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How Mnemonic Devices and Songs Help Third and Fourth Graders Learn and Retain Information

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How Mnemonic Devices and Songs Help Third and Fourth Graders Learn and Retain Information

By

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# Table of Contents

Chapter One: Introduction .................................................. -1-
   Problem Statement .................................................. -1-
   Research Questions ................................................ -4-
   Purpose ............................................................... -4-
   Significance of the Study ........................................... -5-
   Definition of Terms ................................................ -5-
   Overview of Study .................................................. -9-
   Summary of the Study ................................................ -9-

Chapter Two: Literature Review ........................................... -11-
   Introduction .......................................................... -11-
   Mnemonic Instruction .............................................. -12-
   Types of Mnemonics ................................................ -13-
   History of Mnemonics ............................................. -17-
   Current Research and Limitations ............................... -19-

Chapter Three: Methods and Procedures ................................. -23-
   Assumptions ......................................................... -24-
   Participants .......................................................... -25-
   Data Collection ..................................................... -26-
   Procedures ........................................................... -27-
   Procedures: Learning the Events around the Revolutionary War... -28-
   Procedures: Learning the Order of the Planets .................. -32-
   Data Analysis ........................................................ -34-
   Limitations of the Study ......................................... -34-

Chapter Four: Results of the Study ...................................... -37-
   Fourth Grade ......................................................... -37-
   Group One .............................................................. -38-
      Results of First Test ............................................ -39-
      Results of Second Test ....................................... -40-
   Group Two ............................................................... -40-
      Results of First Test ............................................ -40-
      Results of Second Test ....................................... -41-
   Group Three ............................................................ -42-
      Results of First Test ............................................ -42-
      Results of Second Test ....................................... -43-
Chapter One: Introduction

Problem Statement

Much of the information students are required to learn in school consists of isolated facts and discrete bits of specific information and involves a process of comprehension and memorization. Students go through each day bombarded with test procedures, high standards, and a feeling of stress and pressure to learn everything as quickly as possible so the curriculum can all be learned before the year ends. Unfortunately, most students do not learn the best by flipping flash cards, or rote memorization. I have seen teachers who understand this view and try to teach their students some facts and information using visual representations and other aids that are more appealing to students. However, I have also talked to teachers who feel there isn’t enough time in a day for a lot of the curriculum to be taught this way. And as a result, the teachers find themselves rushing through curriculum to leave room for test prep activities.

I believe students need to learn strategies that work within their style of learning, and then use those whenever possible to create and reinforce the links of information within their brains. When students are able to do this successfully, they will be able to retain important information that will most likely be needed on future tests.
As I was researching this topic, I remembered that I had used a specific strategy to help myself and others remember vocabulary, but I never realized that I was using a mnemonic device. For example,

my brother and I were sitting on our couch one Sunday night. He was trying to memorize twenty vocabulary words for the test the next morning. One word he came to, *incognito*, kept giving him trouble, and no matter how many times he looked at that word, he couldn’t remember the meaning. I decided to try something funny, so I said, “*Incognito*, sounds like *burrito*. Maybe if you think of a man dressed as a burrito, you will remember that *incognito* means to ‘be disguised’.”

Well, he laughed and thought I was crazy. Of course, he came home from school the next day and knew what *incognito* meant. Now, a few years later, every time we see that word we have this conversation all over again. As for the other words on that test? They are long gone out of our memory.

As I think about this example and try to understand what is really important in our schools, I believe it to be that my brother got the answer correct. It didn’t matter how, or why, or any other reasoning except that he passed the English test and moved on to the next one. Scruggs and Mastropieri (1998) commented that while it is essential for students to retain factual information to succeed in school, many students, such as students
with learning disabilities, have difficulties remembering academic content. I believe that this is where mnemonic instruction can be useful for students learning new information.

Mnemonic instruction is one way that teachers can help students learn to cue their brains to recall specific facts and other information. This instruction includes multiple strategies such as rhyming, visual representations and placement, songs, poems, and anything that personally relates to a student and his or her personal life. These strategies could be effective for students struggling to remember information taught in school. If effective, students can also transfer this ability into extra-curricular activities and home situations (writing lists, remembering to do homework and chores, etc.).

Without a way for students to connect academic content to their personal lives and experiences, it can be difficult for students to perform well on school tests. As Mastropieri and Scruggs (1989) suggest, “Over and over again, they [mnemonic devices] have been proven to be extremely effective in helping people remember things” (p.14). Though mnemonic devices can help cue the brain to recall facts, it is essentially a device or a supplement to learning that information, not a teaching method on its own.
Research Questions

A series of three questions guided the study:

1. How does using a mnemonic help students learn information faster than students who do not use one?

2. Can all students use a general mnemonic or does the mnemonic need to be personalized based on the student's backgrounds?

3. Do students still use mnemonics they have learned prior to this study to recall facts after the information is learned and part of the long-term memory?

As my research developed, I focused on the above questions with the goal of finding mnemonics that help students retrieve information quickly and accurately.

Purpose

The purpose of this study was to determine if a mnemonic device would help students in third and fourth grade recall information for an upcoming test. My goal was to create a way to enhance the students' memory for the test and possibly for the rest of their learning careers. I wanted the students to know that there are many ways that can help them remember and recall specific information, especially when so much is being
thrown at them at once. I also wanted the students to become motivated enough to try to implement these devices into other content areas and relieve some of the stress that they feel when burdened by their heavy work load.

**Significance of the Study**

With all of the new curriculum and guidelines for New York state teachers to teach and follow, it is becoming increasingly difficult for students to retain the vast amount of information that teachers are trying to pack into their brains. Often, students learn information for a specific test, but then never completely understand it well enough for it to become part of their long-term memory. I believe that if students take the time to learn and then use techniques to help them retain information, they brains will be able to recall information faster and easier in the future. If students can learn how to use mnemonics to their advantage perhaps some of the pressure of learning and recalling factual information might be lessened.

**Definition of Terms**

**Mnemonic Device**- a device, procedure, or operation that is used to improve memory. They are tools anyone can use to cue the brain to remember
important facts. Mnemonic devices are not used for comprehension, rather for facts and making lists of events that are relevant to an individual’s life.

**Methods for Using Mnemonics** - keywords, pegwords, acronyms, loci methods, spelling mnemonics, number-sound mnemonics, and letter strategies. These methods can be used to generate powerful mnemonic systems. Once learned, they can be applied to any fact in any field. Background knowledge must be used when choosing a mnemonic to recall an event; otherwise the mnemonic will not be helpful.

**Keyword Strategy** - this strategy is based on linking new information to keywords that are already encoded to memory. An example of this would be what I shared earlier with the word, *incognito*. Visualizing a man dressed as a burrito and knowing the word “disguised” helped my brother and I recall the definition.

