LATIN VOCABULARY ACQUISITION: AN EXPERIMENT USING INFORMATION-PROCESSING TECHNIQUES OF CHUNKING AND IMAGERY

DISSERTATION

Presented to the Graduate Council of the

University of North Texas in Partial

Fulfillment of the Requirements

For the Degree of

DOCTOR OF EDUCATION

By

Terri Gay Manns Carter, B.A., M.Ed.

Denton, Texas

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The purpose of the study was to determine the effect on student performance and attitude toward high school Latin by Latin I students when provided with vocabulary instruction through chunking and imagery.

The subjects of this research project were Latin I students drawn from three suburban North Texas high schools with populations of more than 1600 students. Each subject took a pretest on 21 Latin vocabulary words taken from *Jenney's Fourth Year Latin*. Following the pretest, each subject then received a list of these same 21 Latin vocabulary words to study prior to the immediate posttest. Comparison Group A received a list of words grouped randomly into three groups of seven. Comparison Groups B and C received a list of words categorized by definition into three groups of seven. Comparison Group C received a five minute imagery treatment prior to the immediate posttest. The Control Group received neither a chunking technique nor an imagery treatment. A delayed posttest was given to all four groups two weeks following the immediate posttest. The delayed posttest took a total of 10 minutes; study time and prior notice were not given. The Confidence in Learning Latin Scale followed the delayed posttest. The data

for the pretest, immediate posttest and delayed posttest were analyzed with an ANOVA. At the .05 level of confidence, there was no statistical difference between the groups for the pretest; however, the immediate posttest and the delayed posttest were further analyzed with multiple pair-wise comparisons using a Fisher-protected Test for Least Significant Difference. The Confidence in Learning Latin Scale data was analyzed with a F-ratio at the .05 level of confidence.

Based on the findings, it is possible to conclude that imagery and chunking instruction do significantly improve student performance among high school Latin I students. It may also be noted that chunking and imagery instruction do not significantly encourage confidence in learning Latin.

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The real nature of teaching: its insights pass,

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Plato (Seventh Letter)

I wish to extend my sincerest gratitude to Dr. Cliff Hardy for allowing his insight to pass from soul to soul through his patience, wisdom and assistance throughout my educational career. My appreciation is also due to Dr. Reginald Hinely and Dr. Bruce Meeks for their dedication to higher education.

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CHAPTER 1

INTRODUCTION

The purpose of this study was to investigate chunking and imagery, two information-processing techniques, on students' Latin vocabulary acquisition and memory retention. Much of the research in foreign languages has focused on linguistics and the systematic study of phonology. While this has proven useful for a better understanding of teaching foreign language sound systems and grammatical structures, the manner in which students acquire foreign language vocabularies has received little systematic attention.

One of the interesting questions in Latin instruction has been the process by which the reader focuses attention on word meanings, word order cues, and cues given by the inflectional endings. How does a skilled reader recall the meanings of Latin words before transferring those words into comprehensible sentences? Classicists need to answer this question before they can understand how one goes about reading Latin as Latin. Given the limited working memory of human beings, skilled reading simply cannot take place until lower level skills such as decoding, lexical access, and parsing become automatic. Can the information-processing techniques of chunking and imagery positively affect the automaticity of Latin vocabulary acquisition and retention?

Robert Gagne and other cognitive psychologists interested in the study of mental processes developed the concept of information-processing theory. This model focuses on the transformations which occur as sensory impulses enter the human information-processing system. Information is either lost or stored in short-term or long-term memory. This model has proven to have wide applicability to learning, memory organization, and procedural strategies. Robert Gagne's information-processing theory supports the techniques of imagery and chunking to enhance vocabulary acquisition and memory retention in the learning process.

In his dissertation, *An Investigation of the Effectiveness of Two Prior Knowledge-Based Vocabulary Teaching Strategies on Vocabulary Knowledge and Reading Comprehension in an Advanced Foreign Language Class (French)*, Lewis Porter quoted Stern's (1983) comment on the subject of vocabulary acquisition. Stern wrote, "One reason for its relative neglect may well be that it does not lend itself easily to the structural and systematic treatment in the way syntax and phonology have done" (p. 13). Another reason for this neglect may have been driven by the assumption that vocabulary acquisition would develop naturally as a result of listening, speaking, reading, and writing in the language, as well as using controlled vocabulary lists from textbooks and ancillary products. Experienced teachers have known that this is not the case; advanced foreign language students often have experienced verbal paralysis when trying to communicate either orally or in writing.

Meara, Wilkins, and Keller have written about the necessity for more research in the area of vocabulary acquisition. Insufficient research was cited by Meara (1983), a paucity of specific techniques devised for lexical instruction was illustrated by Wilkins (1972), and haphazard word exposure was discussed by Keller (1978). Foreign language vocabulary acquisition deserves further investigation and research and the information-processing techniques of imagery and chunking can be applied to and used for this research.

Background

Quid de Latina faciamus? What are we going to do about Latin? As the year 2000 A.D. approaches, Latin teachers are asking themselves this question. Syntactic constructions, lexicons, and paradigmatic charts have been memorized, chanted, written, and examined for more than 2200 years! But with the wealth of knowledge that is available today regarding learning styles, teaching styles, multiple intelligences, and brain research, Latin methodology needs to join the educational world of the 21st century. As e-mail invades homes and classrooms, the Latin teacher should find the courage to step forward and try new teaching methodologies so that the language can reach the students.

Classicists generally agree that the end result of learning Latin is to be able to read and understand Latin as Latin; however, the method that is used to facilitate this end remains in question. Which methodology can best

facilitate the acquisition of Latin vocabulary? Is it the information-processing model, the reading model, the collaborative classroom model, or is it a combination of several models? Each has been offered as the "best" way to teach Latin, but why? What do these teaching strategies offer the Latin classroom and the process of vocabulary acquisition?

Plato's Seventh Letter (341c-d) discusses the "real nature of teaching: its insights pass, not in books, but like sparks from soul to soul." Whether the spark of learning lives or dies after it has been passed is controlled only by the one who receives it; this is true of any pedagogical method. The information-processing model and the application of rational task analysis in reading can be applied to the teaching of Latin (Hamilton, 1992). In a widely accepted reading model, the reading process has been divided into four sub tasks: decoding, literal comprehension, inferential comprehension, and comprehension monitoring (E. Gagne, 1985). All four of these tasks can be applied to the teaching of reading skills to students of Latin in an effective and efficient manner (Hamilton, 1992).

Decoding and literal comprehension work well in the instruction of Latin. Students can begin with decoding, the act of breaking the printed code of a language into meaning. Decoding supports the concept that Latin students would profit from spending more time on pattern drills; software programs have been created especially for this specific purpose. The rapid feedback and the great number of practice items that can be generated by

the computer makes this strategy more efficient than traditional written practice.

Vocal recoding, sounding out words, is important in English and Latin, as it is in all languages; however, some educators believe that it is of less importance in Latin because it is perceived as a "dead" language. Vocalization cues the long-term memory according to the information-processing model. Recoding occurs only if the student has heard the word or a significant component of the word and then stored it in long-term memory. Evidence in the research of recoding states that verbal cues can activate memory which is not activated by the pattern of the written word alone. Imagery can provide this type of activation for the long-term memory. This research provides support for Latin teachers who stress the importance of the verbal skills of their students and spend quality time in foreign language labs. Imagery and oral verbal skills may indeed reinforce reading skills by providing alternate cues to information stored in long-term memory.

The second step in the reading process, literal comprehension, can also be incorporated in the Latin classroom. There are two steps involved in literal comprehension: lexical access and parsing. Lexical access is the end product of decoding; it establishes the literal meaning of a sentence from the patterns recognized in the decoding phase. The meaning of the sentence depends upon the availability of the word in long-term memory. Chunking and imagery may provide the means by which a "richness of meaning" can

be attained and may have a major effect on the complexity of a sentence. This complex meaning can not be derived if the student suffers from vocabulary paralysis; if one is at a loss for a word, then one is not able to derive any meaning from the passage whether it be rote definition or richness in meaning.

With the necessity for vocabulary retention in mind, students in the beginning stages of the study of Latin should focus their study of vocabulary on words as they appear in context. They need considerable assistance from the teacher in developing this skill. From the very beginning, students should be encouraged to elaborate on the meaning of words as they find them in actual sentences. Imagery techniques may facilitate this learning process. Students need to be taught to talk through the associations of the spoken word and connect past meanings with new ones in a meaningful fashion; if it is meaningful, it will be memorable (Hamilton, 1992). As E. Gagne said, "Learning of declarative knowledge is synonymous with the creation of meaning. When no meaning can be created, nothing is learned" (1985, p. 79).

Speed is an important factor in reading and recalling words. Skilled readers automatically prepare a number of possible word meanings suggested by the context and then they rapidly choose the most appropriate (Fredericksen, 1981). They also seem to use context clues especially when they read words that are unfamiliar to them.

This gives strong support to teaching students to read Latin as Latin, that is, in Latin word order from the very beginning of instruction. The analytical (subject-verb-direct object) method removes all cues that are generated by a Latin passage and mandates that the reader of Latin always be in the position of the less skilled readers who lack the ability to use context cues for comprehension ability.

Hamilton states that since Latin rhetorical theory tends to place more significant items toward the end of syntactic structures, context cues may well be even more significant in Latin than in English. For instance, Julius Caesar says, "Apud Helvetios longe nobilissimus fuit et ditissimus Orgetorix" (cited in Liddell, 1966, I. 1). A linear translation reads, "Among Helvetians by far most noble was and wealthiest Orgetorix," whereas an English translation reads, "Orgetorix was the wealthiest and the most noble among the Helvetians." If the reader reads the sentence as an English sentence, he would think that the subject was "apud"; but in actuality, the subject, "Orgetorix," is the last word of the sentence. The context cues enable the Latin student to derive a quicker and more enriched meaning from the language if he reads the entire sentence as a complete unit and not as individual words.

Parsing is the second step in Ellen Gagne's literal comprehension; the reader uses word order and word ending to establish the syntax of the sentence and to perceive relationships between words. English readers use parsing to gain a literal understanding of a sentence. This can not be

achieved in Latin unless the student is able to acquire and retain a large working vocabulary; since Robert Gagne's theories give support to the premise that chunking and imagery help store facts in long-term memory, one would believe that through these information-processing techniques the Latin student should be able to become a better reader.

