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Effect of mnemonics on the vocabulary acquisition and retention of high school students with learning disabilities

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EFFECT OF MNEMONICS ON THE VOCABULARY ACQUISITION AND RETENTION OF HIGH SCHOOL STUDENTS WITH LEARNING DISABILITIES

by

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Dedication

I would like to dedicate this manuscript to my husband, James Whitescarver and my children, Emery Whitescarver, Dezire Whitescarver, and Brielle Whitescarver. Thank you for all your support throughout this process.

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Abstract

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THE EFFECT OF MNEMONICS ON VOCABULARY ACQUISITION AND RETENTION OF STUDENTS WITH DISBAILITIES AT THE HIGH SCHOOL LEVEL
2017-2018
Dr. Amy Accardo
Master of Arts in Learning Disabilities

The purpose of this study was to investigate the effectiveness of mnemonic devices on the acquisition and retention of social studies vocabulary by high school students with learning disabilities. Six students, four male and two female, from a pull-out U.S. history I resource class participated in the study. The research was conducted using a single-subject ABAB design. During baseline, students were evaluated on their acquisition of vocabulary taught using traditional methods. During intervention, students were evaluated on their retention of vocabulary taught using teacher created mnemonic devices. Results show that the use of mnemonic devices increased the acquisition and retention of vocabulary. A student survey given after instruction showed a satisfactory rating in ease and enjoyment of using mnemonics. Further research is needed to examine possible long-term benefits of mnemonic strategies for students with learning disabilities.

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Chapter 1

Introduction

Traditionally, grammar, phonics, and other parts of language have been the focus of language teaching programs, and vocabulary instruction has been neglected (Amiryousefi & Ketabi, 2011). Research however points to a strong relationship between vocabulary knowledge and reading comprehension (Joshi, 2006; Kame'enui & Baumann, 2012). There is a consensus among researchers that the larger your vocabulary, the easier comprehending text will be (Benge & Robbins, 2009). As students move into high school, they begin to encounter more content-area vocabulary. This vocabulary has specialized meaning that students must understand to comprehend the text (Bryant, Goodwin, Bryant, & Higgins, 2003). Some students frustrate when they are faced with new words, most likely because they have difficulty retaining them (Amiryousefi & Ketabi, 2011). Students with learning disabilities, for example, often lack necessary strategies to retain newly learned vocabulary. Foundational to reading instruction, Morrison, Giordani, and Nagi (1977), Tarver, Hallahan, and Kauffman (1976), and Wong, Wong, and Foth (1977) all report that reading difficulties in children with learning disabilities have been found to be partly due to a limited ability to create and utilize reading strategies such as the use of mnemonics.

Statement of the Problem

Vocabulary instruction was neglected in the past because teacher-preparation programs emphasized grammar instruction (French, 1983). Many specialists thought basic grammar needed to be mastered before focusing on vocabulary or there would be

too many mistakes in sentence construction (French, 1983). Additionally, those advising teachers thought that word meanings could be learned only through experience and could not be taught in the classroom. Through more extensive research, we now realize that understanding vocabulary words is a crucial subskill in reading comprehension (Foil & Alber, 2002).

Children with learning disabilities have limited receptive and expressive vocabularies (Goldworthy, 1996). These deficits in vocabulary are likely to cause students to have difficulty comprehending written material (Foil & Alber, 2002). One of the best ways to improve one's vocabulary and general knowledge is by reading. Because students with disabilities are generally struggling readers and do not read, their vocabularies are often limited to their personal experiences (Foil & Alber, 2002). Thus, students who are strong readers continue to grow their vocabularies while students who are struggling readers do not (Benge & Robbins, 2010). Nagy and Anderson (1984) estimate that poor readers read 100,000 words per year compared to ten times that number for average readers and 100 times that number for avid, strong readers.

When comparing secondary students with learning disabilities in reading with their typically developing peers, a significant difference is noted in their vocabulary knowledge as a result of inefficient memorization strategies (Rose, Cundick, & Higbee, 1983). Readers with learning disabilities may need to be taught such cognitive strategies. One of the problems that students have is that they easily forget newly learned words (Amiryousefi & Ketabi, 2011). Evidence suggests that vocabulary acquisition is negatively affected by poor memory and limited independent word learning strategies (Baker et al., 1995) which are typical difficulties manifested by students with learning

disabilities Thus, instructional techniques must focus on ways to enhance retention of new vocabulary (Bryant, et al., 2003).

Significance of the Study

Specialists now agree that vocabulary is one of the most important components of communication (Coady & Huckin, 1997). Vocabulary instruction needs to include strategies to help students transfer newly learned vocabulary from short-term to long-term memory (Amiryousefi & Ketabi, 2011). The main way to do this is to create a strong connection between the newly introduced vocabulary and some element already in the learners' memory (Schmidt, 2000). Mnemonics are a memory enhancing instructional strategy that involves teaching students to link new information taught to information they already know.

There are limited studies done on mnemonic devices. A limited number of studies have been conducted on the effectiveness of mnemonics in the acquisition of second language vocabulary words (e.g., Raugh & Atkinson, 1975; Pressly, Hershey, Bishop, & Dickinson, 1981; Carlson, Kincaid, Lance, & Hodgson, 1976). Erten and Tekin (2008) conducted a study on mnemonics comparing the differences in presenting vocabulary in semantically related or semantically unrelated sets. Rose, Cundick, and Higbee (1983) conducted their research on the effects of mnemonic aids at the elementary level. Additional studies have been conducted at the middle school level (Mastropieri, Scruggs, Levin, Gaffney, & McLoone, 1985; Condus, Marshal, & Miller, 1986; Mastropieri, Scruggs & Fulk, 1990). The limited studies found at the high school level include a focus on SAT vocabulary and memorization of science facts (Therrien, Taylor, Hosp, Kaldenberg, & Gorsh, 2011; Benge & Robbins, 2009). The present study

will focus on a high school population with learning disabilities and their acquisition of social studies vocabulary. This study is significant in that it investigates the effect of mnemonics on a population and content area with a limited prior research base.

Purpose of the Study

The purpose of this study is to investigate the effect of mnemonic devices on the acquisition and retention of social studies vocabulary by high school students with learning disabilities. In addition, the study will investigate student satisfaction with the mnemonic strategies.

Research Questions

Research questions investigated in this study follow:

1.) Will the use of mnemonics increase the vocabulary acquisition of students with learning disabilities at the high school level?

2.) Will the use of mnemonics increase the vocabulary retention of students with learning disabilities at the high school level?

3.) Are high school students with learning disabilities satisfied with the use of mnemonics to learn vocabulary?

Hypothesis

I hypothesize that high school student's acquisition of social studies vocabulary will improve with the use of mnemonic strategies.

I hypothesize that high school student's retention of social studies vocabulary will improve with the use of mnemonic strategies.

Key Terms

For the purpose of this study, *mnemonic* refers to any procedure designed to improve one's memory (Scruggs, Mastiopieri, Berkeley, & Marshak, 2010). *Mnemonic Strategies* refer to some manipulation of the target content intended to tie new information to the learner's existing knowledge base which will result in retrieval of the content (Scruggs & Mastropieri, 1990). In the Keyword Method, a *keyword* is a concrete, acoustically similar word for unfamiliar information that a student can easily link to the to-be-remembered information (Hulstijn, 1997).

