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**THE EFFECTIVENESS OF EMBEDDED PICTURE MNEMONIC ALPHABET
CARDS ON LETTER RECOGNITION AND LETTER SOUND KNOWLEDGE**

by
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A Thesis

Submitted to the
Department of Language, Literacy and Special Education
College of Education
In partial fulfillment of the requirement
For the degree of
Master of Arts in Learning Disabilities
at
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May 2012

Thesis Chair: S. Jay Kuder, Ed.D.

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Abstract

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THE EFFECTIVENESS OF EMBEDDED PICTURE MNEMONIC ALPHABET
CARDS ON LETTER RECOGNITION AND LETTER SOUND KNOWLEDGE

2011/12

S. Jay Kuder, Ed.D.

Master of Arts in Learning Disabilities

The purpose of this study is to compare the use of embedded letter and picture mnemonic cards and separated letter and picture mnemonic cards on students' letter recognition and letter sound knowledge. The study implemented a single subject, alternating treatment design. The participants were three preschool students. A pretest, posttest, and one week follow-up were utilized to collect data. The independent variables were the use of the embedded letter and picture mnemonic cards and separated letter and picture mnemonic cards. The dependent variable was the measure of the participants' letter recognition and letter sound knowledge. Overall, the results of the study showed both embedded letter and picture mnemonic cards and separated letter and picture mnemonic cards to be effective in increasing students' letter recognition and letter sound knowledge. However, a slight difference in results may suggest embedded letter and picture mnemonic cards are more efficient in increasing letter recognition and letter sound knowledge for some children.

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Chapter 1

Introduction

Reading is an essential skill in both the classroom and in life. Early reading skills lay the foundation for later success in reading. Two crucial components in early reading skills are letter recognition and letter sound knowledge. Most children learn to speak naturally, however learning to connect spoken language to written language often requires specific instruction. Without this explicit instruction, learning letter names and letter sounds can be difficult. Letter recognition and letter sound knowledge play a significant role in literacy skills found by the National Early Literacy Panel to be predictive of later literacy skills. (NELP, 2002) Also, letter recognition and letter sound knowledge are crucial to the development of phonic skills. Phonetic awareness was reported by the National Reading Panel as one of the five essential skills in reading achievement. (NRP, 2000; Bowman, M., & Treiman, R. 2004)

A child needs to understand written language before he or she can read. If the child cannot identify a letter and corresponding sound, words on a paper will remain a mystery. If effective strategies are not in place in the early years to teach letter recognition and letter sound knowledge difficulties in these skills can continue to persist into the school age. Once the student is at the school age level deficits become more apparent and can significantly impact a student's reading ability. However, with mastery of letter recognition and letter sound knowledge children can begin to crack the code of reading. These skills can propel students in experiencing success in early reading skills. Therefore, it is imperative to be proactive in early intervening of students that are experiencing difficulties in letter recognition and letter sound knowledge. (Bowman, M., & Treiman,

R. 2004)

Letter recognition and letter sound knowledge are more challenging to learn because letters begin as meaningless symbols to young children. However, pairing the letters with something the student already knows can help make the letters more meaningful, aiding in a student's retention of the information. Mnemonic strategies integrate something known with something unknown. An example of a commonly used mnemonic is HOMES (i.e., Huron, Ontario, Michigan, Erie, and Superior), an acronym used to aid in remembering the five Great Lakes. In this mnemonic strategy, the letter method, each letter cues the name of each lake, the targeted information. Other mnemonic methods include the use of keywords, phrases, and images to help enhance memory. Creating a relationship between known and unknown information helps to effectively store and enhance retrieval of new information. Providing pictures of student-known objects associated with the letters (i.e., unknown information) can help the student better commit letter names and sounds to memory (e.g., the letter, a, next to a picture of an apple).

(Raschke, D., Alper, S., & Eggders, Elaine. 1999)

Mnemonic strategies are validated by components found in the Dual-Coding Theory. This theory describes the encoding and retrieval process of verbal and nonverbal information. Pairing verbal and nonverbal (i.e., images) information together can help enhance memory because the information is stored twice and can work together in facilitating later recall of the information. Furthermore, the theory reinforces the advantage of using imagery to enhance memory because images are more memorable. Therefore, retrieval of verbal information can be significantly increased by pairing information with imagery, more memorable information. (Paivio, Allan. 1991)

Incorporating pictorial mnemonics in the instruction of letter recognition and letter sound knowledge can be an effective strategy to help students who have not yet mastered these skills. To further integrate picture mnemonics with corresponding letters, some researchers have studied the use of embedded picture mnemonics for teaching letter recognition and letter sound knowledge. In this technique, the letter is embedded in a mnemonic picture. The picture has the same initial letter and sound as the embedded letter (e.g., the letter, s, is embedded in a picture of a snake). Embedded picture mnemonics connect letter shapes, names, and sounds to the familiar corresponding pictures. Several studies have shown embedded letter and mnemonic picture cards to be an effective strategy in teaching letter recognition and letter sound knowledge to a diverse pool of student participants. (Argramonte et al., 2002; Ehri, Deffner & Wilce, 1984; Sener & Belfiore, 2005) The purpose of this study will be to expand on previous research to test the effectiveness of embedded picture mnemonics on the acquisition of letter recognition and letter sound knowledge.

Research Problem

The overall questions to be answered in this study:

- 1.) When using embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards which intervention is most effective in increasing letter recognition skills?
- 2.) When using embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards which intervention is most effective in increasing letter sound knowledge?

This study will compare the effectiveness of embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards when attempting to increase letter recognition and letter sound knowledge in normally developing preschool students. My hypothesis is that the embedded picture mnemonic cards will be more effective in increasing the students' letter recognition and letter sound knowledge.

Key Terms

Letter Recognition- the ability to identify the name of each letter

Letter Sound Knowledge- the ability to identify the sound of each letter

Mnemonic – a memory enhancing strategy that connects something unknown with something known

Phonemes- smallest units of sound

Phonemic Awareness - ability to hear, identify, and manipulate phonemes

Phonics- the relationship between letters and sounds (i.e., symbol-sound relationship)

Embedded Letter and Mnemonic Picture Card- the letter and mnemonic picture are integrated together, the letter and picture form the same shape

Separated Letter and Mnemonic Picture Card- the letter and mnemonic picture are dissociated, separated from one another

Implications

Facilitating early reading skills supports a student's acquisition in later reading skills. Learning to read is a monumental step in a student's academic career. Finding best practices to build a strong foundation in early reading skills is beneficial in supporting later success. This study will gather information on effective instruction to aid a child's early reading skills, specifically letter recognition and letter sound knowledge. If

embedded letter and picture mnemonic cards show to accelerate a student's acquisition of letter recognition and letter sound knowledge compared to separated letter and mnemonic cards then the intervention has an important implication for educators. Students that are having difficulties remembering letter names and letter sounds can be taught with the alternative strategy of embedded letter and mnemonic picture cards.