Statement of the Problem

The problem of this study was to determine the effect on student performance and attitude toward high school Latin by Latin I students when provided with vocabulary instruction through chunking and imagery.

Statement of Hypotheses

The following hypotheses were formulated for the study:

H1. There will be a significant difference across four specified groups of Latin students in word recognition as measured by immediate testing.

H2. There will be a significant difference across four specified groups of Latin students in word recognition as measured by delayed testing.

H3. There will be a significant difference across four specified groups of Latin students in attitude scores as measured by a Confidence in Learning Latin Scale.

Definition of Terms

Attitude—used in this study to refer to the extent to which a student has a positive or a negative attitude about Latin as measured by the Confidence in Learning Latin Scale.

Chunking—used in this study to refer to the grouping of Latin vocabulary words into groups of seven; words are grouped randomly and words are grouped into related categories.

Imagery—used in this study to refer to the visualization of meanings of Latin words through verbal mnemonics prompted by the teacher.

Four Specified Groups—used in this study to refer to three Comparison Groups: A, B and C, and one Control Group: X. Comparison Group A tested randomly chunked words, Comparison Group B tested words grouped into related categories, Comparison Group C tested words grouped into related categories after imagery techniques were employed, and Control Group X received no treatment.

Methodology

A total of 121 subjects enrolled in eight Latin I classes from three North Texas suburban high schools with a population of more than 1600 students participated in the study. Each subject first took a pretest on 21 Latin vocabulary words which were taken from *Jenney's Fourth Year Latin* vocabulary list to ensure that the words were unknown to the subjects. All subjects

were given 10 minutes to complete the pretest. Following the pretest, each subject then received a list of these same 21 Latin vocabulary words to study prior to the immediate posttest. Comparison Group A received a list of 21 words which were numbered 1 through 21; they were grouped randomly into three groups of seven words. Comparison Groups B and C received a list of 21 words which were numbered 1 through 21; they were grouped into three groups of seven words and they were grouped into related categories according to definitions. Unlike Comparison Group B, Comparison Group C received a five minute imagery treatment prior to the immediate posttest. The Control Group received neither a chunking technique nor an imagery treatment. All subjects were given five minutes to complete the Confidence in Learning Latin Scale following the delayed posttest.

Data Analysis

When Comparison Groups A, B, C and Control Group X were assigned, a pretest was given to all four groups. From this pretest, the Bartlett Test for Homogeneity of Group Variances (ANOVA) was performed to determine if the groups were statistically the same at the onset of the experiment. The data from the pretest showed that a significant difference did not exist between the groups at the .05 level of confidence. Since a significant difference did not exist between the groups on the pretest, the immediate posttest and the delayed posttest were also analyzed with the

Bartlett Test for Homogeneity of Group Variances. Multiple pair-wise comparisons were conducted between the groups for the immediate posttest and the delayed posttest. These results were reported with a FLSD: Fisher-Protected Test for Least Significant Difference (FLSD) (Yount, 1985). Following the delayed posttest, a Confidence in Learning Latin Scale was used to compare differences in student confidence toward Latin. Each Comparison Group was compared with the Control Group and this data was analyzed with a F-ratio at the .05 level of confidence.

CHAPTER 2

REVIEW OF THE LITERATURE

Overview

Teaching passes knowledge from generation to generation in every culture; teaching is the means by which cultures validate their language, customs, religion, and laws to the rest of the world. This has been an enormous task for teachers throughout millennia; to make learning memorable, applicable, and pertinent has been their constant charge.

The humble task of memorizing has been omnipresent for learning; from the moment of birth, a world of new artifacts and events has been presented and sorted. To make learning meaningful, large quantities of words have been learned and connected to other objects. In any new area of study, a major task has been learning important words and definitions that pertain to the area of study (Joyce & Showers, 1991). Initial foreign language learning involves developing a vocabulary of words that look and sound unfamiliar.

Language learning is significant to societies as it is the basis for communication within and between cultures. It allows for the propagation of ideas and beliefs and it adapts and modifies as it is assimilated by other cultures. Productive language instruction provides societies with a powerful communication tool which enables members of different societies to converse

with each other. Various methods of language instruction have been utilized for the teaching of foreign languages; however, careful investigation into the manner in which information is stored and retrieved in long-term memory can facilitate the foreign language teaching process.

The Bulgarian psychiatrist, Lozanov, developed an instructional program that targeted teaching to more than one area of the brain. He found that foreign language vocabulary could be learned at a rate of 1.2 words per minute with teachers teaching 1,000 words a day with 95% recall the following day (Schmidt, 1980). Lozanov used imagery, music, relaxation techniques, psychodrama and suggestion as the basis for his research (Stein, 1982). Traditionally in education, the teaching of vocabulary has been a process for the left hemisphere of the brain.

The triune brain (MacLean, 1973) is divided into three parts: reticular formation, limbic system, and neocortex. The neocortex is divided horizontally into two regions: the right hemisphere and the left hemisphere. Four general brain function theories have been proposed by neuroscientists: the interaction of the right and left hemispheres of the neocortex, the interactions of the triune brain, locale and taxon memory, and holographic memory. Neuroscientists have suggested that complementary interaction between more than one brain area enhances information retention and recall (Stein, 1982).

Since this study concerned the effects of chunking and imagery on foreign language vocabulary acquisition in high school Latin I students, the review of literature has been divided into five major sections: (1) information-processing theory, (2) memorization methodology, (3) the memory functions of the brain, (4) information-processing research studies, and (5) foreign language research studies.

Information-Processing Theory

Information-processing theory from Robert Gagne's work in 1977 to present brain research has involved an attempt to build a teaching oriented learning theory based on current brain research and a practical knowledge of computers. This theory has included elements of both reinforcement theory and field theory. The information-processing model as explained by Gagne in 1977 is a theory which assumes that internal structures (the brain and sensory organs) perform certain behavioral processes. It was proposed by various cognitive, Gestalt, and humanistic psychologists that the stimuli and the organism act upon each other.

Jan Amos Comenius can be called the first information-processing teacher; he met the language teaching challenge in 1659 through his work, *Orbis Sensualium Pictus*. He offered the world a picture book and nomenclature of all the chief things that existed in his world (Comenius, 1967). Comenius himself hoped that his little book of pictures would stir up the

attention of the reader as the mind fastened upon pictures of words. He believed that the senses were the main guides of childhood because a child's mind did not raise itself to an abstracted contemplation of things. His book became an instructional tool preparing children for deeper studies and providing a device for reading through associations. Through these associations, a child would have a pleasant learning experience of both the Latin and English languages. His book was translated in such a way that every English word was mirrored by a Latin word and a picture providing the reader with both a visualization of the word and the word itself. Little did Comenius know that he was the first educator to explore and utilize the information-processing learning devices of memorization and imagery.

The information-processing model has been defined as a micro-model of psychological processes; and as such, it has been divided into 8 stages of perception, processing and learning (Strom & Bernard, 1982).

1. The stimuli selectively perceived are transferred to, and transformed by, neural activity-in a fraction of a second.
2. The transformed data enter by visual, auditory, or verbal processes into short-term memory, where they persist up to 20 seconds.
3. The critical point in learning occurs when information leaves short-term memory by a process called *semantic encoding*. By this process, perceptual features are sorted and classified into a conceptual mode.

4. In encoded form the data are stored in long-term memory. Storage may be permanent, but for various reasons (such as interference of new impressions) the data may not readily be retrieved.
5. Retrieval is aided by cues derived from search processes, transfer of learning, and mental reconstruction.
6. All these processes culminate in the generation of a response-physical movement, speech, thought.
7. The resulting performance, such as being able to write or tell a correct answer, can be externally observed.
8. Information processing is concluded when the learner gets some sort of feedback, or confirmation that the lesson has been learned. The reinforcement effect of feedback is to make the learning permanently available.

Gagne rejected the idea of one single learning theory; and in doing so, he identified five different types of learning outcomes: intellectual skills, verbal information, cognitive strategies, attitudes, and motor skills. Intellectual skills vary in complexity and include problem solving, rule learning, defined concepts, concrete concepts, and discrimination. These five types of learning provide a basis for stating performance objectives and current curriculum specialists find his task-analysis approach productive.

A linear map of Gagne's information-processing system represents the stages that information passes through from input to storage in either short-term memory or long-term memory (Strom & Bernard, 1992).

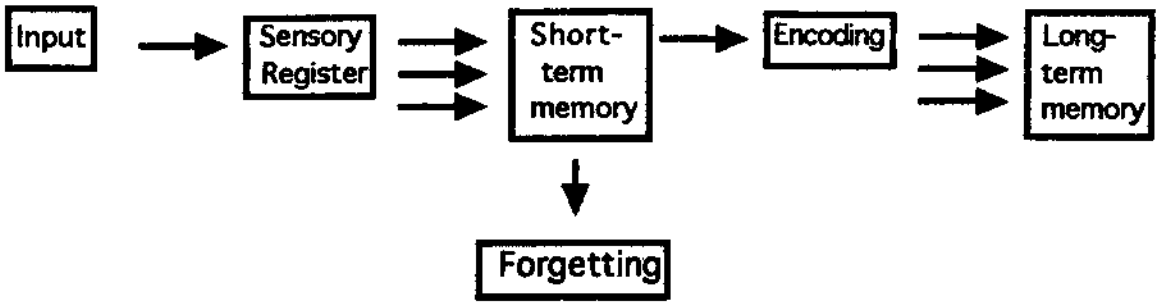

Fig. 1. Linear map of Gagne's information-processing system

Strom and Bernard pointed out that many maps of the information-processing model are developed every day. These human maps can be general or very specific and restricted to a single type of information. The function of the sensory register is to retain information long enough for the person to attend to it and then send it on to the next stage in the memory process. The sensory register accepts all information, but it keeps it only long enough to act upon it, usually less than one second. The information either decays spontaneously or new information erases what was previously in the sensory register. The durability of information in the sensory register and the capacity of this storage have been investigated by Sperling in detail (see Strom & Bernard, 1992).

Information to be learned passes from the sensory register into the short-term memory which holds information recently acquired through the sensory system. Short-term memory retains material for a brief time without active rehearsal because the capacity of short-term memory is limited and the information is quickly forgotten. Information in the short-term memory can be retained by rehearsal or practice (Strom & Bernard, 1992). New information can be rehearsed through elaborative operations which involve connecting new material with past learnings either by giving the new material meaning or through imagery. If information is neither rehearsed nor elaborated, it is lost from the short-term memory in approximately fifteen seconds (Strom & Bernard, 1982).