Chapter 2

Review of the Literature

According to the U.S. Department of Education, one out of four public school eighth-graders lacks basic, grade appropriate reading skills (Butler, Urrutia, Buenger, & Hunt, 2010). In a cross-cultural comparison, it was suggested that between 2% and 4.5% of students in the United States have comprehension abilities well below their cognitive level (Lindgren, Di Renzi, & Richman, 1985). In the late 1990's, the National Reading Panel identified five areas of instruction essential to an effective reading program: phonemic awareness, phonics, fluency, vocabulary, and comprehension (NICHD, 2000). Moving forward, with the onslaught of new technologies (e.g., text-to-speech), the need for decoding skills and reading fluency might dwindle but comprehension skills will remain essential (Sweet & Snow, 2003).

A student's academic progress tends to have a strong correlation to their ability to understand what they read (Sweet & Snow, 2003). Comprehension becomes especially important as students prepare for high school (Sweet & Snow, 2003). Text comprehension is a complex task that requires many cognitive skills and processes including both vocabulary knowledge and inference making (Perfetti, Marron, & Foltz, 1996.).

Vocabulary Development

Vocabulary knowledge and a strong understanding of how vocabulary words relate to other ideas and concepts is a critical comprehension subskill (Foil & Alber, 2002). Anderson and Freebody (1983) indicated that an average student in fifth grade

who does minimal reading each day (3,000 words per school day) would still encounter over 10,000 words per year that they did not know. If the student had a limited vocabulary to start from, that number would grow (Anderson & Freebody, 1983).

Students may have limited vocabularies for many reasons, including limited exposure to books, limited experiences outside of the home, not being encouraged with speaking/ vocabulary at home, being reluctant readers, and being second language students- English Language Learners (Hart & Risley, 1995). Children who have been encouraged by their parents to ask questions come to school with more enriched vocabularies than children from disadvantaged homes (Hart & Risley, 1995). Without intervention this gap continues to grow as students progress through school (Hart & Risley, 1995).

Chall, Jacobs, and Baldwin (1990) conducted a study that showed students with low vocabulary development were able to maintain their overall reading test scores at expected levels through grade four. After that, student word recognition and word knowledge began to slip as words became more abstract and technical. By grade seven, word meaning scores had fallen to almost three years below grade level and reading comprehension levels were almost a year below. Chall et al. (1990) coined the term "the fourth-grade slump" to describe this pattern in developing readers. As a student moves into the secondary grades, they encounter content-specific vocabulary. Students must understand the specialized meanings of these words in order to understand subject area text (Chall et al., 1990).

In a study completed by McKeown, Beck, Omanson, and Perfettti (1983), fourth graders were taught 104 words over a five-month period. Children who received

intensive instruction showed substantial advantage in all comprehension tasks in comparison to the control group. This study suggests that intensive vocabulary instruction designed to promote deep and fluent word knowledge enhances text comprehension.

Another study conducted by Hu Hsuch-chao and Nation (2000) evaluated the effects of text density on a student's ability to comprehend text. Results of this study suggest that the density of unknown words within a text has a significant effect on a student's ability to independently comprehend the text. The study showed that students need to be familiar with 98% of the vocabulary within a text in order to have adequate comprehension. Similar findings were reported in an earlier study by Hirsch and Nation (1992) in which they found that having a strong foundation of the 2,000 most commonly used words was not enough to get pleasure out of reading. Students required a knowledge base of 5,000 vocabulary word families in order to achieve this level of comprehension (Hirsch & Nation, 1992).

Memorization/ Memory Skills

Memory is an integral component of human life. Mild memory impairments can make activities of daily life challenging. Because learning depends on memory, weak memory can prevent students from acquiring new skills and knowledge (MacCormack & Matheson, 2015). Research suggests that memory impairments are frequently the cause of learning problems (Dehn, 2008). Although we know that working memory and learning disabilities are related, we may not fully understand their relationship (MacCormack & Matheson, 2015).

MacCormack and Matheson (2015) describe working memory as our ability to store information temporarily while our brain is busy completing a different task. Working memory is required to complete many tasks including to learn language and solve problems, yet our capacity for working memory is limited (MacCormack & Matheson, 2015). If our attention is broken or our short term memory is overloaded, we can lose some of the information stored there. For students who have learning disabilities, losing the information that was stored in working memory can make learning a daunting and difficult task (MacCormack & Matheson, 2015).

Keeping information in working memory is incredibly important when learning new concepts. Baddeley and Hitch (1974) describe working memory as the process of storing information for the short-term while deciding which information should be stored into long-term memory. When a student is attempting to move newly acquired information from the working memory to the long-term memory, they may experience difficulties encoding the information. Difficulties in the encoding process can lead to problems with the storage of information in long-term memory (Thorne, 2003). Students who have weaker long-term memory storage tend to rely on rote memorization. This strategy uses short-term memory and may help the students remember some answers for the upcoming quiz, but the information does not make its way into the long-term memory (Thorne, 2003). In order to foster long term memory of new information, one needs to realize that our memory is a network of connections. If we want information to stay in this network, it is best to create many connections to access it (Thorne, 2003).

As referenced by the Center for Development and Learning, Thorne (2003) suggests the following memory aiding strategies:

- Activation of Prior Knowledge
- Elaborative Rehearsal: Instead of having a student simply memorize information recorded on flash cards, this strategy involves elaborating on the new incoming information in some way. Elaboration may consist of making associations between the new information and what one already knows, creating a mental image of the new information, recoding information in some way such as taking notes on a chapter while reading it, or creating some mnemonic device that helps memory of the information.
- Multiple Sensory and Multiple Format Instruction
- Episodic and Semantic Memory Systems: Episodic memory is the memory system that stores information about the events or episodes in our lives. Semantic memory is the memory of knowledge and concepts.
- Perceptual and Conceptual Priming: Using advance organizers to introduce vocabulary, objectives, or questions prior to reading.
- Mnemonic Methods

Mnemonic Devices

Mnemonic is a word derived from the Greek word *mnemonikos* ("of memory"). A mnemonic is a technique used to aid memory dating back to 477 BCE (Yates, 1966). In the field of cognitive psychology, mnemonic techniques are considered to be strategies for encoding new information in memory in such a way that it can be more easily retrieved. Some widely known mnemonics examples include:

- FOIL- In elementary algebra, FOIL is a mnemonic used for multiplying two binomials.

- PEMDAS- PEMDAS is an acronym for the words parenthesis, exponents, multiplication, division, addition, subtraction.
- SOHCAHTOA-SOHCAHTOA is a helpful mnemonic for remembering the definitions of the trigonometric functions. (sine equals opposite over hypotenuse, cosine equals adjacent over hypotenuse, and tangent equals opposite over adjacent)
- ROYGBIV-ROYGBIV is an acronym for the sequence of hues commonly described as making up a rainbow: red, orange, yellow, green, blue, indigo and violet.
- Every Good Boy Does Fine/ FACE-A mnemonic used to remember the notes on the lines and in the spaces of the treble clef.
- I before E, except after C- spelling rule
- Digits can be memorized by their shapes, so that: 0 -looks like an egg, or a ball; 1 -a pencil, or a candle; 2 -a duck, or a swan; 3 -an ear; a pair of pouted lips. 4 -a sail, a yacht; 5 -a key; 6 -a comet; 7 -a knee; 8 -a snowman, or a pair of glasses; 9 -an apostrophe, or comma.
- A mnemonic for the number of days in each month:

  "Thirty days hath September, April, June and November; February has twenty-eight alone, All the rest have thirty-one; Excepting leap year: that's the time When February's days are twenty-nine."

- Using hands to make a bed to remember which way your b and d should face.

Mnemonics Used in Math

Mnemonic strategies can be effective in all subject areas. A study conducted by Manalo, Bunnell, and Stillman (2000) investigated the effects of process mnemonic instruction on the computation skills of 13 to 14- year old students with mathematical learning disabilities. Process mnemonics instruction was implemented by (1) presenting numbers as characters (warriors) and (2) by presenting operations as situational stories. In both investigations, students who received process mnemonic instruction made significant improvements in addition, subtraction, multiplication and division. More importantly, students who received process mnemonic instruction maintained gains better than any other group over six-week and eight-week follow-up periods (Manalo, Bunnell, & Stillman, 2000).