Summary

Many students may experience reading difficulties. Helping children master early reading skills can aid in student's later success in reading. This study will focus on comparing the effectiveness of embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards. Preschool children will be instructed in both methods to increase their letter recognition and letter sound knowledge. My hypothesis is that the embedded letter and mnemonic picture cards will show to be more effective than the separated letter and mnemonic picture cards in increasing students' acquisition of letter recognition and letter sound knowledge. These findings will contribute to the limited body of research and hopefully help bring awareness to effective instruction for educators.

Chapter 2

Review of Literature

Letter Recognition and Letter Sound Knowledge

Reading is a complex process that requires the acquisition and application of numerous skills. Early reading skills emerge as the student starts to understand the relationship between spoken language and written language. Children begin to recognize the individual sounds in language and that these sounds are represented by letters. Unlike spoken language which normally develops naturally in children, the development of letter recognition and letter sound knowledge often requires specific instruction. Early reading skills lay the foundation for further achievement in reading. In reading development students can face a number of difficulties with the essential skills. Many students in the United States experience reading problems. Reading difficulties can often significantly impact a student's success in other academic areas. (Bowman & Triman, 2004)

Due to the number of students facing reading difficulties, Congress convened The National Reading Panel (NRP). The panel conducted a meta-analysis to search for skills essential to reading achievement. Also, research explored what instruction is most effective in teaching these essential skills. In 2000, the National Reading Panel published in their report five elements that significantly impact a student's reading achievement. (NRP, 2000) The five elements are phonemic awareness, phonic skills, reading fluency, vocabulary, and comprehension.

Phonemic awareness is the ability to hear, identify, and manipulate phonemes. Phonemes are the smallest units of sound. Phonic skills require the ability to connect letters to spoken sounds. Recognizing letter names and letter sounds are skills crucial in a

student's acquisition of phonic skills. From these two skills, students learn to identify the relationship between sound and symbol (e.g., "What is the name of this letter, g?" "g"; "What sound does g make?", "/g/"). Phonic skills are important to a student's ability to read and are supported by his or her ability to recognize the relationship between letters and sounds. Therefore, letter recognition and letter sound knowledge are important skills in the development of phonic skills, a key component of reading development. The report also found explicit instruction useful in teaching phonics skills. (NRP, 2000)

In addition to the National Reading Panel, the National Early Literacy Panel (NELP) was convened in 2002. The NRP Report focused on school age children while the NELP Report focused on children ages, zero to five. Beginning reading skills emerge before students learn to read. (Bowman et al, 2004). The National Panel of Early Literacy set to study the relationship between early literacy skills and later literacy skills. The panel also studied different instructional methods used in teaching early literacy skills to determine the most effective methods. (NELP, 2002)

The meta-analysis conducted by the National Early Literacy Panel reviewed approximately 500 research articles. Alphabet knowledge, phonological awareness, rapid automatic naming of letter or digits, rapid automatic naming of objects or colors, writing or writing name, and phonological memory are the six early literacy skills the panel found correlated with later literacy skills. A significant correlation indicates these six skills are predictive of later literacy skills. A student's alphabet knowledge, phonological awareness, and rapid automatic naming of letters are reinforced by a student's knowledge of letter names and letter sounds. Letter recognition and letter sound knowledge help students to associate meaning to print (alphabet knowledge), understand letter sounds

(phonological awareness skill), and improve automatic recognition of letters (rapid automatic naming of letters). The report also states interventions on early literacy skills have a positive impact on improving the student's literacy skills. A substantial number of students fail to achieve the basic skills of reading. Preventing deficits in predictive early literacy skills may prevent problems in later literacy skills. Code-focus instruction, direct training was found by the panel to be an effective strategy to teach several early literacy skills. (NELP, 2002)

In the research articles and national reports (Chang, 1999; Missall, Reschly, Betts, McConell, Hesitad, Pickart, et al., 2007; NELP, 2008; NRP 2000; Snider, 2007) letter recognition and letter sound knowledge show to play a crucial role in enabling reading skills in both early literacy skills and later literacy skills. With the acquisition of letter recognition and letter sound knowledge students can begin to unravel the skills essential for reading achievement. As previously stated understanding the relationship of written and spoken language may not develop without specific instruction. Research, (Bowman et al., 2004; Chang, 1999; NELP, 2008; NRP, 2000) illustrates direct instruction as an effective strategy in teaching several basic reading skills. Providing effective instruction in teaching letter recognition and letter sound knowledge is imperative because of the role these skills play in reading development.

However, even with direct instruction students can experience difficulty in remembering information, especially new information. Students are required to be able to remember a lot of information in school. Memory deficits can have negative effects on student's success in school. To aid memory for all students, teachers can utilize the use of mnemonic strategies in the classroom. (Scruggs & Mastropieri, 1990) These strategies

can be utilized to enhance systematic instruction of letter recognition and letter sound knowledge.

Mnemonics

For thousands of years mnemonic strategies have been used to aid memory. Many studies (Mastropieri & Scruggs, 1998; Mastropieri & Scruggs, 1989a,b; Mastropieri, Sweda, & Scruggs, 2000; Scruggs & Mastropieri 1989; Scruggs & Mastropieri 1990a,b; Scruggs & Mastropieri 2010) have researched the application of different mnemonic strategies. The keyword method, pegword method, letter method, and reconstructive elaboration are all different mnemonic techniques. One commonly used method is letter strategy (e.g., ROYGBIV, where each letter represents the colors in a rainbow).

Regardless of the specific technique, all mnemonic strategies encompass the same essential elements. In mnemonic strategies something unknown is paired with something known. Creating this association between new knowledge and previously existing knowledge helps to strengthen memory retention and recall. Connecting the unfamiliar with the familiar makes the new information more meaningful. It is important to ensure that the paired, familiar information is meaningful for the intended audience. What might be really meaningful for one group may not be meaningful for another group (e.g., farming tools to a child who lives on a farm compared to farming tools to a child who lives in a city apartment). The more meaningful the connection the more likely memory will be enhanced. Mnemonic strategies typically work best for recall of specific verbal information. Memory is better enhanced when material is concrete rather than abstract (e.g., Christopher Columbus discovered America in 1492 compared to controversy over the relationship between the Europeans and Native Americas after discovery). In creating

mnemonic devices reconstructing the unfamiliar information to images can especially help in providing elaborate and meaningful connections. This mnemonic strategy is known as reconstruction elaboration, which is the type of mnemonic strategy that will be used in this study.

Researchers (Mastropieri et al, 1998; Mastropieri et al, 1989a,b; Mastropieri, et al, 2000; Scruggs et al, 1989; Scruggs et al, 1990a,b; Scruggs et al, 2010) have found mnemonic devices to be effective for a wide based of ages and abilities. Studies have also included students that often are characterized by having memory deficits (e.g., learning disabled and mildly cognitive impaired students). The content and ages included in mnemonic studies ranged from the third grade to high school in the content of science, vocabulary, and social studies. Mnemonic strategies reported to be successful in increasing student's recall of information.