**Pegword Strategy** - this strategy uses rhyming words to represent numbers or order. The rhyming words, or “peg words” visualized with an image will trigger the events in order. For example, “one” can be remembered by the word, “bun”, “two” with “shoe”, “three” with “tree”, and so on. To
remember that an event was first, a picture would be created with a hamburger “bun” to remember the order. The next item would have a shoe in the representation, and so on. This strategy works great with historical facts that have a specific order.

**Acronyms**- this strategy is mostly used to represent an order or sequence, they are helpful when a set of responses are required. For example, HOMES, (to retrieve the names of the Great Lakes). Acronyms can be re-ordered to make an acrostic, such as *Every Good Boy Deserves Fudge*, which will help a person retrieve the names of the notes on the treble clef.

**Loci Methods**- the strategy of using placement as a way to visualize the information that needs to be retrieved. One way to use this method is to look at something significant and visualizing what needs to be recalled later. When a person looks at the object again, his or her brain should retrieve the information that was visualized earlier.

**Spelling Mnemonics**- the strategy used to recall the correct way to spell words. Sentences can be made up that help students retrieve the spelling of
the word. An example to help a student spell the word “friend” could be “If you fri (fry) your friend, then your friendship will come to an end.”

**Number-Sound Mnemonics**- this mnemonic helps individuals recall long strings of numbers, such as telephone numbers, locker combinations, and so on.

**Letter Strategy**- this strategy involves using acrostics and acronyms. This strategy helps students remember long lists of information. For example the list of the planets: **My Very Educated Mother Just Served Us Nachos**.

There are many different ways to remember information, as well as many books and Internet sites to help people keep their memory skills strong and active. As I researched this topic, I found that the strategies listed above kept coming to my attention again and again. While there are more strategies available, I narrowed my search to what was relevant to the content to what the students I was working with were learning about as well as including more that show the history and limitations of using mnemonics.
Overview of Study

Following Institutional Review Board (IRB) approval and discussing my questions and reasoning with the principal of the school and my literacy professors, I challenged myself to get into the minds of several third and fourth grade students to see if developing a mnemonic device would be appropriate, supportive, and well worth the time and effort spent on this study.

The study lasted for three weeks. During that time, I worked with small groups of third and fourth graders and created picture cards to help enhance the students’ memory of facts related to the Revolutionary War and the order of the planets. Throughout the three weeks, I also wrote daily field notes and collected observations of the students.

At the end of the third week, I asked the students whether or not this process helped them remember the information better and if they thought it was worth their time learning the mnemonic devices.

Summary of the Study

This research was my attempt to make learning information easier and more stimulating for my students. It was meant to help the students explore mnemonic strategies as a way to store factual content in their brains for a
longer period of time. I also wanted to give students more knowledge in finding how their brain works, and give them a chance to remember more facts and information that could possibly be recalled in a decade or two. I believe that if teachers help students learn how their brains store information, they might use mnemonic techniques throughout their lifetime.
Chapter Two: Literature Review

Introduction

Mnemonic instruction is important to consider when teaching students new concepts with new vocabulary that they are expected to remember. This literature review contains research of specific types of mnemonics, its history, and the current research and limitations that has taken place over the last twenty years. Although multiple mnemonic strategies were listed in chapter one, only some will be discussed in the literature review. The strategies that I used in my study will be explained more in depth as well as their limitations and the current research.

As Scruggs and Mastropieri (1998) suggest, "Although many changes in schooling have taken place in recent years, memory for academic content remains an extremely important part of the school learning experience" (p.10). Mnemonic instruction links new information to prior knowledge through the use of visual and/or acoustic cues (The Access Center, 2007). Mnemonic instruction uses many different strategies that are designed to improve students' memory of new information. The keywords, pegwords, and letter strategies work with different combinations and thought processes, but all of them can be used to trigger facts and information. These different strategies can be found under multiple names, such as imagination,
association, and location (2007, www.pickbrains.com), but they all play a significant part in recalling and retrieving new information.

**Mnemonic Instruction**

Kenneth Higbee wrote that a “mnemonic system or technique is a system which aids to memory, and mnemonics refers more specifically to rather unusual, artificial memory techniques” (1979, p.611). While Scruggs and Mastropieri agree, they also state that while a mnemonic is a “device, procedure, or operation that is used to improve memory,” and they suggest that “virtually any instructional practice could be defined as ‘mnemonic’” (1990, p. 271). Teachers and parents who are working with their children to teach new vocabulary and ideas are aiding to their long-term memory.

Mnemonic instruction that uses intervention techniques, such as those used for students with learning disabilities, and target memory retrieval has proven beneficial for students, according to Scruggs and Mastropieri.

Mnemonic instruction works with individuals to tie new information “more closely to the learners’ existing knowledge base and, therefore, facilitate retrieval” (Scruggs and Mastropieri, 1979, p. 272). Depending on what the learner is expected to recall, a mnemonic can be used to aid the retrieval of the subject matter. Some different types of mnemonics are
described in the next section, as well as examples of how they can best be used.

Types of Mnemonics

The keyword strategy is a method that could be used to learn the names of the states, state capitals, presidents, or any vocabulary word or terminology that is confusing to learn or difficult to remember.

Levin gives an example which creates an “interactive relationship between the keyword and the definition” (1993, p. 238). Using the word accolades Levin suggested the sentence, “The people raised their glasses of Kool Aid in honor of the distinguished guest.” He then describes the use of a picture showing the event of raising the glasses. Kool Aid is the keyword that helps learners understand that accolades means “praise for something done well” (p. 237). This is the same strategy I used when I taught my brother the definition of incognito. The visual picture of a man disguised as a burrito helped him recall the definition. Levin also makes sure to highlight once again that, “mnemonic materials [are] specially designed for factual content” (p. 237). The keyword strategy can be used in other ways, but the outcome always suggests the retrieval of the facts.

Another way to use this strategy would be to memorize songs. The poem, Thirty Days Hath September (Scherr, 1944) has been repeated and used
to recall the number of days in a month since the 1600's. I have learned songs in elementary school that list the 50 states in alphabetical order. Without this mnemonic, I would not be able to recall them. Songs and poems can also be written to known tunes, and then help a student master a topic (i.e., the order of the presidents). Listing information without the aid of a mnemonic could be a chore, but learning words to a favorite song is a breeze and sometimes more enjoyable and relaxing for the brain.

The pegword strategy is another way to link information together. This method is best used when numbered or ordered information needs to be remembered. It can also be combined with the keyword strategy to create another way to remember vocabulary in a specific order, or to link "unfamiliar names with numbers" (Scruggs and Mastropieri, 1990, p. 273). According to Scruggs, Mastropieri, Levin, and Gaffney (1985), "research has shown that elaborate strategies such as this are very effective, and that color, appropriately encoded, can also be easily remembered" (p. 273).