Information that is retained for a longer period of time must be transferred from short-term memory to long-term memory by a process called encoding. Encoding begins with the rehearsal in the short-term memory. With more rehearsal, the information stored in the short-term memory moves into the long-term memory where it can be retained for hours, days, weeks, or perhaps forever. Information is retained in the long-term memory as it was presented. This type of learning is useful for spelling words, math tables, or historical information.

The elaborative operations process provides meaningful learning by relating past experiences stored in the long-term memory to new information passing through the sensory register. If new information can relate to or be

placed in an existing knowledge category, it is more likely to be retained in the long-term memory.

Retrieval is the final stage of the information-processing model; it makes the learned material available and useful. The retrieval process can not be directly observed, but it must occur; otherwise, each new bit of information would represent a discrete category in the long-term memory and the memory systems would be overloaded (Strom & Bernard, 1982). Retrieval is equated with making an overt response; cognitive processes involve retrieval.

Forgetting occurs when information can not be retrieved; passage of time or the interference of competing information can cause the failure to retrieve information. Retroactive inhibition and proactive inhibition are two different processes which result in forgetting. Retroactive inhibition occurs when new learning interferes with previously learned material. Learning vocabulary words of a second foreign language can interfere with a person's ability to recall the vocabulary of a foreign language previously learned. Proactive inhibition occurs when original learning interferes with the recall of subsequently learned material (Strom & Bernard, 1982).

Failure to recall information can be a result of an inability to retrieve. Failure to retrieve information may result from the fact that the information was never fully registered in memory. When decoding occurred, the information may have been distorted and it was not available for retrieval; information

erroneously categorized can make retrieval impossible. For education to be effective, both teachers and students should be aware of methods which ensure that learned information can be retrieved.

Memorization Methodology

Bruce Joyce and Beverly Showers explored various models of teaching, specifically the information processing techniques of memorization and imagery (Joyce & Showers, 1991). They cited the works of Pressley, Levin and Delaney as they spoke of the "link-word" method. This is one of several models that assists memorization; it has doubled and even tripled rates of learning two to three times in some experiments. Students learn given amounts of material two to three times more rapidly when they use the link-word methods than they do when they use customary procedures for memorizing words (Pressley, Levin & Delaney, 1982). This is just one of the teaching models that can enhance rapid acquisition of information.

Joyce and Showers reported that the study of memory has a long history; although the "goal of a unified coherent and generally satisfying theory of human memory" (Estes, 1976, p. 6) has not yet been achieved, progress has been made. A number of instructional principles have been developed which teach memorization strategies and enable students to study more effectively. For instance, the material on which a particular teacher chooses to focus will affect what information the students retain. "Many items

are presented to an individual in a short time and only those to which attention is directed enter into memory, and only those receiving rehearsal are maintained long enough to secure the processing necessary to establish a basis for long-term recall" (Estes, 1976, p. 7). If a student does not pay attention to something, then it probably will not be remembered. In addition to this, it needs to be attended to in such a way that it is rehearsed for later recall. For example, as one wanders through a forest, if he does not look carefully at the tree trunks, they are unlikely to be remembered; however, some visual images may be retained in a haphazard fashion. Even if they are noticed, the information needs to be used; different trees should be compared in order to be remembered. Rehearsal has developed retrieval cues which have become the basis for sorting through memory at later times and locating the needed information (Joyce & Showers, 1991).

Short-term memories are often associated with sensory experiences of various kinds. When the student is exposed to the drink called *Sprite*, he/she may remember it as clear-colored and tasting a certain way. The student may associate things according to episodic cues when placing items in long-term recall; that is, he/she remembers those things which pertain to the sequences of experiences to which he/she has been exposed. The student may remember George Bush as the president who followed Ronald Reagan. These men are connected in time and their episodes in history are connected to one another. Unlike episodic cues, categorical cues involve

conceptualizations of the material. Comparing tree trunks, the student forms concepts that provide a basis for describing the individual trunks in relation to one another. He/she replaces specific items with categories, and this categorization or "chunking" provides the student with the basis for memory.

Both scholarly and popular sources agreed that the ability to remember is fundamental to intellectual effectiveness. Far from being a passive, trivial activity, memorizing and remembering are active pursuits. The capacity to take information, to integrate it meaningfully, and later to retrieve it at will is the product of successful memory learning. Most important, individuals can improve this capacity to memorize material so that they can recall it later. This is the objective of the information-processing memory model.

Research on the link-word method has provided advanced knowledge about memorization. The method has two components and assumes that unfamiliar material is to be mastered. The first component provides students with familiar material to link with the unfamiliar items. The second component provides an association to establish the meaning of the new material. When the task involves new foreign language vocabulary, one link ties the sounds to those of words in English. The second link ties the new word to a representation of its meaning. For example, the Latin word *lorica* (breast plate) might be linked to a girl's name "Lori" and a picture depicting "Lori" with a breast plate (Pressley, Levin, & Delaney, 1982).

An important finding from the research stated that people who master material more quickly and who retain it longer generally use more elaborate strategies for memorizing material. They use mnemonics which assist the memorization process. The less effective memorizers generally use "rote" procedures. They "say" what is to be memorized over and over again until they believe it is implanted in their memories.

A second important finding from the research on the link-word method stated that the devices used in the link-word method are even more elaborate than the methods used by the better "natural" memorizers. The link-word method requires more mental activity than rote memory procedures. The additional associations and imagery techniques provide a richer mental context; the linking process increases the cognitive activity. This combination of activity and associations provides better "anchors" within the information-processing systems.

Joyce and Showers stated that the key-word method helps students who are ordinarily good, poor, and average memorizers. They cited the work of Pressley and Dennis-Rounds, 1980, which stated that the key-word method helped students who were below average in verbal ability and who had greater difficulty with complex learning strategies. As students used the link-word method they seemed to transfer it to other learning tasks. Mnemonics were taught so that students could use them independently of the teacher. The students, in other words, developed systems for making up their own

links. Finally, even kindergarten and first grade students profited from mnemonics (Pressley, Miller, & Levin, 1981). They may have had greater difficulty generating their own links, but they did benefit when links were provided for them.

Joyce and Showers stated that the "effect size" from this research was impressive. Even in Atkinson's (1975) early studies the link-word method was about 50% more effective than conventional rote methods. Students learned one and one-half times more material in the same time period as students not using link words. In some of the later studies it was two times as effective (Pressley, 1977; Pressley, Miller, & Levin, 1981). In addition to this, retention was facilitated; more information was remembered longer when link-words were used.

There were two obvious uses of this research in teaching. The first was to arrange instruction so as to make it as easy as possible for students to make associations and to discourage isolated rote drill. The second was to teach students to make their own links when they study new material.

A number of popular "memory systems" have been developed, none of them backed by the research that Pressley, Levin, and their associates have generated. However, some of these systems used sensible principles that were congruent with that research. Lorayne and Lucas's *The Memory Book* (1974) is one such work.

In *The Memory Book*, they stated that an effective memory model must induce attention to what is to be learned. Because entities which can be seen, felt, touched, smelled, or tasted generate powerful associations for remembering, those items that are represented to several of the sensory channels are remembered best. Each channel contains old material which can be associated with new material. If a flower is seen as a visual image, then an object that feels a particular way, has a distinctive smell, and makes a crunchy noise when its stem is cut, can be linked to the flower through several types of senses. The likelihood of remembering it or its name is greater this way than through one sense only. Lorayne and Lucas quoted Aristotle:

> It is the image-making part of the mind which makes the work of the higher processes of thought possible. Hence, the mind never thinks without a mental picture. The thinking faculty thinks of its form in pictures. (Lorayne & Lucas, 1974, p. 22)

Lorayne and Lucas built their memory model to increase attention to what is to be learned, to sharpen the senses involved in attending to the new material, and to facilitate the associations which are made between old and new material. "Observation is essential to original awareness" (Lorayne & Lucas, 1974, p. 22). Anything of which one is originally aware cannot be forgotten, according to Lorayne and Lucas. Their basic memory rule was, "You can remember any new piece of information if it is associated to some-

thing you already know or remember." The Great Lakes are often taught by asking students to remember the word, *homes:* Huron, Ontario, Michigan, Erie, and Superior. To help students remember the spelling of *geography*, teachers offer the sentence, "George eats old gray rats and paints houses yellow."

The major limitation of these devices is that they apply only to one specific thing. The spelling of geography can apply only to the word geography; in addition to this, the sentence, "George eats old gray rats and paints houses yellow," must also be remembered. A memory system should apply more than once and it should link several thoughts or items in order for it to be broadly applicable.

The heart of the memory procedure was to connect two ideas with a second idea triggering yet a third idea, and so on. Suppose that a student needs to remember the following five Latin words: mucro (sharp point), lorica (breast plate), spiculum (point of an arrow), galea (helmet), and arcus (bow). The student should imagine an unusual picture, first with a mucro, then with a lorica, and then with a spiculum. For example, in the first picture the student might imagine a mucro sticking out of a lorica on a soldier holding a spiculum. The second picture might be a galea punctured by a spiculum. Taking the time to concentrate on making these images and then visualizing them will force original awareness. Most memory problems break down into two entities; there is a need to associate names and dates or places and there is

a need to associate names and ideas or words and their meaning. Sometimes there is a need to establish relationships or categories between these two entities.

Memory Functions of the Brain

In her dissertation, *The Effect of an Adaptation of the Lozanov Method on Vocabulary Definition Retention* (1982), Barbara Stein stated that the labeling of the hemispheric specializations of the brain was summarized by Eccles, (1977), a 1963 Nobel Prize recipient. The right side of the body is controlled by the left hemisphere of the brain and the left side of the body is controlled by the right hemisphere of the brain for the majority of people. Visual stimuli presented to the left visual field of each eye is recorded in the right visual cortex, and vice versa, just as sounds to each ear are processed in the opposite hemisphere. Verbal language tools are generally seated in the left hemisphere. This hemisphere, controlling the right side of the body, has become dominant in the majority of people of Western culture (Debes, 1977). The left hemisphere processes in a linear and sequential approach for problem solving which is similar to the linear problem solving function built into computers. While the left hemisphere analyzes details and ideas, the right hemisphere visualizes the gestalt or holistic synthesis of ideas (Eccles, 1977).