Mastropieri and Scruggs (1989) conducted a meta-analysis of mnemonic strategies used in special education classrooms. The researchers found that on average students learned 75 percent of information that was presented with mnemonics. Students that were instructed with information without mnemonics only remembered approximately 43.8 percent of information. In addition, in several studies (Mastropieri et al., 2000; Scruggs et al., 1989; Scruggs et al., 1990; Scruggs et al., 2010) both teachers and students reported mnemonic strategies as enjoyable. It is also noted by researchers mnemonic strategies are not to replace comprehensive instruction but rather as supplementary aid to enhance memory.

The goal of teaching is to transmit knowledge to students. Acquisition of knowledge, learning, and memory is a multifaceted system. The transfer of information is contingent

on student's learning and memory process. Mnemonic strategies can especially aid in enhancing a student's ability to process information and enhance memory for immediate recall and later retrieval. Mnemonic strategies can be a beneficial tool in the classroom. The essential elements found in mnemonic devices are validated by the Dual Coding Theory. The Dual Coding Theory further explains memory, specifically the encoding of verbal and nonverbal information.

Dual Coding Theory

Instruction needs to involve an understanding of what triggers a student's learning and engages a student's memory process. In the Dual Coding Theory, Paivio (1971, 1991) explains the connection between verbal and nonverbal information in the mental structure. The process of nonverbal and verbal information occurs in three different levels. The first process is representational, where nonverbal and verbal information is directly connected with nonverbal memory or verbal memory (e.g., presented with an image of a beach, beach images are retrieved from memory). The encoding of the verbal information and nonverbal can be independent from one another. Nonverbal and verbal information can also associate or refer to one another, this is the referential process. Verbal recognition of information can cue nonverbal information or vice versa (e.g., hearing or reading the statement, a big yellow ball up in the sky, can trigger someone to picture the sun). Associative is the third process, associative reactions involve verbal, nonverbal or both. Retrieval of information can use one, two, or all three of these processes.

Nonverbal refers to the pictures or imagery represented in the mental process. Images are more readily perceived in the memory process compared to verbal information.

Verbal information can benefit from being integrated or paired with imagery because imagery is more memorable. Also, presenting information both verbally and nonverbally increases chances of memory because the information is stored twice and has the potential of working together with one another in the retrieval of information. In addition, information that is concrete is more easily remembered.

The Dual Coding theory validates the use of mnemonics. Especially the theory reinforces the use of mnemonic strategies that use imagery paired with verbal information. Mnemonic strategies help support one's memory by facilitating the unfamiliar with the familiar. With support from the Dual Coding theory and positive outcomes in experimental classroom studies, mnemonic devices can be a real asset in classroom instruction. Mnemonic strategies should be implemented to improve or assist current instruction, when the material is appropriate for the use of mnemonics. Mnemonic strategies can be used to help improve instruction of letter recognition and letter sound knowledge.

Embedded Picture Mnemonics

The goal of this study is for students to master letter recognition and letter sound knowledge. Letter recognition and letter sound knowledge are launching pads to success in other early literacy skills and may be correlated with later reading skills. Educators need to support a student's proficiency in these skills through effective instruction. Letters often start as unfamiliar and meaningless. In addition, the names and sounds are often taught through direct teaching of concrete information, each letter is taught with only one name and in initial instruction often usually taught with just one corresponding sound (e.g., vowels only taught with short vowel sounds, a, /ah/). All these characteristics

make mnemonic strategies compatible with teaching letter recognition and early letter sound knowledge. Mnemonic devices help make the unfamiliar, familiar and make the meaningless, meaningful. Also, mnemonic devices are shown to work best with retention of concrete verbal information. Compared to solely using direct instruction or root drill, mnemonic devices can offer an effective alternative approach in teaching letter recognition and letter sound knowledge.

The researchers, Raschke, Alper, and Eggders (1999) implemented a study to examine the effectiveness of both visual and verbal mnemonics in instruction to increase a student's letter recognition, letter-name association. Visual images were disassociated from the letter and the verbal cue was a catchy short phrase intended for the student to remember (e.g., a picture of a bee paired with the verbal cue, A bee goes buzz.) Both the visual and verbal cues were geared in engaging a student's existing knowledge. Participants in the study varied in disabilities and ranged from the ages five to six years old. As the students began to exhibit mastery of letter names, the visual and verbal cues were gradually removed. A pretest and posttest was given to measure the effectiveness of instruction. The results showed the students increased in letter recognition, implying mnemonic strategies as an effective aid in the instruction of letter name recognition. (Raschke, et.al, 1999)

As the researchers in the previous study, (Raschke, et.al, 1999) many commercial products often include a picture mnemonic disassociated from the letter (e.g., a flashcard with a picture of an apple next to the letter, a). In this study the traditional form of letter and mnemonic pictures being separated will be compared with the use of embedded letter and picture mnemonic cards. The development of embedded pictorial mnemonics utilizes

the mnemonic technique of reconstructive elaboration. The letter, unfamiliar information, is reconstructed elaborately in the integration of the mnemonic picture (e.g., the s is placed inside a picture of a “s” shaped snake). The mnemonic picture has the same initial letter and sound as the embedded letter (e.g., the letter, m, is embedded in a picture of mountains). The development of this mnemonic material connects the letter, unknown stimuli with the picture, known stimuli. Pairing the two variables together allows information to work more closely and aid in immediate recall and later retrieval.

One of the first researchers to study the effects of picture mnemonics integrated with letters was Jay Isgur (1975). The study was conducted with participants from a Learning Disabilities Clinic, ranging from ages five to twenty-nine years old. The participants were chosen because they exhibited low recall of letter sounds. Twenty-six different images were used to represent each letter (e.g., zebra, for the letter, z). Each object was familiar to the participant and the initial letter of the object name was the same letter and sound as the targeted letter (e.g., /m/ for mittens). The instructional procedure followed a multistep process where participants were prompted to do a variety of actions including: visualizing object-images, tracing the image, and listening to and verbalizing repetitions of the sound and the object name. The use of object-imaging projection method, where pictures and letters were integrated showed to be effective in teaching letter sound knowledge. Isgur’s research could have been the facilitator to further research in embedded letter and picture mnemonics. Although not labeled in the study, Isgur’s instruction was a form of reconstruction elaboration, a mnemonic method used later in embedded letter and picture mnemonic studies. (Isgur, 1975)

Many researchers (Argramonte et al., 2002; Ehri, Deffner & Wilce, 1984; Fulk et al.,

1997; Sener & Belfiore, 2005) have studied the effectiveness of embedded picture mnemonics on both letter recognition and letter sound knowledge. The participants in these studies range from at-risk kindergarten students, to transitional first grade students, to fourth grade English language learners and finally normally developing prekindergarten, kindergarten and first grade students. All participants were identified as experiencing difficulties in the acquisition of letter recognition and letter sound knowledge. An initial baseline was used to gather students' letter recognition and letter sound knowledge in the studies.