Another study looked at the effectiveness of using mnemonic strategies to learn, enjoy, and become less apprehensive about statistics. Stalder and Olson (2011) presented 61 undergraduate students with a survey to measure their satisfaction with mnemonic strategies utilized throughout the semester in an introductory psychology statistics course. Eleven mnemonics were provided throughout the semester. Participants significantly recalled 9 out of the 11 mnemonics. Overall reported perceptions indicated students held the use of mnemonics in relatively high regard. The students reported feeling the mnemonics improved their learning and motivation (Stalder & Olson, 2011).

Mnemonics Use for Various Learning Objectives

Stephens and Dwyer (1997) examined the instructional effects of various mnemonic strategies in the memorization of the parts and functions of the human heart.

Two hundred thirty-five college students were randomly assigned to seven treatment groups. The instructional modules included text only, text embedded with mnemonics, and text with embedded mnemonics and visuals. The results of this study indicate that the use of embedded mnemonics with visuals significantly improved student achievement as measured by drawings, identification, and total recall tests (Dwyer, 1997).

A meta-analysis of science instruction for students with learning disabilities completed by Therrian, Taylor, Hosp, Kaldenberg, and Gorsh (2011) suggested that mnemonic instruction is highly effective at increasing students' acquisition and retention of science facts. Among the studies reviewed were two conducted by Mastropieri, Scruggs, and Levin (1985, 1986). Both comparison group studies evaluated the students' recall of mineral hardness following direct instruction (control group) or mnemonic instruction methods (intervention group). The effect sizes were 2.366 and 2.553 respectively in favor of mnemonic instruction. Another study conducted by Scruggs, Mastropieri, Levin, and Gaffney (1985) measured students' acquisition of eight mineral names and their associated attributes. Students in the mnemonic group utilized pegword and keyword mnemonics, and teachers were involved in developing the mnemonic materials. Effect size for the group using mnemonics was significantly higher than that of the group taught using direct instruction (Scruggs et al., 1985).

Mnemonics use for Vocabulary Acquisition

Comprehension of vocabulary is an essential sub-skill needed for proficient reading (Foil & Alber, 2002). Simply requiring students to look up new vocabulary in the dictionary or online and rehearse their definition is a tedious and time-consuming task. For students with disabilities, this task is even more daunting for students with

disabilities. To develop a strong vocabulary, students must link new information to previously learned concepts or information stored within their memory. Mnemonics can make vocabulary instruction an interesting and rewarding part of a student's learning experience (Foil & Alber, 2002).

An action research study was conducted by a high school teacher to help her students learn SAT vocabulary (Scruggs & Berkeley, 2010). The students in this study received mnemonic instruction on key SAT vocabulary over 18 weeks as freshman using cartoons. The students were juniors and seniors. With no review of the cartoons, the average vocabulary retention rate was 73.6%, however, after a 15 minute review using cartoon mnemonics, the student retest average was 82.5% (Scruggs & Berkeley, 2010).

Terrill, Scruggs, and Mastropieri (2004) conducted a study in which one high school teacher used mnemonics to help her students with learning disabilities learn SAT vocabulary. The teacher assigned a keyword to each vocabulary word along with a paired interactive illustration. At the end of the 6 week period, she found that students instructed using mnemonics memorized 92% of vocabulary words in comparison to 49% of the words memorized by students using the traditional method (Terrill et al., 2004).

Marshak, Mastropieri, and Scrugg (2009) conducted a study in which one social studies middle school teacher also found success using mnemonic strategies. This teacher found that students with disabilities performed just as well as students without disabilities when mnemonics were utilized. On post-test items, students taught mnemonically scored 93.9% (Students without disabilities) and 92.6% (Students with disabilities). Students taught traditionally scored 71.4% (students without disabilities) and 55.4% (students with disabilities) (Marshak, Mastropieri, & Scruggs, 2009).

A study conducted by Mastropieri, Scruggs, Levin, Gaffney, and McLoone (1985) found using mnemonic pictures (keywords interacting with definition) in a grade 7 class led to a student recall rate of 79.5%, compared to over 31.2% in students who were taught through traditional methods. A second study conducted by the same researchers found using a mnemonic imagery resulted in student definition recall of 69.3% in comparison to 46.7% for students who received direct instruction.

Condus, Marshall, and Miller (1986) used keyword-image mnemonics to help students memorize vocabulary in a junior high resource classroom. All treatment groups performed better than those in the control groups. Additionally, maintenance (2 weeks later) and follow-up (8 weeks later) assessments showed students using mnemonics significantly outperformed the control groups. Similarly, Mastropieri, Scruggs, and Fulk (1990) found that using keyword mnemonics with students in a grade 6 class to support vocabulary instruction resulted in students out-performing those in the rehearsal condition.

Mnemonic strategies have proven useful for vocabulary acquisition of English Language Learners as well (Raugh and Atkinson, 1975; Carlson, Kincaid, Lance, and Hodgson, 1976; Atay & Ozbulgan, 2007). Mnemonics have been identified as a "Go For It" practice by the Council for Exceptional Children, the Division of Learning Disabilities, and the Division of Research (Espen, Shin, & Busch, 2000).

Conclusion

The word *mnemonic* came from the Greek word *Mnemosyne*, who is the Greek goddess of memory. Mnemonic strategies are designed to help students improve their

memory of important information. This technique connects new learning to prior knowledge through the use of visual and/or acoustic cues. Mnemonics devices are a useful tool for enhancing learning and facilitating recall (Amiryousefi & Ketabi, 2011). Mnemonic devices have been used for math instruction (Manalo, Bunnell, & Stillman, 2000; Stalder & Olsen, 2011). Mnemonics have proven effective at improving acquisition and retention of relevant information in many content areas including, but not limited to geography facts (Rowlinson, 1994), parts and functions of the human heart (Stephens & Dwyer, 1997), circuits and electricity (Dalton, Tivman, & Rawson Mead, 1997), hardness of minerals (Mastropieri, et al. 1985; Mastropieri, et al., 1986), ecosystems (Mastropieri, et al. 1998), scientific method (McCleery & Tindal, 1999), magnetism of rocks and minerals (Scruggs, Matropieri, Bakken, & Brigham, 1993), mineral attributes (Scruggs, Mastropieri, Levin, & Gaffney, 1985), and animal facts (Scruggs, Mastropieri, & Sullivan, 1994).

Moreover, mnemonics have proven an effective strategy for students who are English Language Learners to obtain new vocabulary (Raugh & Atkinson, 1975; Pressley, Hershey, Bishop, & Dickinson, 1981; Carlson, et al. 1976; Atay & Ozbulgan, 2007), and mnemonics have been proven to be an effective tool for students with disabilities. An area where students with impaired memory skills struggle is in the area of vocabulary acquisition. Too often these students are utilizing rote memory or rehearsal strategies to master these new words. Since the students are not creating any connections with these strategies, they find it difficult to move the information from their working memory into their long-term memory.

Studies suggest a strong relationship between vocabulary knowledge and reading comprehension (Carlisle, 1993). With increased reading requirements at the secondary level, students come across difficult, content-specific vocabulary. Knowing the meanings and relationships of these new vocabulary words enhances a student's comprehension of the content (Baumann & Kameenui, 1991). Therefore, to improve comprehension, efforts should be made to improve the student's vocabulary. One effective method to improve and retain a student's vocabulary knowledge base is through the use of mnemonic teaching strategies. This study aims to measure the effectiveness of mnemonic teaching strategies on United States History vocabulary acquisition and retention of students with learning disabilities at the high school level.