Kimura (1973) maintained that both hemispheres operate at the same time while receiving and processing information. Visual tasks, intonation, and auditory cues are simultaneously interpreted. Kinsbourne (1982, p. 411) stated, "In a normal environment, bilateral input appears to keep both sides of the brain sufficiently activated and ready to respond for practical purposes." Lozanov (1978b) developed a program of instruction to enhance information retention and stated (1978a, p. 24), ". . . in no case does the brain function . . . with only the right or left hemisphere. The functional unity of the brain is unbreakable no matter that in some cases one activity or another comes to the fore." He combined both right and left hemisphere activation in a complementary fashion making use of various activities such as music, intonation, suggestion, psychodrama, relaxation, and imagery. Barbara Stein used the left hemisphere functions of visual word processing and auditory word processing and the right hemisphere functions of prosodic functions, music listening, and picture imaging in her research. Her results suggested that using various inputs such as imagery, music, and visual and auditory word processing may increase long-term memory retention.

Barbara Stein cited Paivio's (1975) research that imagery enhances information retention. Information can be processed through either the verbal system of the left hemisphere or the imaginal system of the right hemisphere or through both systems simultaneously. Paivio (1975) presented words to the subjects by pronouncing the words or instructing the subjects to image

the words. Word recall was significantly higher for those subjects who imaged the word over those subjects who did not image the word. Lozanov (1978) suggested that the use of imagery along with word pronunciation enhances information retention and Schuster (1976) reported significant recall of words imaged over words not imaged.

Neurobiologists divided long-term memory into two basic systems: taxon system and locale system (O'Keefe & Nadel, 1978). Memorization of the presidents of the United States employs the taxon system. Hand (1982) stated that the taxon system is rote in nature, not contextual or time-referenced. He maintained that locale long-term memory storage is based on context, thus differing from taxon. In learning the names of the presidents, the locale system is employed when imagery or visual representations are used as memorization techniques. Hand (1982, p. 56) suggested,

> Memories which rely primarily on one communication mode, the verbal, will be nearly context free and will be stored in the taxon memory, subject to decay unless used often. By adding verbal or graphic imagery to the text the reader can imagine, that is construct a time-space context around the verbal information in order to store it in the local memory system.

Vocabulary words encoded in the taxon system are taught verbally without context, without time-reference, through rote memorization, with verbal examples which establish the categories for the use of those words being

learned. Long-term memory retention may be enhanced by using the local system. The local system provides contextual cues, time and space references and multiple channels for storage and retrieval, all of which help to increase the relative permanence of the information storage.

Lozanov (1978a, 1978b) suggested using many channels for teaching vocabulary words. This facilitates the storage of information into the locale system for relatively permanent long-term memory retention of the taxon system. Lozanov used music, relaxation, imagery, psychodrama and suggestion as his information-processing techniques. In developing a course in foreign language, Lozanov used two music sessions in presenting new vocabulary words. In the first session, he used classical music of an emotional nature; for the second session, he used classical music which he contended produces muscle relaxation and rhythmical breathing even without special exercises other than the music itself. During the concert session, he introduced new words by using special voice intonation to establish teacher authority. He used additional channels of input with psychodrama in which students created their own plays using the newly acquired words. Suggestions by the teacher and the learning environment contributed to the multichannel input. Lozanov stressed the importance of the suggestion of ease of learning, joy of learning, and pleasantness associated with learning. With attention given to all of these aspects, Lozanov revealed enhanced learning and retention rates.

Caine and Caine (1994) stated that one of Lozanov's fundamental principles was that every stimulus is coded, associated, and symbolized. Every sound and every visual signal is packed with complex meaning. "What we are discovering . . . is that beneath the surface of awareness, an enormous amount of unconscious processing is going on" (Campbell, 1989, p. 22). Thus one becomes the experiences and one remembers what is experienced. Teaching that is designed to help students benefit maximally from unconscious processing is more effective teaching. When learners seem to forget a great deal of what is taught, the problem may be a reliance on a singular memory system. A variety of teaching activities, such as reading, music, visualization, or discussion activates multiple memory systems (Jensen, 1995).

Renate Caine and Geoffrey Caine stated that felt meaning and purpose are indispensable to the acquisition of natural knowledge. Knowledge becomes natural when it is sufficiently connected to previously learned material. To create patterns of interconnectedness, subject matter should not be presented in isolated, meaningless pieces; but rather, in experiences of wholeness. Many opportunities for making connections must be provided for students from which they can extract meaningful patterns and relationships. Frames of reference allow for creativity within understood parameters. These are the elements that contribute to a sense of wholeness and permit flexibility, change, and excitement. The Caines (1994) referred to this as

dynamic gestalts. Patterns tie together bits and pieces of information and give a cohesive meaning and purpose to daily learning.

The formation of natural memory is motivated by curiosity, novelty, and expectations and enhanced by sights, sounds, smells, taste and touch (Jensen, 1995). Information can be stored "in a fabric or weave of mental space, which is a thematic map of the intellectual landscape, where learning occurs as a result of changes in location or circumstances, or the use of thematic teaching, story telling, visualization and metaphors (Jensen, 1995, p. 205). Context dramatically improves memory; by learning about a subject in context, memory and recall can improve (Boller & Rovee-Collier, cited in Jensen, 1995).

As foreign language programs are assessed and vocabulary acquisition is studied, teachers are examining the suggestive approach of Lozanov and applying teaching methods that address the whole learner (Crowe, 1986/1987). The findings of Lozanov, Sperry, and MacLean have been reviewed and analyzed for the purpose of facilitating instruction and recommending an accelerative approach in curriculum and teacher training.

Suggestopedia is a psychotherapeutic system that is based on the application of suggestology to education and specifically to foreign language instruction (Du-Babcock, 1986/1987). The suggestopedic procedures were designed to enable individuals to acquire language at the conscious and the slightly unconscious levels. The methodology remains a highly structured

approach which impacts the total personality of the learner through relaxation, music, visualization, accelerated and reinforced types of learning. This research indicated that suggestopedic groups' achievement scores showed significant gains above the norm group which received conventional instructional techniques. Du-Babcock's findings supported the hypothesis that the suggestopedic approach was effective in improving not only vocabulary but also English grammar proficiency. Suggestopedic procedure was an approach that facilitated second-language acquisition naturally with emphasis on communicative competence and realistic utterance.

Kopp (1984/1985) stated that humans differentially process cognitions for semantic and syntactic structural properties. The ability to process information has been a function of language acquisition and usage; it has been advantageous for teachers to use many teaching strategies in order to provide for the differences in learning styles. Foreign language vocabulary acquisition increased when two teaching strategies were combined (Bass, 1985/1986). When used concurrently, the Suggestive-Accelerative Learning and Teaching (SALT) method and the structural analysis method produced significant gains over using each method singularly. Additionally, recall was increased when two mnemonic systems, chunking and chaining, were used concurrently (Flick, 1982). Chunking referred to organizing vocabulary words in meaningful categories and chaining presented vocabulary words in a narrative organizational format. Mental models or visualizations allowed

chunking, or reducing information which was attended to at any one time. thereby giving the student an opportunity to manipulate all of the information simultaneously. Visualization enhanced the effectiveness of chunking which, in turn, provided better problem solving skills (Flank, 1985/1986). In addition to mnemonics and visualizations, semantic mapping and experiences enhanced vocabulary development (Karbon, 1984/1985). Teaching students to utilize or to exploit unique personal experiences with chunking created personal semantic maps which enhanced the ability for recall and aided in vocabulary development.

Information-Processing Research Studies

Several studies in the 1990s investigated the impact and the effectiveness of information-processing techniques on learning and long-term memory. Beverly Questad (1992/1993) conducted a multiple-case study on 10 learning disabled middle school students to determine the effects of Lozanov's Accelerated Learning (AL) methods upon reading achievement. Her study, *A Case Study of the Effects of Accelerated Learning Methodology on Reading Gains of Ten Middle School Students in Southwest Washington*, incorporated Lozanov's AL method utilizing the fine arts, suggestion and visualization techniques with a dynamic, active instructional presentation. Using AL instruction, the students experienced a reading gain of approximately 15½ months per year.

Donni Cook (1995) examined the impact of mental imagery instruction upon reading comprehension in her dissertation, *Effects of Teaching Mental Imagery as a Reading Comprehension and Metacognitive Strategy*. In her descriptive study, she attempted to determine a cause and effect relationship between mental imagery and reading comprehension upon sixth grade students. She discovered that mental imagery has a positive effect upon the reading comprehension of middle school students after they receive mental imagery instruction, process understanding through retelling, and participate in an oral interview. She concluded that it is not enough to know about mental imagery; one should also know how to teach mental imagery, the effects gained through the use of mental imagery, and how students respond to mental imagery instruction.

Trent Gages (1994/1995) investigated how students use visualization for learning in his dissertation, *The Interrelationship Among Spatial Ability, Strategy Used, and Learning Style for Visualization Problems*. Visual learning and spatial cognition are influenced both by individual differences and other interrelated factors such as innate spatial ability, individual learning style, and individual preferences for information-processing strategies. He attempted to discover the interrelationship among spatial ability, strategy used, and learning style so that teachers who teach courses which require abstract spatial cognition can accommodate diversity in learning. He found

that regardless of learning style, more visualization is attempted on moderately difficult spatial problems rather than on easier problems.

Sixth grade students in mathematics instruction were the target audience for Jacqueline Specht's (1994/1995) study, *The Role of Learning Style in the Recall of Classroom Instruction*. She investigated the role of episodic memories, especially with respect to the possible mediation of student learning. Study One used the Individual Differences Questionnaire for verbal and imaginal encoding; this same study used the Inventory of Learning Processes as an adequate measure for learning styles which relate to information-processing theories. Study Two manipulated the amount of imagery used during instruction to determine if such a manipulation affects recall of the information presented. She discovered that students who prefer to encode verbally do better on achievement posttests in the verbal condition. Students who prefer to encode imaginally recall more episodic memories in the imaginal condition. Although the predicted main hypothesis and interaction effects of imagery were not significant, limited support for the mediational hypothesis was found in the form of a correlation between recall of instructionally relevant episodes and posttest scores.

