letter?
Can you tell me the letter sound?

Great!

CONTROL GROUP SCRIPT

Control Script

"We are going to learn some letters of the alphabet. You are going to look at a picture while I tell you the letter name, the sound that letter makes, and the name of the picture you see, then I want you to say it back to me!"

Students respond as a group, then individually.

"Good job!"

"Let's do it again, tell me the letter name, letter sound, and the picture name!"

Great!

POST AND POST-POSTTEST SCRIPT

Follow-up Assessment Script

"We are going to play the alphabet game again today!
Remember…you are going to tell me the letter name and the sound of that letter."

"You will go across the page, and when you get to the last letter, move the cover down to the next row."

*If you do not know the letter name or forget the letter sound, you can tell me "**pass**".

Ready, begin!

VITA

Teresa White
8207 Coolshire Lane
Houston, Texas 77070

Teresa White received a bachelor's degree in Corporate and Industrial Health and Fitness Promotion from the University of New Orleans in 1989 and a M.Ed. degree in Elementary Education from the University of Saint Thomas in 1998. For the past 15 years Teresa has been in both the public and private sector of education in positions of teacher, assistant principal, and director.

While completing her doctorial studies, Teresa taught the following courses at Texas A&M University: Assessing Early Childhood Reading, Reading Acquisition in Early Childhood, Language and Reading in Middle School, Assessing Reading in the Middle School, Reading in the Content Areas, and Special Topics: Classroom Management. She served as a research assistant to Dr. Mark Sadoski, as well as conducted focus groups at Houston area high schools for research supporting the High School Completion and Success Grant. Teresa was recommended to serve on the Texas Center for the Advancement of Literacy & Learning (TCALL) Texas Adult Education Standards Project (TAESP) Writing Committee as the research specialist in the area of reading and writing. She was also selected to present and become a Standards specialist to train adult education teachers on the newly created standards benchmarks.