This strategy uses a number system and rhyming words that are connected by visuals and order. For example, one is *bun*, two is *shoe*, three is *tree*, four is *door*, five is *hive*, six is *sticks*, seven is *heaven*, eight is *gate*, nine is *vine*, and ten is *hen*. Scruggs and Mastropieri (1990) suggest the following example to show how this strategy can be used:
To teach that the hardness level of the mineral *hornblende* is *five*, students can be shown a picture of a *horn* (keyword for hornblende) with a *hive* (pegword for five) in it. Therefore, when asked for the hardness level of hornblende, learners can think of the keyword, *horn*, think of the picture with the horn in it, remember that a hive was in the horn, and retrieve the number equivalent for the pegword *hive, five*. (p. 273)

To use the pegword strategy for higher values past ten, the pictures can be altered and used however the learner sees fit. For example, "fifty = 'gifty,' i.e. gift-wrapped, 6 = sticks, therefore, fifty-six = 'gifty sticks'" (p. 274). As long as the pictures that are being visualized are memorable for the learner, the mnemonic can be effective for the retrieval of sequenced information.

The letter strategy is another method that can help the brain recall lists of things. This method is the one that most students are familiar with. Using acronyms is helpful with memorization of anything, and can be easily created for an individual topic. HOMES can be used to remember the Great Lakes (Huron, Ontario, Michigan, Erie, and Superior), but in this example students need to know the names individually before being able to use the letter
Scruggs and Mastropieri (1990) observed the following while working with acronyms:

For acronyms to work well, the response information should be sufficiently familiar so that retrieval can be easily accomplished by provision of the first letter. That is, students must be familiar enough with Superior that they can retrieve the name, given only the first letter. Additionally, acronyms work best when they are effectively elaborated with the stimulus information [such as a picture of the Great Lakes] to prompt learners to retrieve the acronym when asked. (p. 274)

Another form of the letter strategy includes acrostic poems. The order of the planets My Very Educated Mother Just Served Us Nachos is one that I used in my research for the third grade class studying the planets. It is helpful to remember that students need to know each planet to recall using this strategy. They also need to know that Mercury is the planet closest to the sun, and that Mars is the second ‘m’ in the poem. This follows the research of Scruggs and Mastropieri, which indicates that students need to know enough
about a subject area and the vocabulary, as well as comprehend the information in a way that ensures the correct use of the mnemonic to aid their retrieval skills.

History of Mnemonics

Mnemonics have been around for aiding memory since 500 B.C. (Higbee, 1979). Scruggs and Mastropieri (1990) write that mnemonics have been used for thousands of years, and that the Greeks developed systems for remembering stories and lectures. There were no formal writing materials for the Greeks to use, so word of mouth became the way to pass down information between generations. Scruggs and Mastropieri suggest that the Greeks used a loci system, and visualized images (such as a person on the steps of a temple) so they could retrieve important events easily and share their stories with others. This example, according to Scruggs and Mastropieri, “underlines an essential feature of learning: the realization that, to be useful, information must be both comprehended and remembered” (1990, p.272).

Yates (1966) continued with the history and use of mnemonics and explained that these techniques from the Greeks showed up in the Middle Ages, and sometimes were connected with mysticism and the occult. Other research by Yates explained that after the printing press was created and
formal writing became well-known, the use of loci and other mnemonics became less popular.

In the 1970's the use of the pegword strategy came about, associating numbers with things. Mnemonic strategies, such as the pegword and the loci strategies, were described as "useful" and were legitimate "for psychological study" (Bower, 1970).

The keyword strategy can be traced to 1975, when Atkinson used it to teach Russian vocabulary. Through this experimental study, the strategy expanded to use in schools, especially for supporting students with learning disabilities in the 1980's and beyond (Atkinson, 1975).

In 1979, Higbee observed that "even though mnemonic techniques and systems have been in use for more than 2,000 years, virtually all of the experimental research on mnemonics has been conducted in the last 15 years" (p.612). That said, mnemonics have been researched and used for over 40 years.

The poem, *Thirty Days Hath September* (Scherr, 1944) has been repeated and said since the 1600's. Other memorable mnemonics that have been around and used in schools include the order of planets, the letters of the alphabet, and nursery rhymes. Scherr listed these mnemonics, as well as another popular mnemonic that was used during the study of the American
Revolution. An acrostic was made using the word, *Liberty*, each letter stood for a year and an event of the war.

1775- Lexington (battle)
1776- Independence (declaration)
1777- Burgoyne (surrenders)
1778- Evacuation (Philadelphia)
1779- Richard (Bonhomme)
1780- Treason (Benedict Arnold)
1781- Yorktown (battle and treaty) (p. 229)

Scherr (1944) believed that teachers should, “be prepared to help pupils with a simple memory device whenever they require one” (p. 229). He also quotes Frances Gulick Jewett, a psychologist, saying “Make sensible bridges when you can, but even a foolish bridge is better than a chasm” (p. 229).

**Current Research and Limitations**

As stated earlier, mnemonics have been around for thousands of years, but research on its effect with memory retrieval has only been around for the last thirty years. Brown and Deffenbacher (as cited in Higbee, 1979) suggested that most research before this time was spent on observable
behaviors, and not on memory recall and inner thought-processes. As cognitive processes became an area of interest late in the 1960's, mnemonics played an important role in research and inquiry. Bower (1973) agreed and also stated that even though mnemonics were easy to laugh about and "poke fun at," he added that "there is nothing like success to reinforce someone in a new method of learning" (Higbee, 1979, p. 613).

Many other scientists and psychologists have studies the effects of using mnemonic techniques and strategies, and most of the research has documented and concluded that mnemonic instruction and mnemonic strategies help students recall information easier and quicker than students who do not use mnemonic devices for the same material. As Ecroyd (2007) reminds us, mnemonics devices should not be used to memorize concepts because they are designed to "sidestep the deep meaning of a given material" (www.pickbrains.com, 2007).

Although much of the research on mnemonic techniques was positive and full of investigations including different types of strategies, mnemonic strategies are not the only way that students can improve memory skills. Many other methods can be used to help recalling facts that are otherwise difficult to remember. Some of these methods include: increasing attention in your classroom by using pictures and visuals, minimizing interference and
distractions, and promoting active manipulation (Scruggs, 1993). However, using these methods does not necessarily help students recall vocabulary words, which is the area where mnemonic devices can be used.

Slavin (2002) wrote that while mnemonic strategies can be “directly useful to teachers” it is “difficult to imagine that teaching and learning will make broad advances because teachers make occasional use of one or another mnemonic device” (p. 16). He explains that mnemonics can help improve memory of a specific event or vocabulary word, but these [experiments] “are suggestions about how to guide daily teaching problems, not guides to the larger questions educators and policymakers must answer” (p. 16). Slavin was interested in increasing experimental observations and hands-on activities in classrooms, and spend less time on mnemonic development and vocabulary memorization.

Another study by Scruggs and Mastropieri (1990) showed that students can learn mnemonic strategies if given to them for a specific content area, but they have great difficulty generalizing the strategy to independently create a mnemonic for their own use. They also discovered that when “students developed and employed the strategies successfully, they moved through the content about one third as fast as when teachers provided the strategies. (p. 278). They suggest teachers use a specific type of mnemonic
consistently over the year, then students will become more aware of its effectiveness and will “gain sufficient experimental background to begin using them independently” (278).