Heidi Van Ert (1993/1994) also used imagery to study the emotional development of gifted fifth grade students. Her study, *Enhancing Emotional Development among Gifted Fifth Grade Students through the Use of Art and*

Imagery, compared three methods of art and imagery on the development of self-esteem among academically gifted fifth grade students.

Method A was a combination of imagery and art approach, using guided visualization pertaining to a particular aspect of self-esteem. Students then drew what they visualized. Method B consisted of the art activity only, related to the same aspect of self-esteem. Method C involved only the guided imagery exercise.

Results were examined for significant differences among the three methods using a series of appropriate nonparametric procedures. Significant results were obtained in the comparison of these three teaching methods. Approaches employing guided imagery and art, or the guided imagery only, proved to be more effective in terms of developing certain aspects of self-esteem when compared to the art activity only.

Rainer Tschanett (1991/1993) stated the need for individuals to process an ever-increasing amount of information in the 21st century; therefore, he researched the ability for individuals to acquire and to process information in his dissertation, *Person-Specific Factors of Influence on the Consumer's Ability to Acquire and Process Information: A Memory Psychological Perspective*. The ability to process information heavily depends on the knowledge base stored in long-term memory. A well structured declarative and procedural knowledge might contribute to an appropriate interpretation of pictorial and verbal information. It improves the imagery ability, facilitates the

construction of mental models and compensates for developmental deficits. The composition and intensity of the total involvement of an individual determines the activation of existing knowledge. Highly motivated learners construct and develop stronger knowledge structures. A comprehensive explanation of human information-processing requires the integration of ability factors and motivational components.

Foreign Language Research Studies

At the beginning of the 1970s, concern was growing over the acquisition and development of vocabulary. Until this time, the role of vocabulary development in second language teaching was subordinate to the role of grammar. Opposition was arising to the structural approach and concern was expressed that lexical semantics were being emphasized over vocabulary development. Vocabulary acquisition was beginning to be viewed as a skill that had to be acquired and applied by the learner.

Richards (1976) called for direct vocabulary teaching and concluded that instructional materials need to be prepared with a rich concept of lexical meaning. He believed that the goals of vocabulary instruction should exceed "covering" a given number of words on a list to include techniques which develop rich conceptual knowledge based upon his eight postulates.

Judd (1978) stated that vocabulary instruction should be intense from the beginning of the study of the language. No longer was it to be

subordinate to the study of syntax. He emphasized the importance of presenting words in natural linguistic and sociolinguistic contexts since words presented in isolation are generally not well retained.

Ludwig (1978) stated, "Directed vocabulary study must become an integral part of our foreign language programs if adequate communicative competence is to be achieved at any proficiency level." She proposed instructional techniques that center around students' communicative needs and reading and writing skills. Ludwig emphasized the importance of creating for students real-life situations where target words can be used to express personal experiences and thus enhance the learning of new words.

The complex nature of vocabulary development was finally acknowledged by the end of the 1970s. Instructional techniques were offered to serve the learners' communicative needs and to assist in the instructional processes. There appeared many texts which offered solutions to the vocabulary instructional dilemma. These texts combined vocabulary teaching strategies which were set forth over the 1970s and early 1980s.

Wallace (1982) placed vocabulary instruction on an even plane with the teaching of linguistic structures in his work, *Teaching Vocabulary*. He stated that it was possible to have a good understanding of the language and yet not be able to communicate in the target language. He believed that the learner should be able to recognize the word in both spoken and written form, easily retrieve the word, relate the word to its appropriate meaning and

connotation, use the word in correct grammatical form, pronounce and spell the word correctly, collocate the word appropriately, and use the word at the correct level of formality. Wallace supplied instructional activities and exercises which were designed to foster lexical competence in the learner.

In the 1980s, second language acquisition theorists researched the learning process itself; however at the beginning of the 1990s, foreign language educators were advocating the development of vocabulary as an important element of second language acquisition. The Proficiency Movement of the 1980s (Omaggio, 1985) emphasized the crucial role of context in helping students gain proficiency, for all aspects of the language.

In her dissertation, *Acquiring Spanish Vocabulary In and Out of Context*, Christina Czajkoski (1994/1995) investigated two approaches to vocabulary presentation: in-context and out-of-context. The research examined the effects of either treatment upon short-term and long-term recall. Recall was measured in written translation tests of Spanish vocabulary. For the in-context groups, the effects upon recall of personalization and visualization techniques were considered as well as the types of words remembered (cognate and non-cognate) for all subjects. Czajkoski used subjects from both the University of Pittsburgh and Wheeling Jesuit College. There were 29 English-speaking undergraduate students from Pittsburgh enrolled in two second semester beginning Spanish classes. Group A learned word-pairs through memorization and Group B (in-context) experienced all input in

Spanish. The students from Wheeling Jesuit College were English-speaking undergraduate Spanish II students divided into two experimental groups. The effect of the two approaches upon short-term and long-term recall was assessed in a series of six individual recall tests which were administered on the same day as the presentation and followed by a posttest at the end of the semester. In order to determine any effects on short-term recall of either personalization or visualization for the in-context groups only, Czajkoski included personalized questions for three sets of words and used visuals to accompany all the words whenever possible.

Czajkoski (1994/1995) concluded that there were individual differences in the way that second language vocabulary was acquired. Some students learned better in-context and some students did not. Czajkoski stated that further research was warranted in this area to determine if context has a greater effect over a longer period of time.

Bruce Maylath conducted a study in 1994 to determine the effect that lexicon has upon instructors' assessments of student writing. His dissertation, *Words Make a Difference: Effects of Greco-Latinate and Anglo-Saxon Lexical Variation on Post-Secondary-Level Writing Assessment in English*, set out to determine if composition instructors favored writing with highly Latinate or highly Germanic vocabularies, or a blending of the two.

His study involved 90 post-secondary writing instructors and their rankings of nine student essays which were varied to create three versions: one

highly Greco-Latinate (GL), one highly Anglo-Saxon (AS), and one blended (bl). The rankings were analyzed with a 3 x 3 factorial design comparing rankings to the assessors' ages, years of teaching experience, and places of schooling.

Maylath (1994/1995) concluded that quite a few instructors gave their highest rankings to blended texts, but a significant number of instructors favored the extremes. All of the instructors who favored the AS texts were veteran teachers of writing, averaging 23.4 years of experience. In contrast, all of the instructors who favored the GL texts were novices at teaching writing, averaging nine months of experience. The study's results raised questions concerning teaching methods, hiring practices, and instructor training.

Donald Cellini (1992/1993) departed from the vocabulary arena by studying basic characteristics of foreign language programs in middle schools and junior highs in Michigan in his dissertation, *An Assessment of Foreign Language Programs in Michigan's Middle and Junior High Schools*. In addition to this, his study tested the hypotheses that the program goals and objectives, the methods and materials, and the evaluation of students in middle and junior high schools in both urban and non-urban settings were not significantly different.

Data were gathered through a questionnaire survey. The instrument was field tested and sent to all middle schools and junior high schools in the state of Michigan—a total of 525 schools. Completed questionnaires were

returned from 303 schools, for a return rate of nearly 58%. Two hundred and four schools reported offering one or more foreign language programs.

Cellini concluded that there were no significant differences in program goals, teaching methods and instructional materials, and evaluation of students in both urban and non-urban middle and junior high schools in Michigan.

Summary

The information-processing model suggested that learning is no single, simple task. The memory acts of categorizing, classifying, visualizing, and retrieving may be activated by such questions as, "What have we studied that's like this?" "What does this remind you of that we studied yesterday?" Chunking and imagery are information-processing techniques which facilitate retrieval and recognition. The study to be presented is one attempt to investigate the effectiveness of chunking and imagery in the acquisition of high school Latin vocabulary by Latin I students.

CHAPTER 3

METHODOLOGY

Introduction

To test the hypotheses for this research project, it was necessary to provide comparative data on the performance and attitude toward high school Latin by Latin I students. This chapter includes descriptions of the methods, techniques, and instruments used in collecting data. The researcher also discusses the selection of the population for the study.

Selection of the Population

The subjects of this research project were Latin I students who were drawn from eight Latin I classes from three suburban North Texas high schools which had a population of more than 1600 students. The entire project occurred during the spring semester of 1996. The subjects were students who were enrolled in Latin I. Each teacher who administered the project had more than 20 years of teaching experience in Latin classrooms and held a Latin teaching certification from the state of Texas. Two teachers were female and one was male. The researcher met individually with each teacher once prior to the beginning of the project to discuss and finalize the research procedure. This meeting occurred at a time and location convenient

to the participating classroom teacher so that specific questions concerning the logistics of the experiment could be discussed. The subjects in one of the teacher's classes served as Comparison Group A; the subjects in another teacher's classes served as Comparison Group B; the subjects from the third teacher's classes served as Comparison Group C and Control Group X. A total of 121 subjects from the eight classes participated in the study including: Comparison Group A—a randomly chunked vocabulary Comparison Group of 26 subjects; Comparison Group B—a vocabulary chunked in related categories Comparison Group of 38 subjects; Comparison Group C—a vocabulary chunked in related categories and provided with an imagery treatment Comparison Group of 30 subjects; and Control Group X of 27 subjects. All subjects were advised that the testing would in no way affect their grades.

Instrumentation

A vocabulary list of 21 Latin words selected according to definition from a fourth-year word list developed by Jenney (Jenny, Scudder, & Coffin, 1990) was the pretest (appendix A), the immediate posttest (appendix E), and the delayed posttest (appendix F). These 21 vocabulary words were chosen from this particular list in order to ensure that the Latin I students had not studied the tested words previously in class. Each subject received a list of 21 Latin vocabulary words to study prior to the immediate posttest (appendices B, C, and D). These words were defined with the same definitions as

those that were used on the immediate posttest and the delayed posttest. Control Group X received a list of 21 words which were numbered 1 through 21 and occurred in random order (appendix B). Comparison Group A received a list of 21 words which were numbered 1 through 21; they were grouped randomly into three groups of seven words (appendix C). Comparison Groups B and C received a list of 21 words which were numbered 1 through 21; they were grouped into three groups of seven words and they were grouped into related categories according to definitions (appendix D). The pretest had the Latin vocabulary words presented randomly on the left hand side of the page and their definitions presented randomly on the right half of the page in a matching format.