Chapter 3

Methodology

Setting

School. This study was conducted at Audubon Junior/ Senior High School in Audubon, New Jersey. The school consists of approximately 490 seventh through twelfth grade students from Audubon and Mt Ephraim. The high school runs on a nine period schedule with each period lasting 45 minutes. Approximately 23% of the population receives special education services. The population of Audubon Junior/ Senior High School is comprised of 80% Caucasian, 6% Hispanic, and 5% African American students. Twenty-eight percent of the population is within the low income status.

Classroom. The study was conducted in one of the schools out of class resource U.S. history classes during period 1. There is one special education teacher in this class. The classroom where this study took place consists of a teacher's desk and 19 student desks, and is used by two different teachers throughout the day. The teacher's desk is at the rear of the classroom. There is a Smartboard on the front wall and a dry erase board on either side of the screen.

Participants

The study included six ninth grade high school students, four males and two females. Three of the students were classified with other health impairments with diagnoses of ADHD. Two students were classified as specific learning disability and one is eligible under the classification of communication impaired. One of the students

receives English as a second language services as well. Table 1 presents general participation information.

Table 1

General Information of Participating Students

Student	Age	Grade	Special Education Eligibility Category
A	*15*	*9*	*OHI*
B	*14*	*9*	*SLD*
C	*14*	*9*	*OHI*
D	*15*	*9*	*OHI*
E	*14*	*9*	*CI*
F	*15*	*9*	*SLD, ESL*

Participant 1. Student A is a 15 year old, Caucasian male. He is eligible for special education services under the classification of other health impairment with a medical diagnosis of ADHD and pervasive developmental disorder. His academic program and supports include out of class resource for English, mathematics, science, and social studies. Additionally, Participant A receives speech therapy monthly.

Evaluations completed in 2016 indicated a low full scale IQ of 79. The student has higher than average absenteeism. He benefits from small group instruction with a modified curriculum. He requires positive reinforcement, repetition, structure, consistency, and a multi-sensory approach for his academic day to be successful. His marking period 1 classes and grades were as follows: English I (81), fundamentals of high school math (87), U.S. history I (85), environmental science (84), woodwork (85), world Spanish (90), and physical education (69).

Participant 2. Student B is a 14 year old, Caucasian male. He is eligible for special education services under the classification of specific learning disability with weaknesses in the areas of written expression and math computation. His academic program and supports include out of class resource for English, math, science, and social studies. Additionally, Student B receives counseling services monthly. Evaluations completed in 2009 indicated an average full scale IQ 99. The student has regular attendance. Student B relies heavily on teacher support including reminders, positive reinforcement, and cueing. His grades are impacted by distractibility and inattention. Student B benefits from assistance with organization, peer editing of written assignments, and math problems broken down into basic steps. Student B is a pleasant student who is open to teacher support. His marking period 1 classes and grades were as follows: English I (86), fundamentals of math (81), U.S. history I (78), environmental science (94), world French (85), and physical education (89).

Participant 3. Student C is a 14 year old, Caucasian male. He is eligible for special education services under the classification of other health impairment with a medical diagnosis of ADHD. His academic program and supports include out of class

resource for English, science, and social studies. Evaluations completed in 2016 indicated a low average Full Scale IQ 83. The student has higher than average absenteeism. His marking period 1 classes and grades were as follows: English I (64), fundamentals of math (73), U.S. history I (71), environmental science (65), world Spanish (68), business economics (76) and physical education (86).

Participant 4. Student D is a 15 year old, Caucasian male. He is eligible for special education services under the classification of other health impairment with a medical diagnosis of ADHD. His academic program and supports include out of class resource for English, math, science, and social studies. Evaluations completed in 2014 indicated a low average full scale IQ 87. The student has regular attendance. His marking period 1 classes and grades were as follows: English I (79), fundamentals of math (97), U.S. history I (86), environmental science (85), world Spanish (85), skills for living (85) and physical education (90). Student E benefits from extended time, re-testing, repetition and rewording of directions, and one-on-one assistance as needed. He generally follows directions and classroom procedures without difficulty. Behaviorally, Student E is at times off-task and benefits from redirection and prompting. At times, homework completion is an area of challenge. Student E is near-sighted and is supposed to wear glasses to see far away. He is not currently taking medications for ADHD.

Participant 5. Student E is a 14 year old, Caucasian female. She is eligible for special education services under the classification of communication impaired. Her academic program and supports include out of class resource for English, math, science, and social studies. Additionally, this student receives speech and language services monthly. Evaluations completed in 2016 indicated a low average full scale IQ 81. The

student has regular attendance at school. Student F gives good effort with all her school work and shows a real willingness to learn. Student F continues to benefit from small group instruction with a modified curriculum. She requires positive reinforcement, repetition, directions and questions read aloud, consistency, and a multi-sensory approach for her academic day to be successful. Her marking period 1 classes and grades were as follows: English I (98), fundamentals of math (93), U.S. history I (89), environmental science (96), world Spanish (96), and physical education (91).

Participant 6. Student F is a 15 year old, Hispanic female. She is eligible for special education services under the classification of specific learning disability. Her academic program and supports include out of class resource for English, math, science, and social studies. Additionally, this student receives speech and language services monthly. She receives ESL services daily as well. Evaluations completed in 2016 indicated a borderline Full Scale IQ 75. The student has regular attendance at school. Her marking period 1 classes and grades were as follows: English I (79), fundamentals of math (84), US history I (73), biology (96), English ESL (80), and physical education (90). This student is described as hardworking. She requires reading and writing as well as support as well as breaking down math concepts. She does not always advocate for herself or reach out for help in class.

Research Design

The research utilized a single-subject ABAB design. The independent variable within the study is the utilization of mnemonic strategies. The dependent variables within this study are the acquisition of high school vocabulary and the retention of high school vocabulary for students with disabilities. During Phase A, data was collected

from end of the week vocabulary assessments to evaluate academic scores of students who were required to memorize definitions of 10 novel vocabulary words independently. During Phase B, students were instructed using mnemonic strategies that pair novel vocabulary words to a teacher created mnemonic. End of the week vocabulary assessment data was collected. Each phase lasted two weeks. The assessments consisted of open-ended vocabulary worksheets. At the culmination of the study, a comprehensive assessment was given that contained all vocabulary covered. This assessment was intended to measure retention.

Furthermore, at the end of the second Phase B, students were asked to complete a Likert scale survey to report their satisfaction with the mnemonic strategies. Both Phase A and B lasted two weeks. Two weeks following the ABAB cycle, the comprehensive test was given.

Materials

Two sets of materials were used. During Phase A, materials included vocabulary worksheets comprised of 10 vocabulary words and their respective definition, and an end of the week vocabulary assessment. The same materials will be used in Phase B with the addition of teacher provided mnemonics. Some examples of teacher provided mnemonics are outlined below in Figure 1.

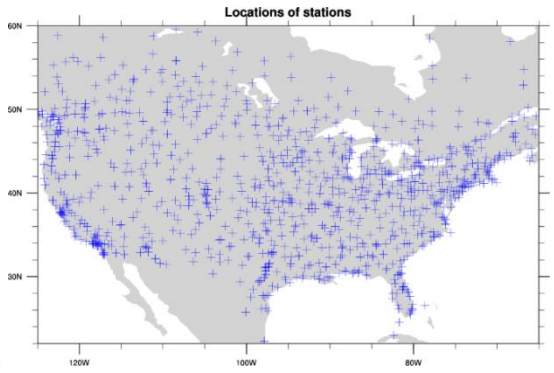
Week 2 Words	Mnemonic devices
nullification	Arm cross (null) movement when saying the word
nationalism	OOh...Na,,,tion….al...ism sung to the tune “National Anthem” with hand over heart
temperance	When you have a “temper” you should not drink
Manifest destiny	 Man’s Destination
frontier	‘Front line” on the basketball court separates the two sides or the front wall of the room separates the two classrooms
homestead	“home”-“house”
transcontinental	You take a train to go between two countries
destiny	Destinee has a hidden power of affecting what will happen  This is Destinee
attainder	“at” - the sound you make when you are telling someone they are being bad/ shake finger at them
federalist	Think “feds”

Figure 1. Example mnemonic devices provided.