One study (Ehri, et.al, 1984) used an experimental group and a control group. The experimental group received instruction with the embedded letter and picture mnemonic cards. The control group was taught with letters separated from the mnemonic pictures. In the other three experiments only one group of students were used, and all participants received instruction with embedded letter and picture mnemonic cards. Researchers used a range of five-21 consonant letters in the interventions. Regardless of a difference in experimental design or in letter selection, all the researchers followed a similar brief transcript for the instructor to follow during the intervention. The instruction was direct to the specific information of the letter name, name of the picture, letter sound and also included some form of verbal prompting (e.g., instructor reviewed the information and student was then asked to repeat the information). All previous research mentioned has shown embedded picture mnemonic intervention as an effective strategy to teach letter recognition and letter sound knowledge.

Another research study (Shmidman & Ehri, 2010) used embedded mnemonics to teach foreign alphabet names and sounds to preschoolers. The results of this study also

illustrates effectiveness of embedded mnemonics, students showed to master information quicker with mnemonics and had better retrieval skills. In a different study (Graaff, Verhoven, Bosoman & Hasselman, 2007) the pictorial mnemonics were implemented by use of a computer program that gradually faded the picture out from the letter. For example, the letter “m” was embedded into a picture of a mouth. As the student became more familiar with the letter m, the picture of the mouth slowly faded out in a gradual six phase process. The results showed the fading program to be a more sufficient teaching tool than embedded pictures. Although experimental methodologies differed, the overall study of embedded mnemonic devices in teaching letter recognition and letter sound knowledge showed to be an effective instructional approach. The results of these studies help to provide educators with evidence-based instruction to be employed in the classroom.

Previous research is limited on the effects of embedded letter and picture mnemonic cards on preschool students. Preschool students are just emerging in early reading skills and may show early deficits in developing letter recognition and letter sound knowledge. In this study the students will be selected because of their low letter recognition and low letter sound knowledge based on a pretest. The pretest will assess recall of letter names and letter sounds without mnemonic pictures. Another selection criterion will be the student’s skill readiness in letter recognition and letter sound knowledge, the ability to auditorily discriminate between phonemes. Student’s that show the ability to auditorily discriminate between words that differ by one phoneme will be selected for the instruction. To review, the preschool students selected will show the ability to auditorily discriminate among phonemes and show both a need of improvement in letter recognition

and letter sound knowledge.

Furthermore, instruction will be administered individually with each unknown letter taught in isolation until the student shows mastery in both letter recognition and letter sound knowledge. Previous studies are limited in studies that have isolated one letter at a time for instruction. In addition, this study will implement an alternating treatment design (e.g., if the student received instruction with an embedded letter for the second letter then the third letter the student will be instructed with a separated letter and mnemonic picture card). Also, the study will include continual probing of letters that were previously taught to check for immediate and delayed recall of letter recognition and letter sound knowledge. The results of this study will expand on previous research and hopefully increase awareness to evidence-based instruction of letter recognition and letter sound knowledge.

Summary

The key to improving a student's success in reading is effective instruction. Letter recognition and letter sound knowledge are important precursors to beginning literacy skills and may correlate with later success in reading. Mnemonic devices can be a useful strategy to supplement instruction. Pairing verbal and nonverbal information together is helpful in processing and retrieving information. In addition, the use of pictorial mnemonics is especially beneficial because imagery is more memorable than verbal information, further increasing the chances of retention. Previous research has shown embedded picture mnemonics to be an effective strategy in increasing student's letter recognition and letter sound knowledge.

Education should be enjoyable, learning to read opens up a whole new world to

students. However, facing deficits in skills essential to reading can diminish intrinsic motivation of reading in students of all ages. Starting young children on the right path in reading success can help propel students into the joy of reading. Therefore, finding the most effective instruction and providing this knowledge to educators and parents is extremely valuable. The purpose of this study is to compare the use of embedded letter and picture mnemonic cards and separated letter and picture mnemonic cards on normally developing preschool students' letter recognition and letter sound knowledge. Generating further research can continue to bring awareness to the strategy of embedded letter and picture mnemonics.

Chapter 3

Methodology

Setting and Participants

This study compared the effectiveness of the use of embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards for increasing students' letter recognition and letter sound knowledge.

The setting for the study was a university preschool in a suburban area of southern New Jersey. This preschool is open to all university staff members (e.g., professors, secretaries, and maintenance), students and alumni. The preschool has full time and part time students with an average amount of fourteen to eighteen students in the classroom daily. The preschool is a multi-age classroom, ranging from ages two and half to five years old. All students enrolled in the preschool appeared to be normally developing children. The classroom is taught by a general education teacher with one instructional assistant and several student – workers (i.e., university students working as part-time aides).

The intervention, pretest, posttest, and one week follow-up occurred in the students' classroom. Students received individual sessions for approximately two to six minutes in the library center on a child-size couch. The library center is a quiet area in the classroom away from noisy centers. While the student received intervention, the other students participated in center activities.

The study focused on three students. The participants in this study were three years old and have been enrolled in the university preschool for the past several months. All of the participants were boys- two were Caucasian and one African American. The students'

teacher did not express any concerns for the overall development of the participants. Physically the participants were able to show control over their fine and gross motor skills (e.g., all participants were able to use their gross motor skills to run and their fine motor skills to feed themselves with a utensil). Participants also appeared socially competent for their age (e.g., able to separate from parents without extreme distraught, were often smiling and laughing, and frequently were found interacting with peers). Their language and literacy skills as well looked to be developing normally (e.g., participants were able to communicate in sentences, follow simple directions, and were often found listening to and looking at books). Furthermore, the participants seemed to be progressing adequately in their cognitive skills (e.g., showed understanding of simple cause and effect relationships, reasoning, and participated in circle time activities that involved color recognition and counting). As a result of observations and teacher's input, all participants appeared to be normally developing three year old children.

The preschool implements *Creative Curriculum*, a curriculum characterized by comprehensive instruction of the cognitive, physical, and social development of young children. The curriculum follows a theme based approach and emphasizes both teacher-directed and child-initiated learning. From observation and input from the teacher there is no consistent direct instruction of letter recognition and letter sound knowledge in the classroom.

The participations in this study were chosen based on three criteria; (a) ability to auditorily discriminate between words that differ in one phoneme; (b) low letter recognition skills (c) low letter sound knowledge.

Materials and Instruments

The dependent variables were letter recognition and letter sound knowledge skills. These variables were measured in the pretest, posttest, and one week follow-up with the use of letter cards (Figure 1) and recorded in a checklist (Figure 2). The lower case letters and lines on the letter cards used in the pretest, posttest, and one week follow-up resemble the letters and lines at the bottom of the cards used in intervention. The checklist consists of consonant letters with two columns following the letter. One column represents letter recognition and the other column represents letter sound knowledge. The assessment used to measure the students' ability to auditorily discriminate (Figure 3) is from the *Basic Reading Inventory: Early Literacy Assessment*, an informal reading inventory. This measure consists of twelve word pairs (e.g., foam and phone), students discriminate if the two words are the same or different. The students' responses were recorded as correct or incorrect on the sheet.