The study used a Confidence in Learning Latin Scale (Garza, 1994) which utilized a five point scale: 1-very low to 5-highest. The Confidence in Learning Latin Scale (appendix G) was divided into four statements: "This research was a pleasant experience," "I enjoy learning Latin vocabulary," "I have a lot of confidence when it comes to learning Latin vocabulary," and "I believe I would like to take another course in Latin." This scale measured the students' confidence in Latin following the delayed posttest.

Research Design and Treatment

A quasi-experimental design (Campbell & Stanley, 1963) was employed. Subjects served in either one of three Comparison Groups A, B,

C or they served in Control Group X. Comparison Group A tested vocabulary chunked into three groups of seven words; Comparison Group B tested vocabulary chunked into three groups of seven words which were organized into related categories; Comparison Group C tested vocabulary chunked into three groups of seven words which were organized into related categories and were provided with an imagery treatment; and Control Group X received neither chunking nor imagery. All subjects received a pretest identical to the immediate posttest and the delayed posttest. The subjects were given 10 minutes to complete the pretest. Additionally, all subjects were given 5 minutes to complete the Confidence in Learning Latin Scale following the delayed posttest.

Subjects in Comparison Group A, Comparison Group B, and Control Group X received 15 minutes of study time without teacher instruction prior to the immediate posttest. Subjects in Comparison Group C received 5 minutes of teacher instruction which provided the subjects with imagery techniques; the subjects then employed their own imagery techniques during the remaining 10 minutes of study time. The teachers assigned to Comparison Group A, Comparison Group B, and Control Group X simply monitored the subjects to be certain that they remained on task during this 15 minute study time. A delayed posttest was given to all four groups two weeks following the immediate posttest. The delayed posttest took a total of 10 minutes. Study time and prior notice were not given.

Procedures for Data Analysis

The pretest data for the four groups were subjected to the Bartlett Test for Homogeneity of Group Variances (ANOVA) to determine if the groups were statistically the same. A significant difference did not exist between the groups at the .05 level of confidence for the pretest. The data for the immediate posttest and the delayed posttest were also analyzed with the Bartlett Test for Homogeneity of Group Variances (ANOVA). A significant difference was shown to exist at the .05 level of confidence; therefore, the immediate posttest and the delayed posttest were further analyzed with multiple pair-wise comparisons. These results were reported with a FLSD: Fisher-Protected Test for Least Significant Difference (Yount, 1985). Following the delayed posttest, a Confidence in Learning Latin Scale was used to compare differences in student confidence toward Latin. This data was analyzed with a F-ratio at the .05 level of confidence.

CHAPTER 4

PRESENTATION AND ANALYSIS OF DATA

Chapter 4 presents an analysis of the data obtained in Chapter 3 and serves to test the hypotheses stated in Chapter 1. As various teaching methodologies are utilized in the classroom, it is of interest to see how information-processing techniques affect student achievement and confidence in learning Latin vocabulary. The researcher therefore made the following analyses:

1. Data were analyzed to determine whether a significant difference in the level of achievement in word recognition existed between those students whose teacher utilized chunking, chunking in related categories, and chunking with imagery and those students whose teacher used neither chunking nor imagery as measured by immediate testing (H1).

2. Data were analyzed to determine whether a significant difference in the level of achievement in word recognition existed between those students whose teacher utilized chunking, chunking in related categories, and chunking with imagery and those students whose teacher used neither chunking nor imagery as measured by delayed testing (H2).

3. Data were analyzed to determine whether a significant difference in the level of attitude toward Latin existed between those students whose

teacher utilized chunking, chunking in related categories, and chunking with imagery and those students whose teacher used neither chunking nor imagery (H3).

To establish preliminary conditions for the research, it was necessary to give each student in Comparison Groups A, B, C and Control Group X a pretest. The same pretest was given to each student; from this pretest, the Bartlett Test for Homogeneity of Group Variances (ANOVA) was performed to determine if the groups were statistically the same. For three degrees of freedom, this resulted in a F-score of 1.544 and a probability of 0.207. The mean between the groups was not significantly different; thus, the groups were alike in that the Latin vocabulary words which were used in the experiment were unknown to all subjects.

Since a significant difference did not exist between the groups, the experiment was analyzed with an ANOVA. Multiple pair-wise comparisons were conducted between the groups and the results were reported with a FLSD: Fisher-Protected Test for Least Significant Difference (Yount, 1985). An immediate posttest was given to each student in the comparison groups and the control group; it was identical to the pretest. Two weeks later, a delayed posttest was given to the subjects which was also identical to the pretest. Following the delayed posttest, the subjects also responded to the Confidence in Learning Latin Scale (adapted from F. Garza, 1995) to analyze differences in student confidence toward Latin. The students utilized in the

study were selected from Latin I classes in suburban North Texas high schools which have a population of more than 1600 students.

Table 1

Achievement Pretest Means and Standard Deviations-Bartlett Test For Homogeneity of Group Variances (ANOVA)

Control and Comparison Groups

Variable	Number of Cases	Mean	Standard Deviation
Control X	27	1.519	1.087
Comparison A	26	2.846	3.738
Comparison B	38	2.132	2.208
Comparison C	30	1.900	1.517

Chi-Square = 42.776 DF = 3 Probability = 0.001

Source	Sum of Squares	DF	Mean Square	F	Probability
Between Groups	24.833	3	8.278	1.544	0.207
Within Groups	627.167	117	5.360		

As can be seen in the above table, no significant difference was found in the mean achievement scores of students on the pretest. This suggests that the Latin vocabulary words that were used in the study were unknown to all of the subjects. In theory, if the groups can be found to exhibit similar achievement on the pretest, any possible differences on the immediate posttest and the delayed posttest can be attributed to the experimental treatments of chunking and imagery rather than any other factor.

Data Related to Immediate Posttest Results

Table 2

Achievement Immediate Posttest Means and Standard Deviations—Bartlett Test for Homogeneity of Group Variances ANOVA (Hypothesis 1)

Control and Comparison Groups

Variable	Number of Cases	Mean	Standard Deviation
Control X	27	16.333	5.477
Comparison A	26	15.692	5.823
Comparison B	38	18.816	3.571
Comparison C	30	20.267	2.016

Chi-Square = 32.352 DF = 3 Probability = 0.001

Source	Sum of Squares	DF	Mean Square	F	Probability
Between Groups	392.587	3	130.862	6.906	0.001
Within Groups	2217.116	117	18.950		

As indicated by the mean, the related chunking group (Comparison B) and the related chunking and imagery group (Comparison C) performed better on the immediate posttest. This suggests that any possible difference in performance could be due to related chunking and imagery. An analysis of variance was performed to determine if this was a significant difference between the groups. As can be seen according to Bartlett's Test of Homogeneity, there were significant differences between the four groups on the immediate posttest. Since the information presented in table 2 indicated significant

differences, the results were further analyzed using Fisher's LSD test for significant differences in means. The results for the immediate posttest group are presented in table 3.

Table 3

Achievement Immediate Posttest Differences in Means and Shortest Significant Ranges For The Four Test Groups— Fisher LSD Results

Control and Comparison Groups

Differences in Means:

	X Control	A Random Chunking	B Related Chunking	C Chunking and Imagery
X	_____	.64 (R1=2.41)	*2.49(R2=2.32)	*3.94(R3=2.20)
A		_____	*3.13(R4=2.35)	*4.58(R5=2.23)
B			_____	1.45(R6=2.13)

*Significant at the .05 level of confidence.

No significant difference was found between random chunking and no treatment of students on the immediate posttest.

No significant difference was found between imagery and related chunking of students on the immediate posttest.

A significant difference was found in the mean achievement scores of the immediate posttest of students who received chunking with related categories and students who received no treatment.

A significant difference was found in the mean achievement scores of the immediate posttest of students who received chunking with related categories and students who received chunking without related categories.

A significant difference was found in the mean achievement scores of the immediate posttest of students who received imagery and chunking and students who received no treatment.

A significant difference was found in the mean achievement scores of the immediate posttest of students who received imagery and chunking and students who received chunking without related categories.

Data Related to Delayed Posttest Results

Table 4

Achievement Delayed Posttest Means and Standard Deviations—
Bartlett Test For Homogeneity of Group Variances
ANOVA (Hypothesis 2)

Control and Comparison Groups

Variable	Number of Cases	Mean	Standard Deviation
Control X	27	4.519	3.683
Comparison A	26	5.346	4.783
Comparison B	38	7.526	4.958
Comparison C	30	9.467	5.090

table continues

Table 4 - Continued

Chi-Square=3.220 DF = 3 Probability = 0.359

Source	Sum of Squares	DF	Mean Square	F	Probability
Between Groups	428.319	3	142.773	6.461	0.001
Within Groups	2585.566	117	22.099		

Since the information in Table 4 indicated significant differences between the four groups, the results were further analyzed. Using Fisher's LSD test for significant differences in means, the results for the delayed post-test group are presented in Table 5.

A significant difference was found in the mean achievement scores on the delayed posttest of students who received related chunking and students who received no treatment.

Table 5

Achievement Delayed Posttest Difference in Means and Shortest Significant Ranges For The Four Test Groups—Fisher LSD Results

Control and Comparison Groups
Differences Between Pairs

	X Control	A Random Chunking	B Related Chunking	C Chunking and Imagery
X	_____	0.83(R3=2.60)	*3.01(R2=2.51)	*4.95(R1=2.38)
A		_____	2.18(R5=2.53)	*4.12(R4=2.41)
B			_____	1.94(R6=2.30)

*Significant at the .05 level of confidence

In addition to this, a significant difference was found in the mean achievement scores on the delayed posttest of students who received related chunking and imagery and those who received random chunking and students who received no treatment. Based on the findings, it is possible to conclude that the instructional methods of related chunking with imagery and related chunking alone do significantly improve student performance in high school Latin on Latin I students.

Table 6

Confidence in Learning Latin Scale Overall Means and Standard Deviations For The Four Test Groups (Hypothesis 3)

Control and Comparison Groups

Group	Number of Cases	Grand Mean	Standard Deviation	F Ratio
Control X	27	14.370	3.260	_____
Comparison A	26	13.846	3.029	1.15 NS*
Comparison B	38	13.432	2.489	1.61 NS*
Comparison C	30	14.100	2.426	1.81 NS*

*To be significant at the .05 level of confidence the F ratio must exceed 1.93.