Procedures

The research utilized a single-subject ABAB design. During Phase A, data was collected from end of week vocabulary assessments to evaluate academic scores where students were required to memorize definitions of 10 novel vocabulary words independently. At the beginning of each week, students were asked to copy the definitions into their notebooks from the board as the teacher introduced each vocabulary word. The initial Phase A lasted 5 weeks and formulates the baseline data. The second Phase A lasted two weeks. During Phase B, students were instructed using mnemonic strategies that paired novel vocabulary words to a teacher created mnemonic. The students were instructed to copy the definition from the board. In addition, the teacher provided a mnemonic device to help them remember the given words. They were instructed to make note of these devices in their notebooks however they chose. End of the week vocabulary assessment data was collected through vocabulary quizzes where the students were asked to connect the vocabulary with the correct definition. Each Phase B lasted two weeks. Students were graded on 0-10 point scale. A comprehensive assessment was given that contained all vocabulary covered. This assessment was in a multiple choice format. This assessment was designed to measure retention. Furthermore, at the culmination of the study, students completed a Likert scale survey to report their satisfaction with the mnemonic strategies.

Measurement Materials and Procedures

Weekly assessments. Weekly vocabulary quizzes were completed. These assessments required the students to match their ten vocabulary words to the correct

definition. Students earned 1 point for every vocabulary word defined adequately and correctly.

Cumulative assessment. A cumulative vocabulary assessment was given at the end of the study. This assessment included a randomly chosen 75% of the words provided over the course of the study. This assessment was in a multiple choice format. Students earned 1 point for every vocabulary word that correctly matches its definition.

Survey. At the conclusion of the study, the students were asked to complete a student satisfaction survey using a Likert scale. Participants answered 7 questions regarding their satisfaction with using mnemonics strategies to memorize vocabulary words. The researcher read each question aloud and gave the students the opportunity to circle the number that best represents their perception of the mnemonic strategies. Participants answered each question with a rating of 1-5: 1 representing strongly disagree, 2 representing disagree, 3 representing neutral, 4 representing agree, and 5 representing strongly agree. The students were instructed to not put their names on the survey so they would remain anonymous. Figure 2 shows the survey the students were asked to complete.

Likert Scale

<u>This survey is anonymous. Do NOT put your name on this paper.</u>

Choose a response to each of the following statements.

I prefer using mnemonics to memorize vocabulary words.

5	4	3	2	1
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

It is easier to memorize vocabulary definitions when using mnemonics.

5	4	3	2	1
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

I prefer teacher provided mnemonics over student created mnemonics.

5	4	3	2	1
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

I enjoyed using this memorization strategy.

5	4	3	2	1
Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree

I think I will use this strategy in the future.

5	4	3	2	1

Figure 2. Student satisfaction survey.

Data Analysis

Survey results were compiled, recorded as percentages, and reported in a table. Weekly vocabulary assessments and cumulative vocabulary assessment were converted into percentages. The data from these tests were displayed in visual line graphs. In addition, results were compared and contrasted for each phase. The data points were used to identify changes in performance across phases. Mean and standard deviations for weekly vocabulary assessments and cumulative vocabulary assessment are reported in tables. A comparison between phases and comparisons among vocabulary retention on the cumulative assessment helped to determine the effects of mnemonics on the vocabulary acquisition and retention of students with disabilities at the high school level.

Chapter 4

Research Results

This single-subject design study utilized ABAB phases to examine the effect of mnemonic strategies on the acquisition and retention of high school vocabulary on students with learning disabilities. Six high school sophomores receiving U.S. history I instruction in a resource room setting participated in this study. Research questions investigated in this study follow:

1.) Will the use of mnemonics increase the vocabulary acquisition of students with learning disabilities at the high school level?

2.) Will the use of mnemonics increase the vocabulary retention of students with learning disabilities at the high school level?

3.) Are high school students with learning disabilities satisfied with the use of mnemonics to learn vocabulary?

Vocabulary Acquisition Scores

To answer research question 1, data was collected throughout all phases. Weekly vocabulary assessments were administered to evaluate the effectiveness of mnemonic strategies on the acquisition of high school vocabulary. These assessments were divided into two parts, each containing five vocabulary words. They were each graded on a five-point scale with one point earned for every vocabulary word correctly matched to its definition. Scores were then converted into percentages. Means and standard deviations of student percentage scores on daily assessments are shown in Table 2.

Table 2

Mean and Standard Deviation of Assessments across Phases

	Baseline		**Phase B**		**Phase A**		**Phase B**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Student A	96	0.54	50	0	90	1.15	100	0
Student B	78	0.83	65	1.73	90	1.15	85	1.73
Student C	28	1.92	55	0.58	55	0.58	70	1.15
Student D	72	1.98	60	0	70	0	85	1.73
Student E	76	0.54	55	0.58	70	1.15	85	1.73
Student F	18	0.83	45	0.58	35	1.73	75	1.73

Student A is a 14-year old, Caucasian male. He is eligible for special education services under the classification of specific learning disability with weaknesses in the areas of written expression and math computation. During the first baseline phase, Student A's mean score on his daily assessments was 96%. Student A's mean score decreased during the first intervention phase to 50%. When the intervention was removed during the second baseline phase, Student A's mean score increased to 90% and then increased again during the second intervention phase to 100%. Student A's daily data is shown in Figure 3.

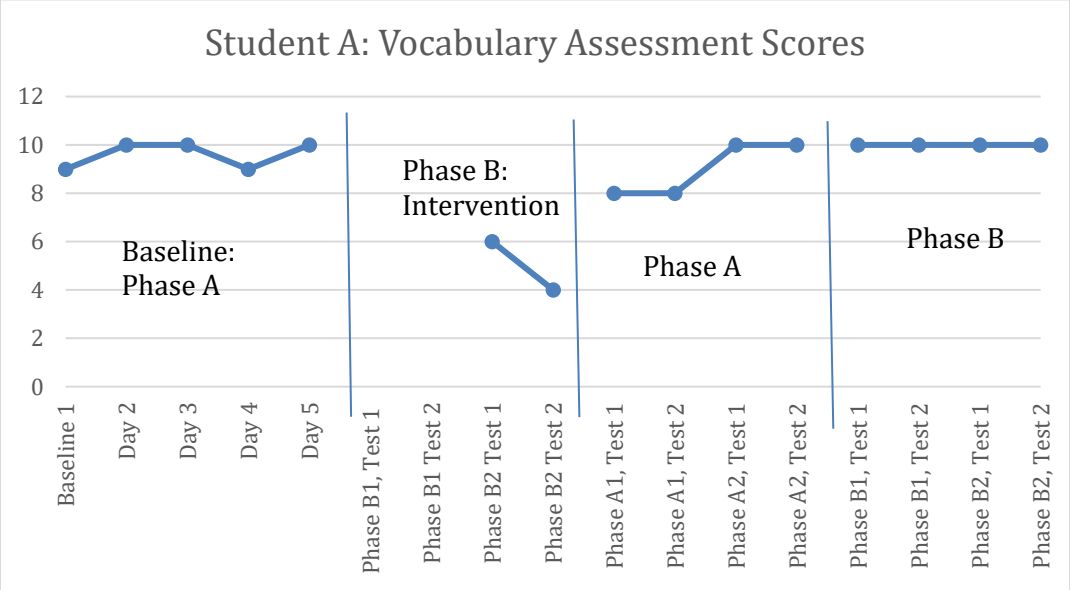


Figure 3. Student A Vocabulary Assessment Scores

Student B is a 14 year old, Caucasian male. He is eligible for special education services under the classification of other health impairment with a medical diagnosis of ADHD. During the first baseline phase, Student B's mean score on his daily assessments was 78%. Student B's mean score decreased during the first intervention phase to 65%. When the intervention was removed during the second baseline phase, Student B's mean score increased to 90% and then decreased during the second intervention phase to 85%. Student B's daily data is shown in Figure 4.