The limitations for this study generally show that students need a lot of support when learning mnemonic strategies for specific content areas, but I believe that this support should be available to them anyway, because the purpose of learning a mnemonic is to recall and retrieve new information not yet stored in long-term memory.
Chapter Three: Methods and Procedures

After much research on other topics I thought I wanted to explore, I found that mnemonic devices were following me wherever I turned. I changed my research question multiple times so I would be able to explore what was really intriguing me. I wanted to help those students who had limited ability to retrieve facts and retain general information. In this chapter, I outline the tasks I completed as well as describe the students who took part in my study.

During the study, I was interning as a literacy specialist in an elementary school in western New York to complete credit for my Master’s Degree in Childhood Education. Although the data for this project was not collected until February of 2007, I had been involved in the two classrooms since the beginning of the 2006-2007 school year. The students in both classes, one third grade and one fourth grade, were familiar with me taking part in their daily writing routines and activities. The data was collected during the three weeks was analyzed on a daily basis and helped me understand how the students collected and recalled information.
Assumptions

From the start of my research in the third grade classroom, I assumed that the students had not learned any mnemonic device to remember the order of the planets. Even though I had many discussions with the teacher prior to beginning this research, I didn’t find out about the planet song until I was introducing the mnemonic. The teacher wasn’t familiar with the word mnemonic and when I explained it to her I didn’t add that mnemonics can be songs, too. I wasn’t prepared for the students to already know and be able to recall the planets in order. In fact, they knew them so well that they ended up testing my knowledge.

Another assumption I made during this research was that all of the students would want to take part in the study every day. I had a fourth grade student decide on the second day that she did not want to participate. She ended up joining back up with the group the next day, but missing the previous day did impact the outcome of her retrieval skills with the mnemonic I taught. A different student was sick for two days during the first week, and when she attempted to join back into the original group, I found that it was difficult for her to catch on to the last few mnemonics.
Participants

The school district where I interned is compromised of five elementary schools, two middle schools, a ninth grade academy, and one high school which includes an alternative education program. The district is situated in western New York, a short drive south of Lake Ontario. The northern portion of the district is primarily commercial, while the southern portion is rural residential with an agricultural base (school website, 2007). The district serves nearly 6,000 students; almost 500 of them attend the school where I conducted my research.

Each classroom has approximately a 14:1 ratio, where teacher aides and literacy specialists are involved daily in the classroom routines. More than eighty percent of the district is made up of Caucasian students; other students' backgrounds include African American, American Indian, and Asian students. Most of the families in this school district are in the middle to upper middle class end of the socioeconomic spectrum. In the fourth grade class, two students were African American, two students were Asian, one student was American Indian, and six students were Caucasian. In the third grade class, three students were Caucasian and two students were African American.

The students in both classes were asked if they wanted to participate in
my research (27 total students). I sent letters home to parents to explain my research as well as a consent form to return to me if their child could participate in the study. (See Appendix A and B). A little more than half of the students from each class returned their parents’ consent letters, so I was limited on the number of students who could participate in the study. I had a total of sixteen students to work with during this study. Five students in the third grade, three boys and two girls, were learning about the planets. Eleven students in the fourth grade class, four boys and seven girls, were learning about the events leading to the Revolutionary War.

Confidentiality was very important; I wanted to make sure the students were not identified outside of the classroom. All student names were deleted from written documents and no names were included on papers that were returned to me. Students are identified by gender, with no reference to their classroom or school where they attend. All of the data I collected will be destroyed one year after the completion of the study.

Data Collection

Throughout the study, I collected data in a variety of ways: daily observations and written notes while working with students in the small groups. I also discussed the information I collected with the classroom
teachers weekly and sometimes daily. Most meetings were short and spoken; some written notes were taken during the last meeting after data collection was completed.

I tape recorded my conversations with the fourth grader students who were learning the mnemonics for the order of events leading up to the Revolutionary War. I listened to these tapes daily to see which students were retaining the information and who needed extra support. Toward the end of the data collection process, I asked the students to give me a written response, letting me know if they found the mnemonic useful, and if they would like to use these memory strategies in the future. These various strategies of data collection were necessary in helping me discover the power of learning mnemonics and using mnemonic instruction.

Procedures

I spent approximately 45 minutes in the two classrooms daily, working with individual children on classroom activities or doing guided reading with them. In one fourth grade classroom I worked with three different groups of 3-4 students, in the third grade classroom I worked with one group during guided reading. They were reading at grade level or a little below grade level.
Before introducing mnemonics into these classrooms, I discussed my questions with the classroom teachers. I asked them which mnemonic they thought their students would learn best, and what topics they would be exploring so I could parallel my research with daily standards and activities. One teacher did not know what I meant when I first told her that I was researching mnemonics. When I started rattling off a few of the well known chants, such as HOMES and the order of the planets, she understood exactly what I was talking about. I have found this to be consistent with other individuals as well. The word, 'mnemonic', is sometimes not familiar, but the chants and poems and acrostics are. After each week of data collection, I discussed my findings with the classroom teachers and asked them if they saw any change in their students' attention during that content block. I was curious to see if learning the mnemonic was helping the students discover other ways to use their knowledge.

Procedures: Learning the Events around the Revolutionary War

The pictures I used for the fourth grade students learning about the war can be found in Appendices C-F. I took the following steps in the fourth grade classroom.
1. The students were introduced to the topic of the Revolutionary War by their classroom teacher. Each student was placed in a guided reading group where he or she was reading a historical fiction chapter book; the setting of each story was around the time of the war. After they had been introduced to eight specific events, they where told by their teacher that they were going to be tested on the order of when the events took place. She wanted to give them a timeline and have them fill in the events.

2. While one group of students were in guided reading with their classroom teacher, I would take 3-4 students into another corner of the room to teach them the mnemonic. On the first day, I asked them if they wanted to learn a fun way to remember these events and to trigger their brain to cue the information during the test. The first day I went over all eight events in order and had a short conversation with all three groups about what happened around that time.

3. With the research I had conducted previously with this topic, I decided to use the pegword strategy to remember the events. Throughout my research I discovered that this strategy works best with historical events, as well as memorizing order. The second day, I showed the students the first three events: the Stamp Act, the Boston Tea Party,
and Paul Revere’s ride. I enlarged pictures of each one and talked briefly about them. I explained the pegword mnemonic and gave the students approximately two minutes to look at each picture. I then walked through each picture, talking aloud about what I was thinking in my brain to cue the picture and the order. We practiced this together with the first three pictures.

4. The third day I asked the students to recall the first three events as I said the cue word to help them retrieve the information. The students enjoyed this and caught on fast. I added two more pictures to the list: The Declaration of Independence and the Articles of Confederation. The students had a couple minutes to look at the two pictures, and then I turned all five pictures over and had each of them recall what they could.