From the above data, it may be noted that achievement in Latin I does not significantly encourage confidence in learning Latin among high school students. The students in the control group who received neither chunking nor

imagery seem to display greater confidence in learning Latin I than the other subjects. This may be due to the fact that they may have acquired their own individual information-processing techniques which they employed during the allotted study time.

CHAPTER 5

SUMMARY, FINDINGS, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

The general purpose of this study was to investigate the effects of information-processing techniques of imagery and chunking on the achievement and confidence of Latin I high school students. A total of 121 students participated in the study during the spring semester of 1996. The researcher compared the pretest, immediate posttest, delayed posttest, and confidence rating of three comparison groups and a control group.

Comparison Group A studied 21 Latin words which were chunked into three groups of seven. Comparison Group B studied the same 21 Latin words which were chunked into three categories according to definitions with seven words in each category. Comparison Group C studied the same 21 Latin words which were chunked into three categories with seven words in each category; however, this group also received imagery techniques. Control Group X received no treatment.

All of the groups took a pretest followed by 15 minutes of study time. Comparison Groups A and B received no teacher instruction; Comparison Group C received 5 minutes of imagery instruction followed by 10 minutes of individual study time. Control Group X had 15 minutes of individual study

time without chunking or imagery. All subjects received an immediate post-test following the study time. A delayed posttest was given to all subjects two weeks after the immediate posttest; prior notice was not given to the subjects. All subjects responded to a Confidence in Learning Latin Scale following the delayed posttest. Data collected from these four instruments served as the basis for the analysis of the hypotheses.

Summary of Findings

Achievement and confidence scores of Control Group X and Comparison Groups A, B, C were compared following the chunking and imagery treatment. Correlational analyses among these variables were also calculated for all four groups. Analysis of variance was used to analyze achievement and confidence for the groups. A Fisher-Protected Test of Least Significant Difference (FLSD) was used to analyze multiple pair-wise comparisons of the pretest, immediate posttest, delayed posttest, and confidence scale. The findings resulting from the analysis of the statistical data in this study were the following:

1. No significant difference was found in the mean achievement scores of students on the pretest.

2. No significant difference was found between random chunking and no treatment of students on the immediate posttest.

3. No significant difference was found between chunking and imagery and related chunking of students on the immediate posttest.

4. A significant difference was found in the mean achievement scores of the immediate posttest of students who received chunking with related categories and students who received chunking without related categories and students who received no treatment.

5. A significant difference was found in the mean achievement scores of the immediate posttest of students who received imagery and chunking and students who received only a chunking treatment and students who received no treatment.

6. A significant difference was found in the mean achievement scores on the delayed posttest of students who received related chunking and students who received no treatment.

7. A significant difference was found in the mean achievement scores on the delayed posttest of students who received related chunking and imagery and those who received no treatment.

8. A significant difference was found in the mean achievement scores on the delayed posttest of students who received related chunking and imagery and those who received random chunking.

9. No significant difference was found in the attitude scores across the four specified groups of Latin students as measured by a Confidence on Learning Latin Scale.

Conclusions

Based on the findings, it is possible to conclude that imagery and chunking instruction do significantly improve student performance among high school Latin I students. On the other hand, it may also be noted that it does not significantly encourage confidence in learning Latin.

Implications

Based on the results of the study and the review of the literature, it may be possible to state various implications concerning the ability of imagery and chunking to assist classroom teachers and students in many of today's educational challenges. These implications consider the student, the teacher, and staff development requirements.

Multiple pair-wise comparisons were significant on both the immediate posttest test and the delayed posttest between the imagery and chunking group (Group C) and randomly chunking (Group A), chunking in related categories (Group B), and Control X. This implies that students can retain and recognize more information that is stored in long-term memory by information-processing techniques of chunking and imagery. This might be a key for both students who need to memorize, retain, and retrieve many facts and teachers who need to teach many facts.

By using chunking and imagery, teachers can present many facts and feel confident that the students can remember them and use those facts later.

In order for teachers to fully utilize chunking and imagery, they will need to attend many sessions of staff development and training to fully understand and master these information-processing techniques. As with any new teaching technique, many teachers may be skeptical or hesitant to try something "different." This type of teacher anxiety could be addressed through continuous staff development on such topics as brain research, models of teaching, and more specifically, information-processing techniques of chunking and imagery.

This will require a commitment from the district to provide the necessary funds for substitutes as teachers attend training and for both district level and campus level guest speakers who are knowledgeable in the field of information-processing techniques and brain research. The success of any innovation in the classroom depends upon the commitment of funding.

Recommendations for Further Research

This study dealt specifically with the effect of chunking and imagery on student performance and confidence in learning Latin on Latin I high school students. From this study, various avenues for further research might be developed. They could include:

1. One study might utilize the application of music during the imagery techniques.

2. A second study might omit the 15 minute study time for the control group. It is highly possible that the student's individual desire for achievement is a strong, motivating factor that had not been contemplated.

3. Another study might deal specifically with the concept of staff development when implementing information-processing techniques in high school classrooms.

4. A fourth study might be a longitudinal study utilizing the same students throughout a sequential cycle (level one through level four or five) of a foreign language while employing imagery and chunking.

5. Another study could extend the period of this study to a full year of Latin I instruction utilizing imagery and chunking throughout the entire year.

6. Finally, a study could examine the effects of confidence, attitude, and anxiety of learning Latin on Latin I high school students.

APPENDIX A

VOCABULARY ACQUISITION EXPERIMENT PRETEST

NAME _____ CODE _____

MATCHING: Match the definitions in Column B with the Latin words in Column A.

	COLUMN A	COLUMN B
_____	1. velum	A. plank
_____	2. fluvius	B. breast plate
_____	3. vertex	C. sword
_____	4. prora	D. boat
_____	5. arcus	E. open sea
_____	6. rostrum	F. ocean
_____	7. carina	G. helmet
_____	8. spiculum	H. keel
_____	9. mucro	I. lake
_____	10. trabs	J. bowstring
_____	11. lacus	K. a sail
_____	12. lorica	L. bow
_____	13. galea	M. stream
_____	14. nervus	N. point of an arrow
_____	15. stagnum	O. curved boat
_____	16. aequor	P. straits
_____	17. ensis	Q. whirlpool
_____	18. ratis	R. stern
_____	19. puppis	S. sea
_____	20. pontus	T. sharp point
_____	21. pelagus	U. prow

APPENDIX B

Word List: Vocabulary Acquisition Experiment—Control Group

1. ratis - boat
2. vertex - whirlpool
3. lorica - breast plate
4. puppis - stern
5. trabs - plank
6. arcus - bow
7. pelagus - open sea
8. fluvius - stream
9. stagnum - straits
10. nervus - bowstring
11. ensis - sword
12. rostrum - curved boat
13. galea - helmet
14. velum - a sail
15. carina - keel
16. mucro - sharp point
17. prora - prow
18. spiculum - point of an arrow
19. pontus - sea
20. lacus - lake
21. aequor - ocean

APPENDIX C

Word List: Vocabulary Acquisition Experiment

Comparison Group A

GROUP 1

1. nervus-bowstring
2. pontus-sea
3. rostrum-curved boat
4. carina-keel
5. ensis-sword
6. trabs-plank
7. aequor-ocean

GROUP 2

8. pelagus-open sea
9. vertex-whirlpool
10. prora-prow
11. lorica-breast plate
12. spiculum-point of an arrow
13. galea-helmet
14. puppis-stern

GROUP 3

15. fluvius-stream
16. lacus-lake
17. ratis-boat
18. stagnum-straits
19. mucro-sharp point
20. arcus-bow
21. velum-sail

APPENDIX D

Word List: Vocabulary Acquisition Experiment
Comparison Group B and Comparison Group C

GROUP 1

1. ratis-boat
2. velum-a sail
3. prora-prow
4. puppis-stern
5. trabs-plank
6. carina-keel
7. rostrum-curved boat

GROUP 2

8. fluvius-stream
9. stagnum-straits
10. aequor-ocean
11. pontus-sea
12. pelagus-open sea
13. lacus-lake
14. vertex-whirlpool

GROUP 3

15. arcus-bow
16. mucro-sharp point
17. lorica-breast plate
18. spiculum-point of an arrow
19. ensis-sword
20. galea-helmet
21. nervus-bowstring

APPENDIX E

VOCABULARY ACQUISITION EXPERIMENT
IMMEDIATE POSTTEST

NAME_____ CODE_____

MATCHING: Match the definitions in Column B with the Latin words in Column A.

COLUMN A		COLUMN B
_____ 1.	velum	A. plank
_____ 2.	fluvius	B. breast plate
_____ 3.	vertex	C. sword
_____ 4.	prora	D. boat
_____ 5.	arcus	E. open sea
_____ 6.	rostrum	F. ocean
_____ 7.	carina	G. helmet
_____ 8.	spiculum	H. keel
_____ 9.	mucro	I. lake
_____ 10.	trabs	J. bowstring
_____ 11.	lacus	K. a sail
_____ 12.	lorica	L. bow
_____ 13.	galea	M. stream
_____ 14.	nervus	N. point of an arrow
_____ 15.	stagnum	O. curved boat
_____ 16.	aequor	P. straits
_____ 17.	ensis	Q. whirlpool
_____ 18.	ratis	R. stern
_____ 19.	puppis	S. sea
_____ 20.	pontus	T. sharp point
_____ 21.	pelagus	U. prow

APPENDIX F

VOCABULARY ACQUISITION EXPERIMENT

DELAYED POSTTEST

NAME_____ CODE_____

MATCHING: Match the definitions in Column B with the Latin words in Column A.