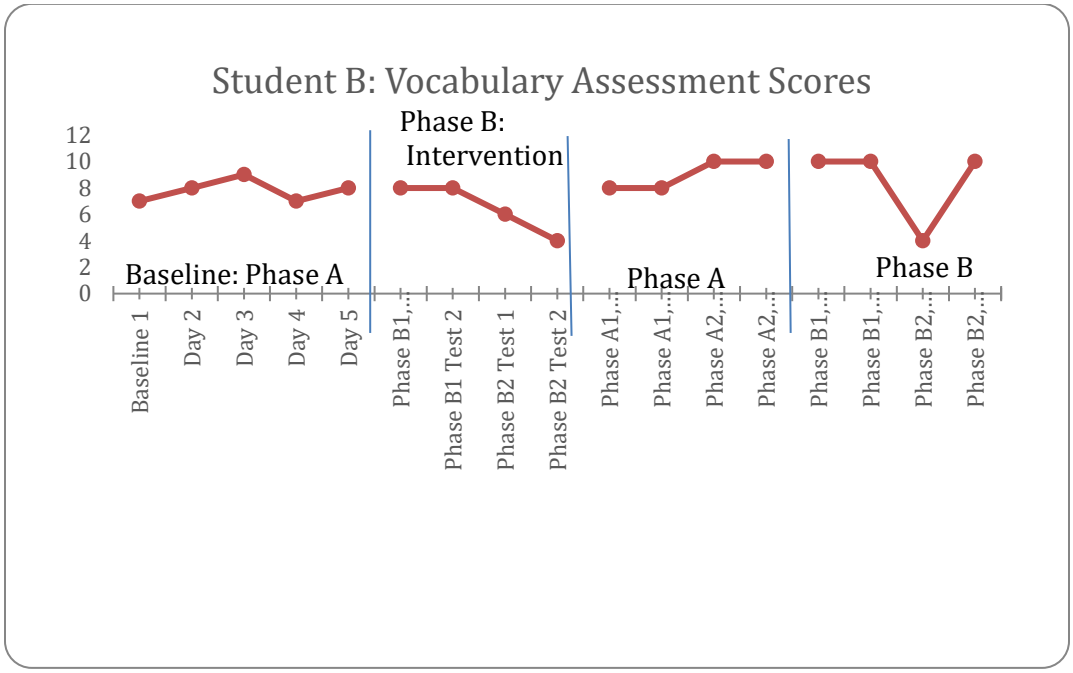


Figure 4. Student B Vocabulary Assessment Scores

Student C is a 14 year old, Caucasian male. He is eligible for special education services under the classification of other health impairment with a medical diagnosis of ADHD. During the first baseline phase, Student C's mean score on his daily assessments was 28%. Student C's mean score increased during the first intervention phase to 55%. When the intervention was removed during the second baseline phase, Student C's mean score stayed consistent to 55% and then increased during the second intervention phase to 70%. Student C's daily data is shown in Figure 5.

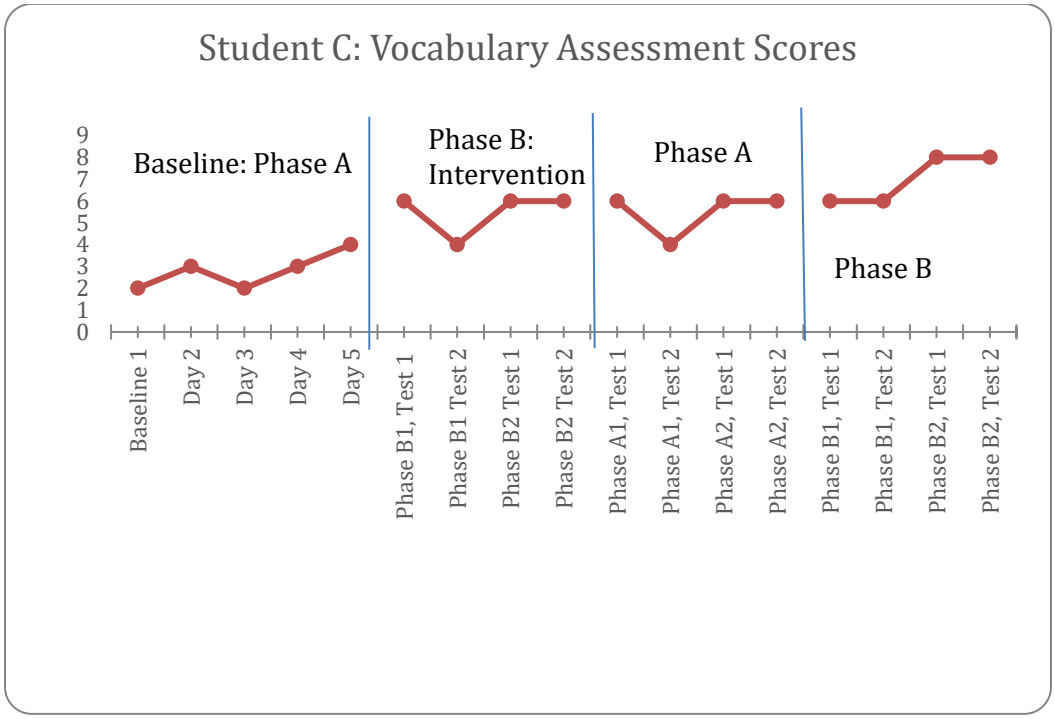


Figure 5. Student C Vocabulary Assessment Scores

Student D is a 15 year old, Caucasian male. He is eligible for special education services under the classification of other health impairment with a medical diagnosis of ADHD. During the first baseline phase, Student D's mean score on his daily assessments was 72%. Student D's mean score decreased during the first intervention phase to 60%. When the intervention was removed during the second baseline phase, Student D's mean score increased to 70% and then increased again during the second intervention phase to 85%. Student D's daily data is shown in Figure 6.