5. Students were shown the same five out of eight events the next day. I decided to see if the students could add their own ideas to my research, so I had them come up with the pictures for the last three events: the British recognizing U.S. independence, the signing of the Constitution, and George Washington being elected president. The students talked about what they could use as a picture (keyword) to help them remember the cue word (or pegword). Each group picked
one together for each event, and then we went through all of the events in order.

6. On the Friday of the first week, I showed each group their own set of pictures, including the new ones they made for the last three events. We practiced turning them over and saying the keywords and the pegwords aloud, so everyone had a chance to repeat it orally as well as hear it repeated by their classmates.

7. On Monday of the second week, I went through all of the pictures again, having the students tell me the events as the cue cards were being viewed. Each student had a chance to listen and say the events.

8. That Friday, I gave the students a pretest that showed all of the pictures of the events, but not the order. Each group took a turn sitting with me in the corner of the room, writing in the numbers of the events. I then asked them to turn their paper over and write down how they thought they remembered the order of events. I asked them if they used the mnemonic, and if not, how they thought they recalled the events?

9. The following Friday (three weeks after the first time I introduced the mnemonic device) I gave the students the same test to see if their knowledge of the events was still in their memory. I also had them
write on the back of their papers a comment on how they remembered
the order of events.

Procedures: Learning the Order of the Planets

This classroom was divided into their guided reading groups during
this time. I worked with a group of five students. They were in the middle of
a planet unit, where each student was learning about one specific planet and
sharing the information with the rest of the class. Some students had the
same planet assigned to them, but they needed to find information on their
own. They were using a planet Web site and nonfiction books to find their
information. The teacher had a specific book for them to read during guided
reading. I decided to introduce the mnemonic on the final day with that book
as a closure to help the students remember the order of the planets.

I took the following steps in the third grade classroom.

1. On Monday, we read the first page of the book. It was all about the
planet, Mercury: each day after that we talked about a different planet.
The book listed the planets in order, from Mercury to Neptune. Pluto
was not included in this book, even though the students knew about it
and talked about it at the end of the book. It took two weeks to read
the book (one page every day) and on the Thursday of the second week we discussed Pluto and stated the planets in order.

2. On the last day of reading the book and discussing the facts, I introduced the mnemonic, *My Very Educated Mother Just Served Us Nachos* and showed the students how the words matched up with the planets' names, and that they would be able to then list the planets in order by remembering the mnemonic. The next step did not go how I had originally planned. Instead of continuing this mnemonic, the students informed me that they knew the planet order from a song that the teacher had been playing every day when it was time to get ready for lunch. Then, as if it were planned, they started to sing the song together (and had to be quieted down because the teacher was reading with another group). They, in turn, taught me a mnemonic as well. What is interesting to me, though, is that because I already knew the order of the planets with my mnemonic, I didn’t remember the song or use that to cue my brain. It could have been because I only heard the song when they were singing it, and I might be able to learn it if I heard the song multiple times. Likewise, I would assume that this is the action the students took when I was teaching them my method for recalling the planets.
Data Analysis

After collecting the data, I was able to listen to each student who I recorded and have a clearer understanding of his or her individual learning styles. Reading and rereading my written notes helped me begin to see patterns and then determine who the mnemonic worked best for, and what other mnemonics would be better for students who still had some trouble with retrieving the information. Daily discussions with both classroom teachers allowed me to understand individual teaching styles, as well as goals and methods they carried out during activities.

Limitations of the Study

There were several factors that limited this study. One factor was that I did not fully understand each student’s learning abilities. At the end of the study, I found that one student actually tried using a different mnemonic strategy than the one I was teaching her, though I don’t think she realized she was doing that. I feel that if I knew more about the students, or if I was their classroom teacher, they would have benefited more from this study.

This limitation also includes finding out more of what the teacher does in the classroom while I was not there. The students in the third grade classroom were already learning the planets order through the use of a song, I
just didn’t realize it. The full effects of the study were changed in this aspect, because they already learned one mnemonic and their brains were ‘shut down’ from learning another one.

The number of students that could participate in the study was also a limitation. There were several other students that could have benefited from learning the mnemonic strategy for the Revolutionary War but they did not return their signed permission slips.

Another limitation I encountered was during the first week in the fourth grade classroom. Two students were absent from the group that week. One was sick and not in school, and the other student did not feel like participating that day. Both continued to participate after that day, but they had a hard time recalling all of the events because they learned the last five in one sitting. I also had one other student absent the last day of the final week. Because of this, I do not have conclusive data on whether or not he could recall the events in order after two weeks.

Time was also a limitation in this study. The fourth grade classroom teacher had some other activities planned that took portions of the group away from my study over the weeks that I was in there. The research was completed during a break in the schedule where the teacher was able to work with individual students and didn’t need the whole group’s attention. Time
was also an enormous limitation in another way. Originally my thought process led me to believe that learning and using mnemonics take a long time to remember and use correctly. It would be interesting to see if these students recall this strategy when tested on the Revolutionary War at the end of the year, or years down the road.

The only way to get the full effect of the research is to see the students in a couple years, or ten years, and so on. Other classmates my age remember some mnemonic devices that were taught to them in elementary school. For the moment, it is impossible for me to test these students for a duration longer than the school year allows, and those last weeks in the classrooms were all I had to complete my research. In a few years, when those students are asked to remember the content surrounding the mnemonic, it will be apparent to them whether or not the mnemonic was effective.
Chapter Four: Results of the Study

The purpose of this research was to determine how effective mnemonic devices were at helping third and fourth grade students retrieve and recall information about specific content. This chapter is divided into each grade level's results, subsections that show each group within the classroom and the result of each student, and a summary of the findings from each grade level.

Fourth Grade

The students' goals were to recall the order of events that occurred around the Revolutionary War. What is critical to understand is that the students did not need to know the dates of the events, only the order. The information the students needed to recall and put on a timeline for their teacher included:

- The Stamp Act in 1765
- The Boston Tea Party in 1773
- Paul Revere's Ride in 1775
- The Declaration of Independence in 1776
- The Articles of Confederation in 1781
- The British Recognize U.S. Independence in 1782
The United States Constitution in 1788

George Washington Elected President in 1789

The events were taught to the students by their classroom teacher during their normal social studies hour. After the week of learning about the material (and also reading a historical fiction book based around the war) the students started to learn the pegword mnemonic with me. Below are the results of my test on how they recalled the events in each group, as well as each child individually.

Group One

This group consisted of three students, two boys and one girl. During the study, I explained how the mnemonic worked, and gave the students pictures of five out of the eight events. I then had the students come up with the pictures for the last three events. I wanted to see if they would recall these events as quickly as the others that I already had made up. Their group's cards were as follows: One is bun, Two is Shoe, Three is Tree, Four is Door, Five is Hive, Six is Sticks, Seven is Heaven, and Eight is Plate. The last three were the visuals that they decided on and I developed these pictures for the next group meeting. Please see Appendix D for the pictures.
After two weeks of looking at the cards and memorizing the order, I gave the students a test (See Appendix G) to see if they could remember the order.