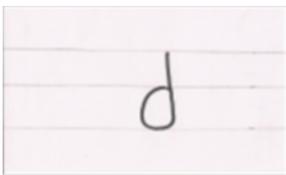


Figure 1. Letter Card

In the embedded letter and mnemonic picture cards, each letter is integrated into a picture that resembles the shape of the letter. The letter is written in the picture, the letter is embedded in the mnemonic picture. The letter and picture are similar in shape (e.g., for the letter, l, the picture is a vertical and straight lamp, same form of the letter). The picture starts with the same letter name and sound of the embedded letter (e.g., the letter, h, was embedded inside the picture of a house). The picture is in color and the embedded letter is in black. Furthermore, underneath the embedded letter and mnemonic picture is a set of three lines where the letter and picture are not integrated but instead shown side by side. The letter at the bottom is written in black ink and the picture is in black and white. The cards used in the embedded letter and mnemonic intervention are from *Itchy's Alphabet*, a phonics program. The cards from this program were slightly modified. The researcher used a black marker to write the letter on the picture so the letter and picture appear as a cohesive image.

In the separated letter and mnemonic picture cards the letter and picture are dissociated from one another and the shape of the picture is not similar to the shape of the letter. The picture starts with the same letter name and sound of the letter (e.g., the letter, g, is underneath a picture of a goat). Underneath the mnemonic picture is a set of three lines where the letter is written in black ink. The separated letter and mnemonic picture cards were made by the researcher. These cards resemble the embedded letter and mnemonic picture cards (e.g., same size, colored pictures, and letters written in black).

Pictures of the same object are used in both the separated letter and mnemonic picture cards and the embedded letter and mnemonic picture cards (e.g., the letter, g, a picture of a goat is used for the embedded card and for the separated card a different picture of a

goat is used). The major difference between the cards is in the embedded letter and mnemonic picture card, the letter and picture are combined in the same image and have the same shape and in the separated letter and mnemonic picture card, the letter and the picture are detached from one another and the images are not the same shape.

Procedure

This study followed a single subject, alternating treatment design. A pretest, posttest, and one week follow-up were implemented in this study. The students were first given the pretest to gather information on their initial knowledge of letter names and letter sounds of all consonant letters. In addition, during the pretest session the students' ability to auditorily discriminate between two words that differ in one phoneme was measured. The pretest was given to fourteen preschool students. Of the fourteen participants, three were chosen because the students illustrated the ability to auditorily discriminate between phonemes and showed in need of improvement in letter recognition and letter sound knowledge. It is relevant to note the other students who showed the ability to auditorily discriminate were not in need of additional support in letter recognition and letter sound knowledge.

The intervention proceeded every Tuesday and Thursday for six weeks for a total of twelve sessions. The number of sessions varied for the participants because the rate of intervention was tailored to the student's acquisition of each letter name and letter sound. Therefore, the students moved at their own rate during the intervention. If the child was able to automatically (i.e., less than three seconds) recognize the letter name and letter sound taught in the previous session then the student proceeded to a new letter. If the student was unable to automatically recognize the letter and sound of the letter previously

taught then instruction of this letter continued. Although the students were sometimes at different letters throughout the intervention, the students relatively followed a similar pattern in acquisition of letter recognition and letter sound knowledge. The students also received alternating treatment of the two different cards (e.g., if the student received instruction with an embedded letter and mnemonic picture card for the first letter then the second letter the student received instruction with a separated letter and mnemonic picture card).

Following the six weeks of intervention the posttest was given, only the five letters used in the intervention was assessed. A week after the student's initial posttest the assessment was repeated to follow up on the student's retention of their letter recognition and letter sound knowledge.

Data Collection Procedures

Each participant was seen individually during the intervention, pretest, posttest, and one week follow-up. The instructional time lasted approximately two to six minutes for each session. On the first day, the students participated in the pretest and auditory discrimination evaluation. The researcher said to the student, "We are going to play a word game". The researcher said "Listen to the words I am about to say: fair-far." Then the instructor asked the student, "Do they sound exactly the same or are they different?" The instructor provided another example and said "Listen to these two words: cap-cap". The researcher asked "Are they the same or different?" After reviewing the student's response the researcher said "Now I am going to read you pairs of words. I want you to tell me if they are the same or different. Listen carefully." The researcher read twelve pairs of words (e.g., tot and top) and recorded students' responses.

After the auditory discrimination evaluation, the researcher said to the student, “We are going to play a letter game.” During the pretest, the student was shown one letter card at a time. Only lower case consonant letters were used in the pretest. While looking at the letter card, the student was asked “What is the name of this letter?” Then the student was asked “What sound does this letter make?” Results of student’s letter recognition and letter sound knowledge were recorded separately in a checklist (e.g., if the student correctly recognized the letter name but not the letter sound, a check was placed under the letter name column and an X under the letter sound column). After this session the student received a sticker.

The checklists were reviewed and from students’ results, three participants were chosen for the intervention because they showed difficulties in both letter recognition and letter sound knowledge. Also, students were chosen because they were able to auditorily discriminate between two words that differed by one phoneme. The ability to auditorily discriminate increases the likelihood that students will benefit from the intervention.

On the second meeting the intervention began. Before the start of the intervention, the researcher said to the student, “We are going to practice learning letters!” After the introduction the researcher held up an intervention card and said, “Look at the picture and listen for the letter name, name of the picture, and letter sound.” The researcher then said the letter name, name of the picture, and letter sound of the specific card (e.g., “g, goat, /g/”). Next, the researcher prompted the student verbally to repeat this information. First the researcher asked, “What is the name of this letter?” Then the researcher asked, “What is the name of this picture?” Finally the researcher asked, “What sound does this letter make?” If the student responded incorrectly, he or she was corrected immediately.

Following the student's responses the researcher reviewed the information. Again the researcher held up the card and said, "Look at the picture and listen for the letter name, name of the picture, and letter sound." This cycle of instruction was repeated two more times in a session.

The next meeting the researcher held up the previously instructed letter and said "What is the name of this letter? The researcher asked, "What is the name of the picture?" Finally the researcher asked, "What sound does the letter make?" If the student was able to correctly answer each of the three questions within less than three seconds then the student was instructed on the next letter. Since the study employs an alternating design method the next letter would be the opposite type of intervention card as the previous taught letter (e.g., if embedded letter and mnemonic picture card was used then the next letter a separated letter and mnemonic picture card was used). In each session the previously taught letters were reviewed. These probes provided continual review of student's acquisition of letter recognition and letter sound knowledge. The same procedure followed for all intervention sessions. After each intervention session the researcher said, "Good job!" Then the student received a sticker. The same procedure and brief script occurred for each participant.