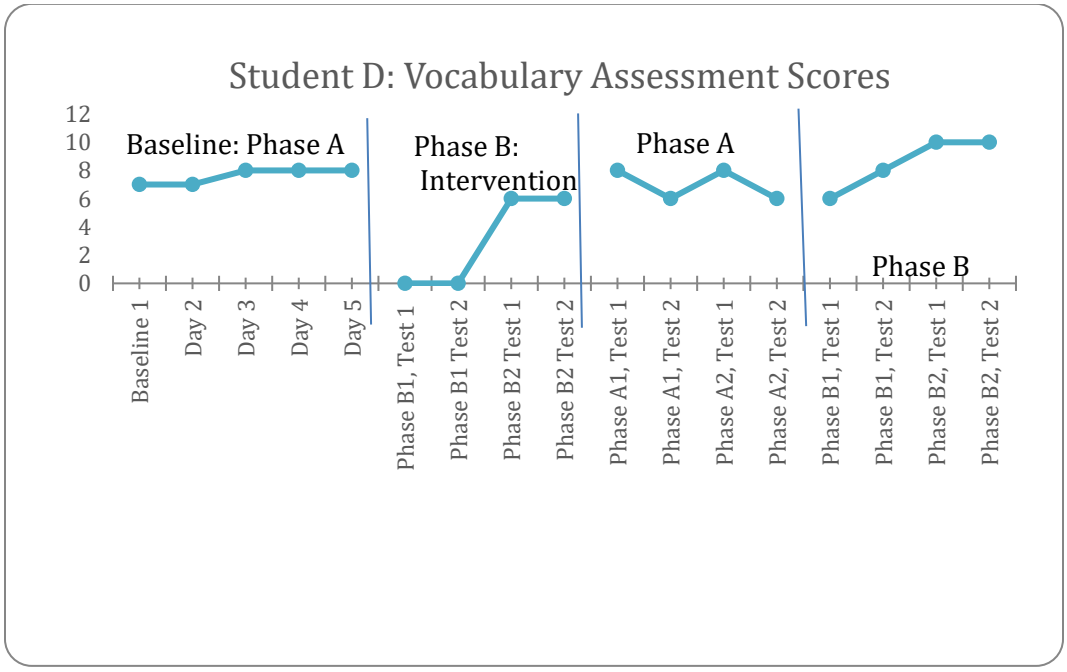


Figure 6. Student D Vocabulary Assessment Scores

Student E is a 14 year old, Caucasian female. She is eligible for special education services under the classification of communication impaired. During the first baseline phase, Student E's mean score on his daily assessments was 76%. Student E's mean score decreased during the first intervention phase to 55%. When the intervention was removed during the second baseline phase, Student E's mean score increased to 70% and then increased again during the second intervention phase to 85%. Student E's daily data is shown in Figure 7.

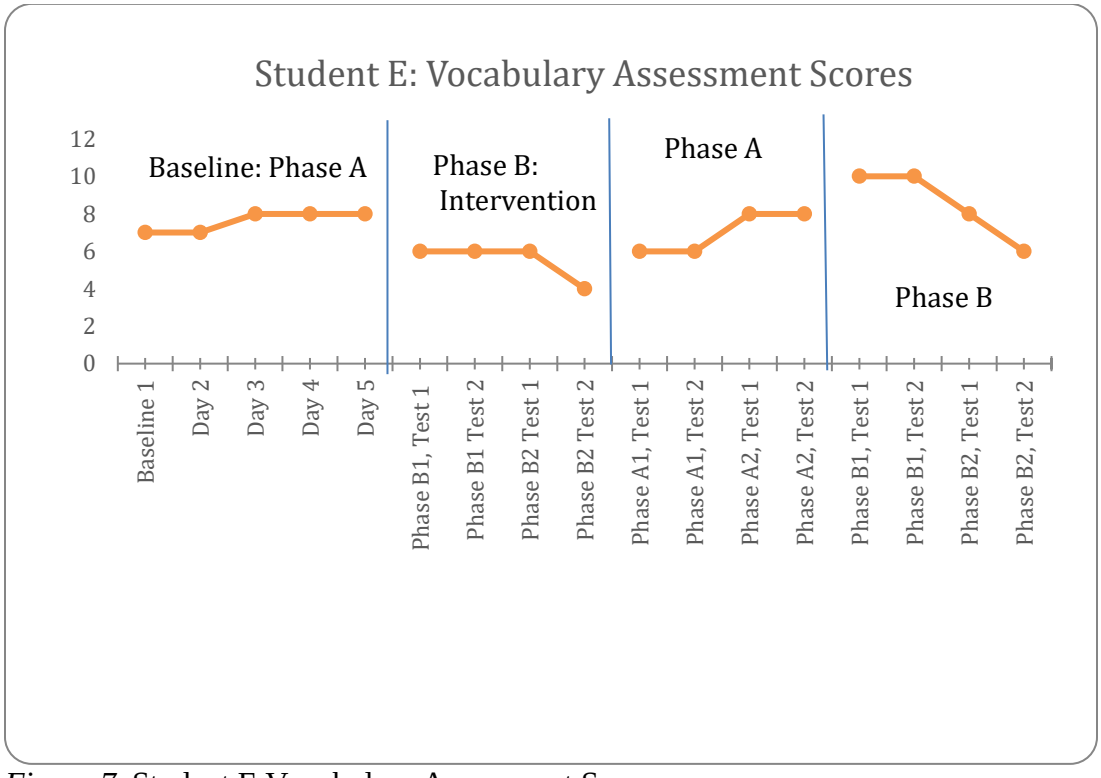


Figure 7. Student E Vocabulary Assessment Scores

Student F is a 15-year old, Hispanic female. She is eligible for special education services under the classification of specific learning disability. During the first baseline phase, Student F's mean score on his daily assessments was 18%. Student F's mean score increased during the first intervention phase to 45%. When the intervention was removed during the second baseline phase, Student F's mean score decreased to 35% and then increased again during the second intervention phase to 75%. Student F's daily data is shown in Figure 8.

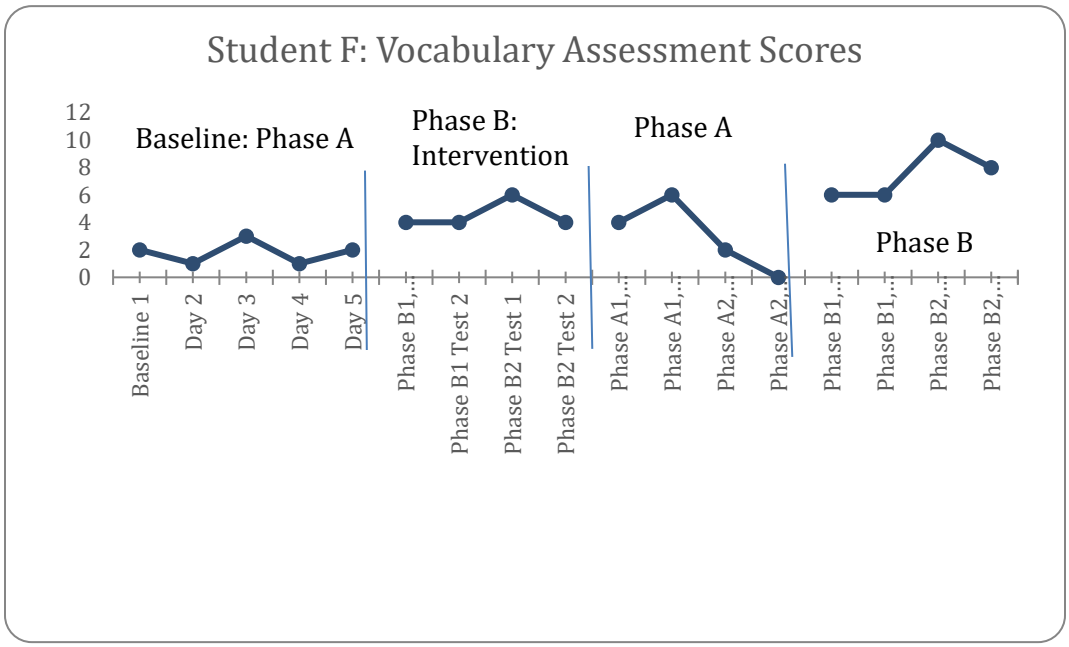


Figure 8. Student F Vocabulary Assessment Scores

Cumulative Assessment Scores

To answer research question 2, vocabulary retention was assessed through a cumulative vocabulary assessment. This assessment was graded on a 50 point scale with one point earned for every vocabulary word correctly matched to its definition. Scores were then converted into percentages. Results are outlined in Table 3.