Results of First Test

Student 1: Recalled six out of eight events correctly. Number 5 and number 7 were reversed.*

Student 2: Recalled all events correctly.

Student 3: Recalled six out of eight events correctly. Also reversed numbers 5 and 7.*

*These students were not sitting next to each other, so it surprised me that they mixed those two numbers. Also, one picture (5) was provided from me and the other (7) was created by them.

The results helped me understand whether or not the mnemonic made sense to them. I feel that this group understood the background information of the Revolutionary War, but perhaps did not have enough background knowledge to recall the specific mnemonic that I provided. The following Friday, I gave these students the same test, and had them fill in the blanks to see if they could recall the mnemonic and order. I also had them write on the back of their paper how they think they remembered their answers.
Results of Second Test

Student 1: Recalled all eight events in order correctly. The student wrote, "I remembered all of them because the pictures we did helped me remember. Like one bun is the Stamp Act because on the picture of the bun it had a stamp on it. So that's how I remembered them."

Student 2: Recalled all eight events in order correctly. The student wrote, "I remembered by thinking of the pictures."

Student 3: Recalled all eight events in order correctly. The student wrote, "How I remembered it was I know some of it and then I guessed."

Later that day the classroom teachers gave the students the timeline to fill in with the events. All students in Group One filled in the eight events correctly.

Group Two

Group Two consisted of two girls and two boys. For this group's last three pictures they decided to use: Six is Tricks, Seven is Heaven, and Eight is Gate. (See Appendix E)

Results of First Test

Student 1: Recalled all eight events in order correctly.
Student 2: Recalled all eight events in order correctly.

Student 3: Recalled all eight events in order correctly.

Student 4: Recalled all eight events in order correctly.

The following Friday I gave these students the same test, and had them fill in the blanks to see if they could recall the mnemonic and order. I also had them write on the back of their paper how they think they remembered their answers. Student 4 was absent that day, so his data was not available for me to evaluate.

Result of Second Test

Student 1: Recalled all eight events in order correctly. The student wrote, "By looking at the picture and thinking of the pictures of them." The student also showed on the back of his paper, which picture would have the bun on it, which one had a shoe in it, and so on.

Student 2: Recalled all eight events in order correctly. The student wrote, "I remembered the pictures."

Student 3: Data was not available.

Student 4: Recalled all eight events in order correctly. The student did not write a response on the back of her paper.
Later that day the classroom teachers gave the students the timeline to fill in with the events. All students in Group Two filled in the eight events correctly.

*Group Three*

Group Three consisted of four girls. For the last three pictures they decided to use: Six is Mix, Seven is Heaven, and Eight is Late (and Gate). (See Appendix F) They decided to incorporate a picture showing George Washington standing at a gate, saying to himself, “I’m late.”

*Results of First Test*

Student 1: Recalled all eight events in order correctly.

Student 2: Recalled all eight events in order correctly.

Student 3: Recalled two events in order correctly. (3 and 8).

Student 4: Data was not available.

The following Friday I gave these students the same test, and had them fill in the blanks to see if they could recall the mnemonic and order. I also had them write on the back of their paper how they think they remembered their answers.
Results of Second Test

Student 1: Recalled all eight events in order correctly. The student wrote, “I remembered the pictures in my head and the numbers that rhymed with it.”

Student 2: Recalled all eight events in order correctly. The student did not write a response on the back of her paper.

Student 3: Recalled two events in order correctly. (These were the same events as the week before). This student wrote, “1 Bun, The Boston Tea Party” on the back of her paper. Out of the two pictures that were correct in the order, one picture (3) was given by me, and one picture (8) was created by her group.

Student 4: Recalled all eight events in order correctly. The student wrote, “The pictures helped me remember.”

Later that day the classroom teachers gave the students the timeline to fill in with the events. Two students in Group Three filled in the eight events correctly. The third student put three events in order correctly, but the events were not in the correct order from the start, so she needed additional support to understand the order of events.
Summary of Fourth Grade Findings

The results of test one showed 7 out of 11 students able to recall the events in order. One student recalled two events in the correct order, two students recalled six events in the correct order, and one student was absent. The data collected showed that some students were able to understand and use the mnemonic to recall the correct order of events. The results of test two showed that 9 out of 11 students recalled all eight events in order, while one student recalled 2 events correctly, and one student was absent. The data collected for test two showed that most students could recall the events in the correct order. While this data does not conclusively show that these students used the mnemonic, their knowledge of the recalled information was proven on the test.

The results showed me that most of the students understood how to use the mnemonic or comprehended the content enough to be able to figure out the event order. It also made sense to me that some students would not be able to tell me how they remembered the information (which is why I didn't receive written feedback on all papers) or would try to use other strategies to remember the order of events. I feel that it is hard to explain how connections are made and why something makes sense to one student and not another. The one student in group three changed my perspective on
how easy it is to learn a mnemonic. She was trying to manipulate the
pegword strategy into the letter strategy, (by thinking and writing, “One,
bun, Boston Tea Party”). This result made me wonder if she would’ve been
able to do the task without the mnemonic or if she used the letter strategy the
first time instead.

**Third Grade**

At the end of the second week, I asked the five students in my guided
reading group if they wanted to learn a way to remember the planets in order
from the sun. As I started to continue with the mnemonic, I was interrupted
by one of the boys who starting singing the planet song. The entire group
then sang the part of the song, where it listed the order of the planets. As the
song ended, the same student asked me if I knew the order of the planets. I
listed them, and they all were surprised that I knew them. I told them the
mnemonic and how the phrase “my very educated mother just served us
nachos” helps me remember the order of the planets. They listened for a
moment, but none of them seemed interested in learning the new mnemonic.
As it came to the end of our group time, the teacher turned on the music,
which happened to be the planet song, and they left the group singing the
song once again.
Summary of Third Grade Findings

The third grade students surprised me and offered me more knowledge and understanding than I thought I would receive. I didn’t think the students would tell me a mnemonic and then not listen to the one that I thought was easy to use. All of these students knew the song, and therefore, knew the order of the planets. They were using a mnemonic, which was a song, and that helped them learn and recall the order of the planets before I had a chance to introduce a mnemonic to them.

During the third week the students did their oral presentations of their planet discoveries. They listened to the planet song every day as science came to an end and were preparing for lunch. I did not test the students on the order of the planets again but I did listen to them as they sang along with the music as it played.

For some students, mnemonics could be confusing and overused. For others, it is an easier way to retrieve and recall information, whether short term or for long term purposes.
Chapter Five: Conclusions and Recommendations

Discussion

To determine whether this research study was successful or not, I will base my conclusion on my research questions. I feel that it is important to reflect on my observations over the first few weeks of the study, as well as to consider how the students felt as they were learning the mnemonics and what could be done in the future to ensure their success at retrieving and recalling important information.