The posttest and one week follow-up was given with the same materials and identical brief script as the pretest. However, in the posttest and follow-up evaluation the participants were only tested on the five letters used in the intervention (i.e., g, h, l, d, and f), not all consonant letters. After the posttest and follow-up measure the student received a small prize.

Chapter 4

Results

Summary

In this single subject, alternating treatment study, three students in a preschool classroom were chosen because of their ability to auditorily discriminate between phonemes, and low letter recognition skills and low letter sound knowledge. The research questions to be answered were:

When using embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards which intervention is most effective in increasing letter recognition skills?

When using embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards which intervention is most effective in increasing letter sound knowledge?

The study consisted of a pretest, alternating intervention, posttest, and one week follow-up. During the intervention sessions, students alternated between intervention methods (i.e., if the first letter was instructed with an embedded letter and mnemonic picture card then the second letter was instructed with a separated letter and mnemonic picture card). Each student's pretest, posttest, and follow-up results were recorded for the two intervention methods (i.e., embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards), results are represented in three individual bar graphs. Cumulative results were calculated and used to compare the total number of responses of students' letter recognition skills and letter sound knowledge with embedded letter and mnemonic picture cards and those instructed with separated letter and

mnemonic picture cards, results are represented in two line graphs.

Individual Results

Figure 6 illustrates student A's results in letter recognition and letter sound knowledge. During the pretest student A was unable to correctly identify the names and sounds of the five letters used in the intervention (i.e., g, h, l, d, and f). During the posttest and follow-up measure student A was able to properly identify the names and sounds of the three out of the three letters (i.e., g, l and f) instructed with embedded letter and mnemonic picture cards and two out of the two letters (i.e., h, and d) instructed with the separated letter and mnemonic picture cards.

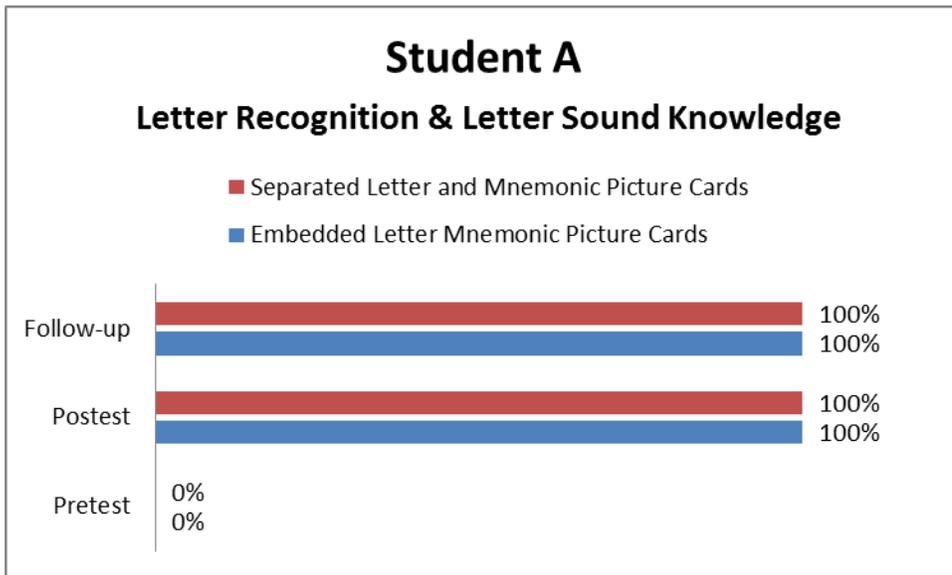


Figure 6. Student A Letter Recognition and Letter Sound Knowledge Results

Figure 7 shows student B's results in letter recognition and letter sound knowledge. In the pretest student B was unable to correctly identify the name and sounds of the five

letters used in the intervention (i.e., g, h, l, d, and f). During posttest and one week follow-up student B was able to correctly identify the names and sounds of the two out of the two letters (i.e., h, and d) instructed with the embedded letter and mnemonic picture cards. During the posttest student B was able to correctly identify the names and sounds of the three out of the three letters (i.e., g, l, and f) instructed with the separated letter and mnemonic picture card. In the one week follow-up student B was able to appropriately identify the sounds and names of two out of the three letters (i.e., g, l, and f) instructed with the separated letter and mnemonic picture cards. Student B was unable to recognize the name and sound of letter g, responding, “I don’t know” when asked “What is the name of this letter?” and “What is the sound of this letter?”.

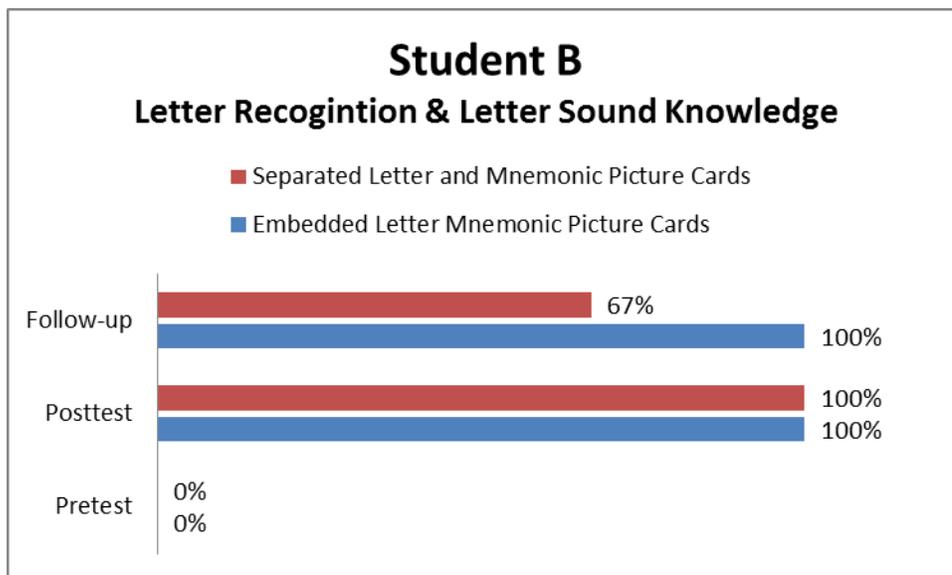


Figure 7. Student B Letter Recognition and Letter Sound Knowledge

Student C was unable to identify the sounds and names of the five letters used in the intervention. During posttest and one week follow-up Student C was able to identify the

sounds and names of the three letters (i.e., g, l, and f) instructed with the embedded letter and mnemonic picture cards. Out of the two letters (i.e., h and d) instructed with the separated letter and mnemonic picture cards student C was able to accurately recognize the name and sound of one letter during the posttest and one week follow-up. When shown the letter d and asked “What is the name of this letter?”, Student C responded “b” and when asked “What is the sound of this letter?” the student responded, “/b/”, during both the posttest and one-week follow up.