COLUMN A		COLUMN B	
_____ 1.	velum	A.	plank
_____ 2.	fluvius	B.	breast plate
_____ 3.	vertex	C.	sword
_____ 4.	prora	D.	boat
_____ 5.	arcus	E.	open sea
_____ 6.	rostrum	F.	ocean
_____ 7.	carina	G.	helmet
_____ 8.	spiculum	H.	keel
_____ 9.	mucro	I.	lake
_____ 10.	trabs	J.	bowstring
_____ 11.	lacus	K.	a sail
_____ 12.	lorica	L.	bow
_____ 13.	galea	M.	stream
_____ 14.	nervus	N.	point of an arrow
_____ 15.	stagnum	O.	curved boat
_____ 16.	aequor	P.	straits
_____ 17.	ensis	Q.	whirlpool
_____ 18.	ratis	R.	stern
_____ 19.	puppis	S.	sea
_____ 20.	pontus	T.	sharp point
_____ 21.	pelagus	U.	prow

APPENDIX G

Confidence in Learning Latin Scale*

Name of Student _____

Name of Teacher _____

Confidence in Learning Latin Scale

Instructions:

After each statement, circle a number that corresponds closest to the way you feel

1	SD	Strongly Disagree
2	D	Disagree
3	N	Neutral
4	A	Agree
5	SA	Strongly Agree

1. This research was a pleasant experience.	1	2	3	4	5
2. I enjoy learning Latin vocabulary.	1	2	3	4	5
3. I have a lot of confidence when it comes to learning Latin vocabulary.	1	2	3	4	5
4. I believe I would like to take another course in Latin.	1	2	3	4	5

Adapted from Federico Garza, Confidence in Learning Scale, *The effect of the use of laser video disc on achievement, attitude, and confidence of high school biology students*. (Doctoral Dissertation, The University of North Texas, 1994). University Microfilms International. No. 3965, 161.

APPENDIX H

VOCABULARY ACQUISITION EXPERIMENT

PROCEDURES FOR TEACHERS

COMPARISON GROUPS A, B, AND X

I. ASSIGNING NUMBERS TO STUDENTS
   A. Make a list of all Latin I students:
      a. last name
      b. first name
      c. middle initial
      d. grade level
      e. gender
   B. Assign a number to each Latin I student.
   C. The students will have this assigned number for the pretest, the immediate posttest, and the delayed posttest.

II. PRETEST
   A. Write each student's name and assigned number on the pretest.
   B. Give each student a pretest.
   C. Have the students take the pretest.
   D. The pretest will be timed for ten minutes.
   E. Collect the pretests as students finish.
   F. Place the pretests in the large brown envelope labeled "Pretest".

III. VOCABULARY LIST
   A. Immediately following the pretest, students will study the vocabulary list.
   B. Students should study quietly for fifteen minutes.
   C. Teachers will not assist the students during this fifteen minutes in any way.
   D. Teachers will keep students on task during this fifteen minutes of study time.

IV. IMMEDIATE POSTTEST

A. The teacher will write each student's name and assigned number on the immediate posttest. This should be the same number that the student had on the pretest.
B. At the conclusion of the fifteen minutes of study time, give each student the immediate posttest. All students should receive a test with an assigned number on it. They should have the same number on the immediate posttest as they had on the pretest.
C. Have the students take the immediate posttest.
D. The immediate posttest will be timed for ten minutes.
E. Collect the immediate posttests as students finish.
F. Place the immediate posttests in the large brown envelope labeled Immediate Posttest."

V. DELAYED POSTTEST

A. Two weeks following the immediate posttest, the teacher will write each student's name and assigned number on the delayed post-test. This should be the same number that the student had on the pretest and the immediate posttest.
B. Give each student a delayed posttest with an assigned number on it. They should have the same number on the delayed posttest as they had on both the pretest and the immediate posttest.
C. Students will not have prior notice or study time for the delayed posttest.
D. Have the students take the delayed posttest.
E. Teachers will not assist the students in any way.
F. The delayed posttest is will be timed for ten minutes.
G. Collect the delayed posttests as students finish.
H. Place the delayed posttests in the large brown envelope labeled "Delayed Posttest."

VI. CONFIDENCE IN LEARNING LATIN SCALE

A. The teacher will write each student's name and assigned number on the Confidence in Learning Latin Scale. This should be the same number that the student had on the pretest, the immediate posttest, and the delayed posttest.
B. Immediately following the delayed posttest, students will complete the Confidence in Learning Latin Scale.
C. Have the students complete the Confidence in Learning Latin Scale.
D. Teachers will not assist the students in any way.
E. The Confidence in Learning Latin Scale will be timed for five minutes.
F. Collect the Confidence in Learning Latin Scales as students finish.
G. Place the Confidence in Learning Latin Scales in the large brown envelope labeled, "Confidence in Learning Latin Scale."

APPENDIX I

VOCABULARY ACQUISITION EXPERIMENT

PROCEDURES FOR TEACHERS

COMPARISON GROUP C

I. ASSIGNING NUMBERS TO STUDENTS
   A. Make a list of all Latin I students:
      a. last name
      b. first name
      c. middle initial
      d. grade level
      e. gender
   B. Assign a number to each Latin I student.
   C. The students will have this assigned number for the pretest, the immediate posttest, and the delayed posttest.

II. PRETEST
   A. Write each student's name and assigned number on the pretest.
   B. Give each student a pretest which has the assigned a number on it.
   C. Have the students take the pretest.
   D. The pretest will be timed for ten minutes.
   E. Collect the pretests as students finish.
   F. Place the pretests in the large brown envelope labeled "Pretest".

III. VOCABULARY LIST
   A. Immediately following the pretest, the teacher will conduct and model the imagery technique by reading the script. This process should continue for five minutes.
   B. The teacher will then encourage the students to develop and model their own imagery techniques during the remaining ten minutes.
   C. The teacher will keep students on task during this ten minutes of study time.

IV. IMMEDIATE POSTTEST

A. The teacher will write each student's name and assigned number on the immediate posttest. This should be the same number that the student had on the pretest.
B. At the conclusion of the five minutes of imagery instruction followed by ten minutes of individual imagery time, give each student the immediate posttest. All students should receive a test with an assigned number on it. They should have the same number on the immediate posttest as they had on the pretest.
C. Have the students take the immediate posttest.
D. The immediate posttest will be timed for ten minutes.
E. Collect the immediate posttests as students finish.
F. Place the immediate posttests in the large brown envelope labeled "Immediate Posttest."

V. DELAYED POSTTEST

A. Two weeks following the immediate posttest, the teacher will write each student's name and assigned number on the delayed post-test. This should be the same number that the student had on the pretest and the immediate posttest.
B. Give all students a delayed posttest with an assigned number on it. They should have the same number on the delayed posttest as they had on both the pretest and the immediate posttest.
C. Students will not have prior notice or study time for the delayed posttest.
D. Have the students take the delayed posttest.
E. Teachers will not assist the students in any way.
F. The delayed posttest is will be timed for ten minutes.
G. Collect the delayed posttests as students finish.
H. Place the delayed posttests in the large brown envelope labeled "Delayed Posttest."

VI. CONFIDENCE IN LEARNING LATIN SCALE

A. The teacher will write each student's name and assigned number on the Confidence in Learning Latin Scale. This should be the same number that the student had on the pretest, the immediate posttest, and the delayed posttest.
B. Immediately following the delayed posttest, students will complete the Confidence in Learning Latin Scale.
C. Have the students complete the Confidence in Learning Latin Scale.
D. Teachers will not assist the students in any way.
E. The Confidence in Learning Latin Scale will be timed for five minutes.
F. Collect the Confidence in Learning Latin Scales as students finish.
G. Place the Confidence in Learning Latin Scales in the large brown envelope labeled, "Confidence in Learning Latin Scale."

APPENDIX J

Dear Parents,

I will be conducting a research project designed to study the effect of chunking Latin vocabulary words on the instruction of Latin I. I request permission for your child to participate. The study consists of grouping twenty-one Latin vocabulary into three groups of seven. Since memorization of vocabulary words is an essential part of learning a foreign language, this project will help educators to determine the best method of instruction for vocabulary learning.

Your decision whether or not to allow your child to participate will in no way affect your child's standing in his or her class/school. Furthermore, your child's participation in this study is voluntary. Your child may discontinue the study at any time without penalty or prejudice. At the conclusion of the study, a summary of group results will be made available to all interested parents and teachers. Should you have any questions or desire further information, please call me at 817-267-9563. Thank you in advance for your cooperation and support.

Sincerely,

Terri Carter

This project has been reviewed by the University of North Texas Committee for the Protection of Human Subjects. (Phone: 817-565-3940)

****

Please indicate whether or not you wish to have your child participate in this project, by checking a statement below and returning this letter to your child's teacher as quickly as possible.

I do grant permission for my child, _____, to participate in this project.

I do not grant permission for my child, _____, to participate in this project.

_____

Parent/Guardian's Signature

APPENDIX K

Informed Consent for Student Training in the use of Chunking of Latin Vocabulary Words at _____ High School

I, _____, agree to participate in a study of the effectiveness of chunking Latin vocabulary words at _____ High School in _____ Independent School District. I understand that the purpose of the study is to improve the instruction of Latin through the use of chunking Latin vocabulary words.

I understand that my participation is voluntary and that I may withdraw at any time. I understand that there is no risk or discomfort directly involved with this study. I understand that if I choose to participate, I will be expected to 1) take a vocabulary pretest, an immediate posttest, and a delayed posttest; and 2) complete a Confidence in Learning Latin Scale.

I have been informed that any information obtained in this study will be recorded with a code rather than with my name. The researcher will not have a record which identifies me as an individual. Under this condition, I agree that any information obtained in this study may be used in any way thought best for publication or education.

If I have any questions, I should contact the researcher, Terri Carter, at 817-267-9563 (home).

_____

(Date) (Signature of Participating Student)

_____

(Date) (Investigator)

This project has been reviewed by the University of North Texas Committee for the Protection of Human Subjects.

APPENDIX L

Informed consent for Teacher Involvement in the use of Chunking of Latin Vocabulary Words at _____ High School

I, _____, agree to participate in a study of the effectiveness of chunking Latin vocabulary words at _____ High School in _____Independent School District. I understand that the purpose of the study is to improve the instruction of Latin through chunking Latin vocabulary words

I understand that my participation is voluntary and that I may withdraw at any time. I understand that there is no risk or discomfort directly involved with this study. I understand that if I choose to participate, I will be expected to 1) administer to my Latin I students a vocabulary pretest, an immediate posttest, and a delayed posttest; and 2) administer to my Latin I students a Confidence in Learning Latin Scale.

I have been informed that any information obtained in this study will be recorded with a code rather than with my name. The researcher will not have a record which identifies me as an individual. Under this condition, I agree that any information obtained in this study may be used in any way thought best for publication or education.

If I have any questions, I should contact the researcher, Terri Carter, at 817-267-9563 (home).

_____

(Date) Signature of Participating Teacher)

_____

(Date) (Investigator)

This project has been reviewed by the University of North Texas Committee for the Protection of Human Subjects.

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