1. How does using a mnemonic help students learn information faster than students who do not use one?

During my research and data collection I had a chance in both classrooms to work with small groups and see students' individual results at recalling information. I did not, however, compare my results with the rest of the class whom did not learn the mnemonic for the test.

Levin (1993) states that, "virtually all mnemonic research has focused on students' learning of factual information" (p. 239). Mnemonic techniques used in classrooms need to be learned quickly and efficiently, so that students and teachers will have time to understand the topic and comprehend the content before moving on to a new topic.
As I mentioned previously, time was a limitation, and as my research came to a close, the classroom teachers moved away from the topic I was researching and on to new materials. Although I could have looked at the timelines of other fourth grade students, or listened to the third grade students sing their planet song, I would not completely understand whether or not the mnemonic was successful because their brain could have recalled the information another way. The mnemonic I wanted to teach the third grade students could have been blocked by already knowing the planet order with the song they learned, therefore using a different mnemonic for the same content. Some of the fourth grade students could have known the events by using their historical fiction book knowledge and other background knowledge to retrieve the events and might not have understood the mnemonic well enough to use it as it was intended. I feel that these other instances, along with learning the mnemonic, helped the students' comprehension of the content. Repeating and using the mnemonic helped the students to retrieve and recall this information faster.

Some students learn visually, and thus the pictures alone might have been helpful. Other students learn through use of rhyming techniques, thus listening to the song might have been enough. Attention spans as well as
minimal distractions in the classroom also have an impact on how well students learn and then remember information.

This first question was not answered in the third grade classroom. Every student had listened to the planet song to get ready for lunch, and by doing this most of them remembered the words, which helped them recall the order of the planets. Because the teacher had played the song daily there was no control group of students who did not know the order of the planets. The students in this classroom who memorized the song learned the order of the planets quickly and correctly. I also discovered through my data collection that they could recall the order of the planets when asked and also comprehended the information that was being told to them through the song.

Overall, I feel that if a teacher thinks a mnemonic would be helpful to remember important information, all students should be able to enjoy the process of learning the mnemonic. The third grade teachers taught her students the mnemonic because she knew it was critical for them to know the order of the planets. Recalling information using a mnemonic that is meaningful and based on background knowledge helped students recall important information.
2. Can all students use a general mnemonic or does the mnemonic need to be personalized based on the student’s backgrounds?

Mnemonics work when students are familiar with the content and can comprehend the information that needs to be recalled. For example, the third grade students were familiar with the planets they were studying and familiar with the song. They knew the names of the planets as well as the order. Without knowing the names of the planets, *My Very Educated Mother Just Served Us Nachos* is not going to work for anybody. Obviously, a mnemonic will not be remembered if the information is not important to the individual. The third grade students studied the planets and researched this content daily. This information was important for them to comprehend. The third grade students might be ready to recite the order of the planets because the order of the planets is a topic that is explored often in educational settings.

The fourth grade students had opportunities in their classroom to learn about the war, using historical fiction books, maps, and Internet resources. Although I worked with students to recall specific events of the Revolutionary War, the students might not remember the mnemonic unless they are repetitively asked questions about the specific events. This mnemonic technique was created for use during the timeline test, and
therefore the knowledge might be hard to remember over time. Over the three week period most students were able to recall the events in order. This told me that the students were able to apply the knowledge of the pegword mnemonic to the given events. With guidance and a specific mnemonic structure, most students were able to recall the events correctly.

As I collected the data, I discovered one student using the letter strategy instead of the pegword strategy. She was matching up the first letter of the pegword with a different picture, so when I wanted her to recall the second event, it wasn’t the correct one. If I was to give her a mnemonic for something else, I would use the letter strategy with her to make it as easy as possible to retrieve the information.

Levin (1993) states that a “critical, educational goal is to teach students to recognize the multitude of academic content to which a mnemonic strategy learned in one context could be profitably applied, or the situations for which it would be wise to combine two separately learned strategies” (p. 241). Levin also concludes that teaching students “how to generalize any cognitive strategy has proven to be a challenging task” (241). I feel that this mnemonic strategy was able to be used by the students because it was based on their background knowledge of the topic. It would be hard for them to recreate the mnemonic for the same content (or another topic) according to Levin, but
they would be able to use the pegword and keyword mnemonic techniques with teacher support and guidance.

It was also important to me that at the end of the first week, the students were enjoying the task of learning the mnemonic. The reason for using a mnemonic is for easy retrieval and recall, and if students were not enjoying the pictures and learning the events in order, this task would have failed.

By reading my field notes and listening to my audio tapes I learned that the teachers who used mnemonics and songs in their classrooms helped their students learn new ways to organize and store information, which made it easier to retrieve and recall important information.

3. Do students still use mnemonics they have learned prior to this study to recall facts after the information is learned and part of the long-term memory?

Because the topic being explored is mnemonics and recalling information over time, I wanted to see if students learned or used mnemonics prior to the study. Students who have background knowledge of mnemonic techniques might have better opportunities to explore new strategies and might have a quicker recall and retrieval time than students who do not have
prior experiences with mnemonics. These students and the specific mnemonics I used in the study might not answer this question for many months, or even years. I researched this question by asking other adults about the mnemonics they learned when they were in elementary school. From experience though, and discussing mnemonics with friends and coworkers, a mnemonic is usually still recalled first before the rest of the information can be provided. For example, I can remember the alphabetical order of the fifty states, but I need to sing the song to recall them. Thinking about the mnemonics leads people to retrieve and recall information, especially when a group of friends are reminiscing and can recall even more through the conversation. I believe that mnemonics stay in our long-term memory and over time, as different events and situations resurface, the mnemonic Sneaks out and the information associated with the device can be retrieved once again.

**Recommendations for Future Research**

If I was to do this research project again, I would incorporate time to talk to teachers and staff who were working with the students to discover individual learning styles and specific needs. I would also want to interview each student who I was working with, to first understand which mnemonics
the student already knows and how he or she recalls vocabulary and important information.

I would also change the type of mnemonic that I used with the fourth grade students. I believe that it worked for most of the students for a short period of time, but this type of pegword mnemonic doesn’t seem to be one that stays in the memory forever. When I was creating this mnemonic I was using my background knowledge and pictures that were easy for me to recall. The events around the Revolutionary War are not often asked to students so the numbered information as well as the events might not be retained long enough in the short term memory to become a part of the long term memory. I can recall these events still, but I feel that it is because I introduced it to the students, and visualized the original pictures. I also have had the chance to do the data collection and write up my findings. The students might be able to use the pegword strategy for themselves when they are older, but I don’t believe that the mnemonic I used will be information they would recall or retrieve in the future.