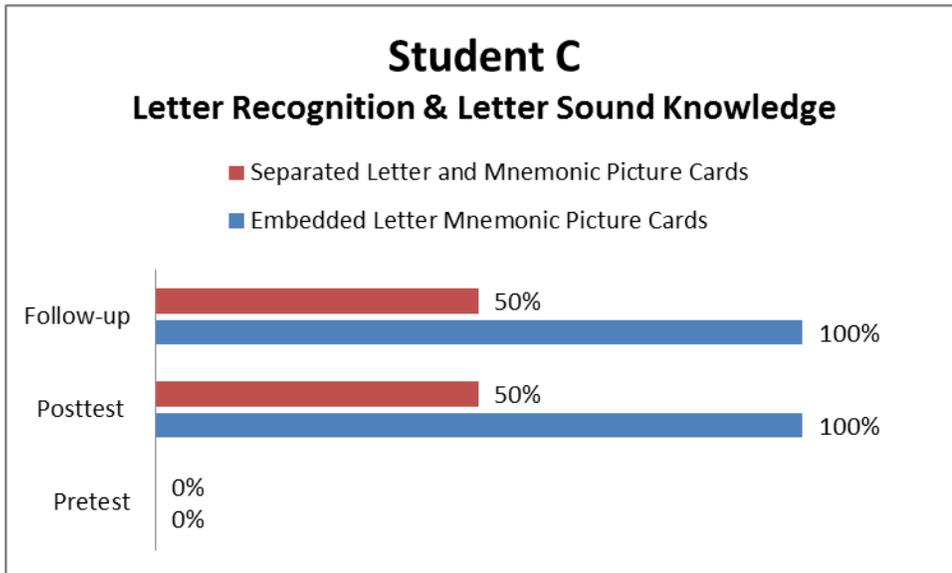


Figure 8. Student C Letter Recognition and Letter Sound Knowledge Results

Cumulative Results

Figure 9 compares the cumulative results of students’ acquisition of letter recognition from instruction with embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards. The mean number of students’ letter recognition skills on

the pretest was zero percent, the students were unable to identify the names of the five letters (i.e., g, h, l, d and f) used in the intervention. Student A and student C was instructed with three embedded letter and mnemonic picture cards, and student B was instructed with two embedded letter and mnemonic picture cards. This renders a total of eight responses evaluated for the effectiveness of embedded letter and mnemonic picture cards. The cumulative average of the students' responses in letter recognition in letters instructed with embedded letter and mnemonic picture cards on the posttest and follow-up measure is 100%, eight out of the eight letters were correctly identified.

Student A and student C was instructed with two separated letter and mnemonic picture cards, Student B was instructed with three separated letter and mnemonic picture cards. This renders a total of seven responses evaluated for the effectiveness of separated letter and mnemonic picture cards. The cumulative average of the students' responses in letter recognition in letters instructed with separated letter and mnemonic picture cards in the posttest was 86%, six out of seven letters were correctly identified. The cumulative average of the students' responses in the follow-up measure was 71%, five out of the seven letter were correctly identified.

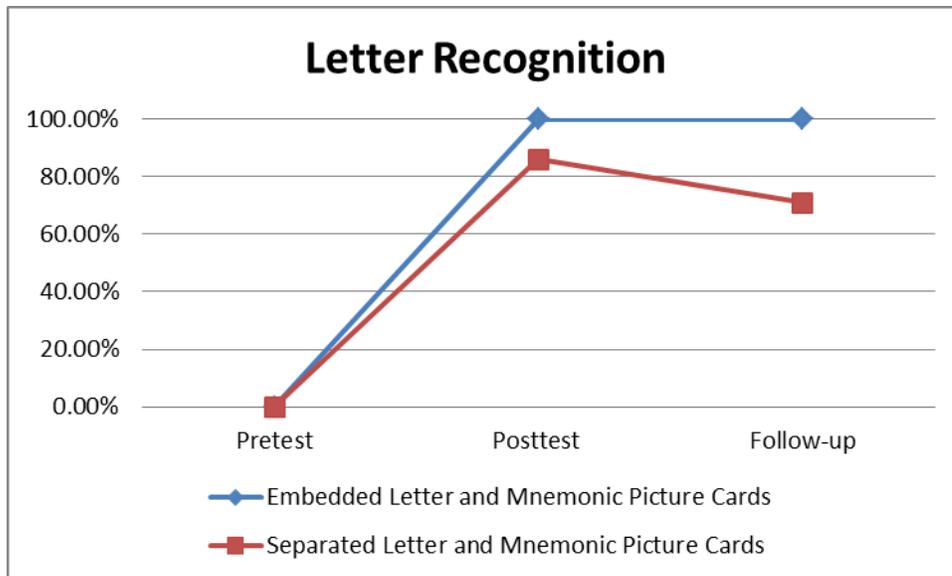


Figure 9. Pretest, Posttest and Follow-up Letter Recognition

Figure 10 compares the cumulative results of students' knowledge of letter sounds from instruction of embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards. The students were unable to identify the sounds of the five letters (i.e., g, h, l, d, and f), the mean number on the pretest is zero percent. Student A and student C were instructed with three embedded letter and mnemonic picture cards, and Student B was instructed with two embedded letter and mnemonic picture cards. A total of eight responses were evaluated for the effectiveness of embedded letter picture mnemonics on letter sound knowledge. The cumulative average of the students' responses in letter sound knowledge in letters instructed with embedded letter and mnemonic picture cards in the posttest and follow-up measure is 100%, eight out of the eight sounds were correctly identified.

Student A and student C were instructed with two separated letter and mnemonic

picture cards, Student B was instructed with three separated letter and mnemonic picture cards. Seven responses were evaluated for the effectiveness of separated letter and mnemonic picture cards. The cumulative average of the students' responses in letter sound knowledge in letters instructed with separated letter and mnemonic picture cards in the posttest was 86%, six out of seven were correctly identified. On the follow-up measure the cumulative average is 71%, five out of the seven were correctly identified.