Table 3

Cumulative Assessment Results: Percentages

	Total Score (%)	Baseline/Phase A Words	Phase B Words
Student A	88	83	95
Student B	78	73	85
Student C	54	43	70
Student D	76	73	80
Student E	28	6	60
Student F	14	6	25

Survey Results

To answer research question 3, all students completed a Likert scale satisfaction survey at the end of the study. Results were tallied and calculated into percentages. Table 4 represents the percent of students that responded in each category to each statement at the end of the study.

Table 4

Student Satisfaction Percentages (Likert Scale Results)

Statement	**5**	**4**	**3**	**2**	**1**
1. *I prefer using mnemonics to memorize vocabulary words.*	**14**	**29**	**0**	**29**	**29**
2. *It is easier to memorize vocabulary definitions when using mnemonics**.***	**43**	**14**	**29**	**14**	**0**
3. *I prefer teacher provided mnemonics over student created mnemonics.*	**29**	**14**	**29**	**29**	**0**
4. *I enjoyed using this memorization strategy.*	**0**	**57**	**14**	**29**	**0**
5. *I think I will use this Strategy in the future.*	**29**	**29**	**14**	**14**	**14**
6. *I think I will be able to easily create mnemonics to memorize new information**.***	**0**	**14**	**43**	**14**	**29**
7. *I believe I was able to remember more when using mnemonics**.***	**14**	**43**	**14**	**14**	**14**

Note. 5-Strongly Agree; 4-Agree; 3-Nuetral; 2-Disagree; 1-Strongly Disagree

Chapter 5

Discussion

The purpose of the present study was to investigate the effect of mnemonic devices on the acquisition and retention of social studies vocabulary by high school students with learning disabilities. In addition, the study investigated student satisfaction with using the mnemonic devices.

Findings

Three out of six students had overall improvements when comparing Phase A scores to Phase B scores. Student C showed a 20.5 point increase of mean scores when comparing Phase A (M= 42) to Phase B (M= 62.5). Student D showed a 1.5 point increase of mean scores when comparing Phase A (M= 71) with Phase B (M= 72.5). Student F showed a 33.5 point increase of mean scores when comparing Phase A (M= 26.5) to Phase B (M= 60). Students who showed a decrease of mean scores averaged a ten point decrease. When comparing the first three phases with the final intervention phase, all students showed improvement. Student A showed a 21 point increase when comparing the average of the first three phases (M= 79) to the final Phase B (M= 100). Student B showed a 7 point increase when comparing the average of the first three phases (M= 78) to the final Phase B (M=85). Student C showed a 24 point increase when comparing the average of the first three phases (M=46) to the final Phase B (M= 70). Student D showed a 18 point increase when comparing the average of the first three phases (Mean: 67) to the final Phase B (M=85). Student E showed an 18 point increase when comparing the average of the first three phases (M=67) to the final Phase B

(M=85). Student F showed a 42 point increase when comparing the average of the first three phases (M=33) to the final Phase B (M=75). These results corroborate prior research that also demonstrated increases in vocabulary acquisition after instruction using mnemonics (Mastropieri et all., 1985).

Four students showed a decline from the initial baseline phase and the first intervention stage. Student A showed a 46 point decrease in mean scores from Baseline (M= 96) to the first intervention stage (M= 50). Student B showed a 13 point decrease in mean scores from Baseline (M= 78) to the first intervention stage (M=65). Student D showed a 12 point decrease in mean score from Baseline (M=72) to the first intervention stage (M= 60). Student E showed a 21 point decrease in mean score from Baseline (M= 76) to the first intervention stage (M=55). These decreases could possibly be due to the novelty of the intervention. The students possibly had an overreliance on the intervention and did not adequately study to prepare for the end of the week assessments. It is possible as students became more comfortable with the intervention and aware of the level of practice required, their scores started to increase.

In terms of cumulative vocabulary assessment scores, all students showed a higher percentage of retention on words paired with mnemonic devices than words introduced through traditional methods. Student A demonstrated a 12 point difference between the cumulative assessment of Baseline words (83%) as compared to Phase B words (95%). Student B demonstrated a 12 point difference between the cumulative assessment of Baseline words (73%) and Phase B words (85%). Student C demonstrated a 27 point difference between the cumulative assessment of Baseline words (43%) as compared to Phase B words (70%). Student D demonstrated a 7 point difference between

the cumulative assessment of Baseline words (73%) and Phase B words (80%). Student E demonstrated a 54 point difference between the cumulative assessment of Baseline words (6%) as compared to Phase B words (60%). Student F demonstrated a 19 point difference between the cumulative assessment of Baseline words (6%) as compared to Phase B words (25%). These results corroborate prior research that also demonstrated increases in vocabulary retention by students using mnemonic strategies (Scruggs & Berkeley, 2010; Terrill et al., 2004). Furthermore, the increase in cumulative assessment percentages for Student D, who receives ESL services corroborates prior research that found mnemonic strategies as effective for vocabulary acquisition of English Language Learners (Raugh and Atkinson, 1975; Carlson, Kincaid, Lance, and Hodgson, 1976; Atay & Ozbulgan, 2007).

Student satisfaction as measured by the Likert survey showed varying levels. The highest rating percentages were in the areas of finding vocabulary easier to memorize using mnemonic devices and the overall enjoyment of using the devices. Forty-three percent of the students thought they could remember more when using mnemonic devices, however, 86% of students felt neutral or negative about their ability to create their own mnemonics to memorize new information. Within this study, students were not instructed in how to create their own mnemonics or asked to develop their own mnemonics, so this likely affected their confidence levels. It is recommended that future studies add a component in which students generate their own mnemonic devices. Of note, one student scored the entire Likert scale with "disagree." This may suggest the student found minimal success with the strategy, or this may suggest that this student did not actually consider the survey questions as it was anonymous and ungraded. Mixed

levels of social validity could be explained by the lack of thorough instruction on the use of mnemonic devices by the teacher.

Limitations

One limitation of this study was that the strategy was implemented by a teacher that was not the researcher. This may have had an impact on the fidelity of the implementation. Another limitation of this study was the timeframe in which it was implemented. Within the course of the study, the school had several days off for snow, and several days off for spring break. Student attendance may have had an impact on study results. If students were absent, they may not have received the same level of instruction on the vocabulary. Additionally, if a student was absent, the teacher was unable to find time to have them make-up the vocabulary assessment.

Implications and Recommendations

The results suggest that some students may benefit from the use of mnemonic strategies when memorizing vocabulary. Teachers may benefit from instruction on how to implement this strategy into their lessons and pair newly taught information with such mnemonics.

The present study corroborates findings from the literature (Scruggs & Berkeley, 2010; Terrill, Scruggs, & Mastropieri, 2004; Marshak, Mastropieri, & Scruggs, 2009; Mastropieri, Scruggs, Levin, Gaffney, & McLoone, 1985; Condus, Marshall, & Miller, 1986; Mastropieri, Scruggs, & Fulk, 1990). However, more research is needed. Long-term studies that include collection of maintenance data to assess whether vocabulary retention is maintained overtime is warranted. Additionally, long term studies to assess if

student retention improves as they become more familiar with using the strategy is warranted. Finally, research using larger groups of students, as well as groups that include students without disabilities, should be conducted.

Conclusions

The present study supports the use of mnemonic devices with students with learning disabilities and other health impairments. After using mnemonic devices, vocabulary scores improved over time. Additionally, the retention percentages of vocabulary paired with mnemonics were higher than for those words taught through traditional methods. Mnemonics seem to be an effective research-based strategy that can be used successfully in the classrooms with students with disabilities.

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