Teachers who chose to incorporate mnemonic instruction in their classrooms should be aware of what the different mnemonic techniques are, as well as their students’ needs. Some students do not recall information using these techniques, while others might need them as an extra boost to
retrieve information. Mnemonic instruction is not a replacement for regular instruction, so teachers need to be aware of which mnemonics would be the best and most rewarding for students to use and learn. This depends on the individual classroom, as well as district and state standards of what needs to be taught.

Researchers and teachers in the future should be aware of what mnemonic strategies they are choosing to use when teaching students a new concept. Students use background knowledge and their environment to figure out new situations, and teachers should model and guide students who need extra support when learning new information. Researchers should focus on mnemonic techniques that work to enhance general instruction of a concept, which could possibly be carried into another content area or grade level.

Levin (1993) wrote, “we researchers must shoulder much of the mnemonic-failure blame and be willing to do more of what it takes to make classroom implementations possible” (p. 242). Mnemonic techniques are not created equally, meaning that every technique will not work with every child or content area. Teachers and researchers need to be cautious about the mnemonics they use, while also understanding its value and the reason why it is being taught to their students.
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Appendix A:

STATEMENT OF INFORMED CONSENT FOR MINORS

This permission slip shows a study being done that helps you and your teacher find out how mnemonic devices help retain useful information. The purpose of this research is to understand what strategies students use in order to make sense of new information. The person conducting the research is a student at SUNY College at Brockport. If you agree to be a part of this study, you will be asked to complete a five-day curricular unit where you will be learning a mnemonic device that will be about something you are already learning. This could help you remember this information better and retain that information over a long period of time.

The possible benefit from being in this study could be that information will be learned that would allow you to see which strategies are helpful to you when you are learning new information that you will be required to remember for future testing.

Your participation in this study is completely voluntary. Being in it or refusing to be in it, will not affect your grades or class standing. You are free to change your mind or stop being in the study at any time.

I understand that:

1. My participation is voluntary and I have the right to refuse to answer any questions. I will have a chance to discuss any questions I have about the study with the researcher after completing the questionnaire.
2. My confidentiality is guaranteed. My name will not be written on the survey. There will be no way to connect me to the written survey. If any publication results from this research, I would not be identified by name. Results will be given anonymously and in group form only, so that neither the participants nor their schools can be identified.
3. There will be no anticipated personal risks because of participation in this project. There could be benefits, however, being a part of this research. You will be learning a strategy that could help you recall information faster and easier, which could also be useful in the future.
4. My participation involves learning a new concept and discussing whether or not it was easier to remember using a mnemonic device along with that concept. I will not be missing out on regular classroom activities during this five-day lesson.
5. Approximately 13-15 people will take part in this study. The results will be used for the completion of a research project by the primary researcher.
6. You will be recorded using a tape recorder so the investigator can focus on teaching you the mnemonic. After the taped data is recorded and written up, these tapes will be destroyed.
7. Data and consent forms will be kept separately in a locked filing cabinet by the investigator and will be destroyed by shredding all paper data when the research has been completed.

You are being asked whether or not you want to participate in this study. If you wish to participate, and you agree with the statement below, please sign in the space provided. Remember, you may change your mind at any point and withdraw from the study. You can refuse to participate even if your parent/guardian gives permission for you to participate.

If you have any questions you may contact:
Primary researcher: Sarah Wood
Education and Human Development
(585) 395-5945

I understand the information provided in this form and agree to participate in this project.

_________________________________________  __________________________
Signature of participant /Date

59
Appendix B: STATEMENT OF INFORMED CONSENT FOR PARENTS

This form describes a research study being conducted with students to find out how using mnemonic devices help students retain useful information. This purpose of this research is to understand what strategies students use in order to make sense of new concepts. The person conducting the research is a graduate student in the Department of Education at SUNY Brockport. If you agree to have your child participate in this study, s/he will be asked to complete a five-day curricular unit where they will be shown a mnemonic device. The device will supplement a topic they are already learning about and could help them retain that information over a long period of time.

The possible benefit from being in this study could be that a mnemonic could be learned that might allow students to see which strategies are helpful to them when they are learning new information that they are required to remember for future testing.

Your child's participation in this study is completely voluntary. Being in it or refusing to be in it, will not affect your child's grades or class standing. S/he is free to change her/his mind or stop being in the study at any time.

I understand that:

1. My child's participation is voluntary and s/he has the right to refuse to answer any questions. S/he will have a chance to discuss any questions s/he has about the study with the researcher during and after completing the lessons.
2. My child's confidentiality is guaranteed. Her/his name will not be written on the survey. There will be no way to connect my child to the written survey. If any publication results from this research, s/he would not be identified by name. Results will be given anonymously and in group form only, so that neither the participants nor their schools can be identified.
3. There will be no anticipated personal risks because of participation in this project. There could, however, be a benefit to learning the mnemonic device. Your child will be learning a strategy that could help them understand what they are learning about. This strategy can also be changed to help improve memory for future testing.
4. My child's participation involves learning a new concept and discussing whether or not it was easier to remember using a mnemonic device along with that concept. Your child will not be missing out on regular classroom activities during this five-day lesson.
5. Approximately 13-15 people will take part in this study. The results will be used for the completion of a research project by the primary researcher.
6. Your child will be tape recorded so the researcher can focus on teaching them the mnemonic device. During the study tapes will be kept locked up. After the study is completed the tapes will be destroyed.
7. Data and consent forms will be kept separately in a locked filing cabinet by the investigator and will be destroyed by shredding the paper data when the research has been completed.

You are being asked whether or not you will permit your child to participate in this study. If you wish to give permission to participate, and you agree with the statement below, please sign in the space provided. Remember, you may change your mind at any point and withdraw from the study. Your child can refuse to participate even if you have given permission for her/him to participate.

I understand the information provided in this form and agree to allow my child to participate as a participant in this project. I am 18 years of age or older. I have read and understand the above statements. All my questions about my child's participation in this study have been answered to my satisfaction.

If you have any questions you may contact:
Primary researcher: Sarah Wood
Faculty Advisor: Professor Amy Barnhill
Education and Human Development
(585) 395-5945

Signature of Parent/Date

Child's name

60
Appendix C:
Fourth Grade Study: Picture 1 - The Stamp Act

THE STAMP ACT

1765

date: _______
THE BOSTON TEA PARTY

date: 1773
Fourth Grade Study: Picture 3- Paul Revere’s Ride

PAUL REVERE'S RIDE

date: 1775

[Image of pine tree, lantern, and rider]
Appendix D: Group One
Picture 6- The British Recognize U.S. Independence
THE UNITED STATES CONSTITUTION

date: 1788
Group One: Picture 8- George Washington Elected President
Appendix E: Group Two

Picture 6- The British Recognize U.S. Independence
GEORGE WASHINGTON
ELECTED PRESIDENT

date: 1789
Appendix F: Group Three

Picture 6: The British Recognize U.S. Independence
THE UNITED STATES CONSTITUTION

date: 1788
Group Three: Picture 8- George Washington Elected President

GEORGE WASHINGTON ELECTED PRESIDENT

date: 1789