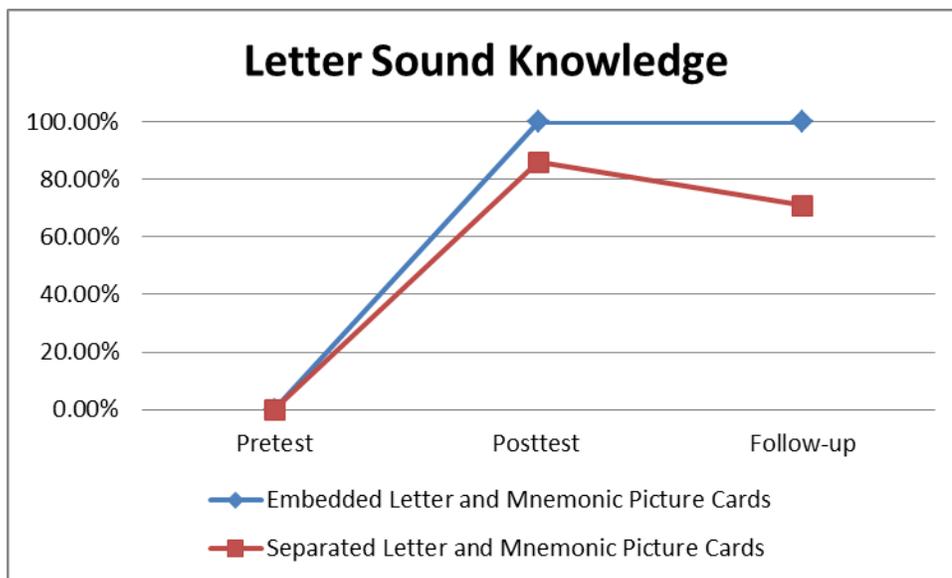


Figure 10. Pretest, Posttest and Follow-up Letter Sound Knowledge

Chapter 5

Discussion

Review

In this study, the effectiveness of embedded letter and mnemonic picture cards and separated letter and mnemonic picture cards were compared when attempting to increase letter recognition and letter sound knowledge in normally developing preschool students. Three students were chosen from a multi-age university preschool because of their ability to auditorily discriminate between phonemes and low letter recognition skills and low letter sound knowledge. The study followed a single subject, alternating treatment design. The students' data was collected in a pretest, posttest, and one week follow-up.

Both the embedded letter and mnemonic picture cards and the separated letter and mnemonic picture cards proved to be effective methods of intervention for increasing students' letter recognition skills and letter sound knowledge. However, the research problem questioned which method would be more effective in increasing both letter recognition and letter sound knowledge.

As stated in Chapter 1, it was hypothesized that embedded letter and mnemonic picture cards would be a more effective method of intervention. Embedded letter and mnemonic picture cards were hypothesized to be more effective because the integration of the letter and mnemonic picture utilizes the mnemonic strategy of reconstructive elaboration (i.e., reconstructing the unfamiliar information to images). The use of reconstructive elaboration was hypothesized to better increase students' retention of the information. While both interventions were effective, the amount of letter names and letter sounds recalled with embedded letter and mnemonic picture cards instruction was slightly higher

than separated letter and mnemonic picture cards.

Student C was unable to correctly identify the letter d during posttest and one week follow-up measure. Student C received instruction with a separated letter and mnemonic picture for the letter d. However, the letter d is a common letter students reverse during early acquisition of letter recognition skills. Therefore, student C's inability to correctly identify the letter may be due to reversal of the letter, a common error in young children. Nonetheless, it is interesting to note the other student that received instruction with embedded letter and mnemonic picture card for the letter d, was able to correctly identify the letter during both posttest and one week follow-up. Embedded letter and picture mnemonic cards may help reduce letter reversals. This could be an area of future research.

Another difference between results was student B responded, "I don't know" when shown the letter g during the one week follow-up. The student received instruction with a separated letter and mnemonic picture for the letter g. The student was able to recognize the letter during the posttest but was not able to recall the letter in the one week follow-up measure. This may illustrate the embedded letter and picture mnemonic card can help some child better retain the information. However, this was the first letter the student was assessed on during the one week follow-up. From the recent lack of exposure to intervention materials and procedure, the student may have been initially confused by the letter card. In this study it is relevant to note the participants are only three years of age. Testing and instruction is less reliable with young children. Young students have less experience with testing procedures. Furthermore, the lower case g takes a different form than an upper case g, a lower case g may be less commonly seen by the student.

Nonetheless, the other students instructed with the embedded letter and mnemonic picture card for the letter g were able to retain knowledge and recalled the correct name and sound of g. Future studies could more closely examine the effects of embedded letter and picture mnemonic cards on retention of letter recognition skills and letter sound knowledge.

In addition, it is interesting to note that there was no difference between the student's letter recognition and letter sound knowledge skills. This may suggest the mnemonic picture regardless if embedded or separated with the letter helps students simultaneously learn letter name and sound.

Overall both cards appeared to increase students' letter recognition and letter sound knowledge. However, there is a slight difference, the use of embedded letter and mnemonic picture cards may be more efficient and successful when attempting to increase letter recognition and letter sound knowledge. Chapter 2 reported on several peer reviewed research articles that discussed the use of embedded letter and mnemonic picture cards as effective in increasing letter recognition and letter sound knowledge.

Discussion of the study

The result of this study does support the original hypothesis. Nonetheless, there are several limitations of this study. As previously noted when working with young children there is always concern of reliability. Also, increasing the duration of the intervention could have been helpful in collecting more comprehensive results. Further duration could have included another follow-up measure. Another limitation of this study was that the intervention only had three participants. The small number of participants allows only a limited amount of data to interpret whether embedded letter and picture mnemonic cards

are actually more effective. Beyond the small number of participants, all three participants were boys with little diversity in their age, ethnicity, social economic background and overall development (i.e., all participants were normally developing). The three participants are not an accurate representation of the population. Increasing the number of participants could have been helpful in collecting more accurate results.

Another limitation of this study was the intervention occurred in the presence of the other preschool children. Although sessions took place in the library, a quiet center, the other children and teachers were actively participating in center activities around the participant and instructor. The other students and activities in the classroom served as distractors during the instruction. Future direction of research should determine an optimal setting for intervention to occur.

Continued research can also study effectiveness in group administration as compared to individual sessions. Studying effectiveness of group sessions can provide educators with more practical implications in the classroom. The development of a computer program could also be studied to provide educators an alternative to an individual intervention. Furthermore, because of the cohesive integration created in the embedded letter and mnemonic picture it may be interesting to study the effectiveness of this method on increasing correct letter formation.

Overall, continued research of the effectiveness of embedded letter and mnemonic picture cards in teaching letter recognition and letter sound knowledge is significant in providing educators with valuable instruction of best practices for early literacy skills to possibly prevent later reading problems.

Conclusion

In this study, two questions were to be answered. First, would embedded letter and mnemonic picture cards or separated letter and mnemonic picture cards be effective in increasing letter recognition skills. After reviewing the student data, both interventions increased students' letter recognition skills. Second, would embedded letter and mnemonic and picture cards or separated letter and mnemonic picture cards be more effective in increasing students' letter sound knowledge. Both interventions increased students' letter sound knowledge. Although both methods appeared to increase students' letter recognition and letter sound knowledge there were slightly better results shown with letters instructed with embedded letter and mnemonic picture cards. Therefore, embedded letter and picture mnemonic cards may be more efficient and successful in teaching letter recognition and letter sound knowledge for some students. This has practical implication for letter recognition and letter sound knowledge instruction. Providing students with the most effective instruction is crucial for educators and in students' success. Preventing initial signs of potential reading problems through research-based instruction may help reduce deficits in early literacy skills and later reading skills.

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