Latinate Word Parts And Vocabulary: contrasts Among Three Groups Comprising the Community College Preparatory Reading Class

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LATINATE WORD PARTS AND VOCABULARY:
CONTRASTS AMONG THREE GROUPS COMPRISING
THE COMMUNITY COLLEGE PREPARATORY READING CLASS

by

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A dissertation submitted in partial fulfillment of the requirements
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Students enrolled in a college preparatory reading class at one particular community college were categorized based on language origin. Native English speaking students comprised one group and foreign students formed two additional groups—students whose language origin was Latin-based (i.e. Romance languages) and students whose language origin was not Latin-based (i.e. Japanese). A pretest assessment measure was used to quantify the extent that pre-existing knowledge of Latinate word parts and morphologically complex vocabulary differed among groups based on language origin. The identical instrument served as a posttest to measure the extent that direct instruction in morphological analysis resulted in change among the same groups after one semester of instruction. Two sections on both the pretest and posttest yielded a total of four distinct mean scores that formed the primary basis for comparison.

Categorizing students within the college preparatory reading class based on language origin revealed distinctive strengths and weaknesses relative to group identity when learning Latin-based word parts and vocabulary. Results of a one-way fixed-factor analysis of variance, in conjunction with multiple comparison procedures, indicated that the Latin-based group performed the strongest. This group had the greatest mean score on all four measurements; however, only for the word part section of the pretest was the difference statistically significant. The non Latin-based group performed the poorest as evidenced by scoring the lowest on three of the four measures, with a statistically significant difference for the vocabulary pretest. Additionally, a disproportionately large number of students within the native English-speaking group had difficulty mastering
word parts. Though the lower group mean was statistically significant for the word part section of the posttest, practical significance was not observable from the descriptive data. A follow-up frequency tabulation revealed a dichotomization within the native English speaking group between those who proceeded to master word parts and those who did not.

Furthermore, results from a pretest/posttest comparison for each respective group indicated that all three groups made significant gains on both sections of the test instrument as a result of direct instruction in Latinate word parts and vocabulary. However, there was an incongruity between word part and vocabulary mastery as all three group means were markedly better on the word part section of the instrument. The results of this study suggest that college preparatory students, regardless of their language origin, enter higher education with limited knowledge of Latinate word parts and vocabulary. The results further suggest that students comprising the heterogeneously populated college preparatory reading class can profit from direct instruction in morphological analysis—regardless of language origin.

Prior research has demonstrated that college-level content words tend to be morphologically complex, singular in meaning, and likely to be Latinate in origin. Reading is the salient skill utilized across the curriculum and often the primary means of content dissemination. Reading, in turn, is principally linked to the extent of one’s vocabulary. Consequently, teaching morphologically complex vocabulary at the college preparatory level along with providing a working knowledge of morphemes can assist students toward college readiness.
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## TABLE OF CONTENTS

LIST OF TABLES............................................................................................................................ vii  
LIST OF FIGURES.......................................................................................................................... viii  

CHAPTER 1 THE PROBLEM AND ITS CLARIFYING COMPONENTS........................................... 1  
  Introduction..................................................................................................................................... 1  
  Purpose of the Study....................................................................................................................... 3  
  Statement of the Problem............................................................................................................... 4  
  Research Questions....................................................................................................................... 6  
  Hypotheses to be Tested............................................................................................................... 6  
  Definition of Terms....................................................................................................................... 7  
  Assumptions.................................................................................................................................... 10  
  Methodology.................................................................................................................................. 11  
    Selection of the Population........................................................................................................ 11  
    Instrumentation.......................................................................................................................... 11  
  Significance of the Study............................................................................................................. 12  
  Limitations of the Study.............................................................................................................. 13  
  Delimitations of the Study.......................................................................................................... 14  
  Organization of the Study............................................................................................................ 15  

CHAPTER 2 REVIEW OF THE LITERATURE ............................................................................. 16  
  Introduction................................................................................................................................... 16  
  The Prominent Role of Vocabulary............................................................................................... 20  
  Morphological Analysis................................................................................................................ 21  
    Early Studies Examining the Latin Curriculum ........................................................................ 23  
    Early Studies in Morphological Analysis.................................................................................. 29  
  Frequency Lists and Semantic Transparency.............................................................................. 34  
    An Experiment Involving Semantic Transparency ................................................................... 39  
  Critical Components of Morphological Analysis........................................................................ 40  
    Morphological Analysis as a Strategy....................................................................................... 40  
    Word Part Selection.................................................................................................................... 42  
  Limitations...................................................................................................................................... 46  
  Shepherd’s Limitation.................................................................................................................... 48  
  Summary......................................................................................................................................... 49  

CHAPTER 3 METHODOLOGY...................................................................................................... 51  
  Introduction................................................................................................................................... 51  
  Selection of the Population.......................................................................................................... 51  
  Setting........................................................................................................................................... 55  
  Vocabulary and Word Part Instruction......................................................................................... 56  
  Assessment..................................................................................................................................... 57  
  Data Collecting Instruments........................................................................................................ 58  
  Research Questions....................................................................................................................... 60  

CHAPTER 4 DATA ANALYSIS...................................................................................................... 62
LIST OF TABLES

Table 1 Student Number Based on Language Origin ....................................................... 54
Table 2 Descriptive Data for Vocabulary Pretest (N = 132) ............................................ 63
Table 3 Analysis of Variance for Vocabulary Pretest ...................................................... 65
Table 4 Tukey’s b Post Hoc Comparison for Vocabulary Pretest ........................................ 66
Table 5 Descriptive Data for Word Part Pretest ............................................................... 67
Table 6 One Way Analysis of Variance for Word Part Pretest ........................................ 68
Table 7 Tukey’s b Post Hoc Comparison for Word Part Pretest ........................................ 69
Table 8 Descriptive Data for Vocabulary Posttest (N = 132) ........................................ 70
Table 9 One Way Analysis of Variance for Vocabulary Posttest .................................... 72
Table 10 Tukey’s b Post Hoc Comparison for Vocabulary Posttest .................................. 73
Table 11 Frequency Summary for Vocabulary Posttest: All Groups .............................. 74
Table 12 Descriptive Data for Word Part Posttest ............................................................ 75
Table 13 One Way Analysis of Variance for Word Part Posttest ............................... 77
Table 14 Tukey’s b Post Hoc Comparison for Word Part Posttest .......................... 78
Table 15 Frequency Data for Word Part Posttest: All Groups .................................... 78
Table 16 Latin-Based Pretest/Posttest Gain Score Comparisons ............................ 80
Table 17 Non Latin-Based Pretest/Posttest Gain Score Comparisons .......................... 82
Table 18 Native English Speakers Pretest/Posttest Gain Score Comparisons ............. 83
Table 19 Pretest/Posttest Gain Score Summary: All Groups ........................................... 84
LIST OF FIGURES

Figure 1 Vocabulary Pretest Mean Scores for Each Level.................................................. 63
Figure 2 Word Part Pretest Mean Scores for Each Level..................................................... 67
Figure 3 Vocabulary Posttest Mean Scores for Each Level .................................................... 71
Figure 4 Word Part Posttest Mean Scores for Each Level....................................................... 75
Figure 5 Non Latin-Based Word Part Posttest Mean Scores with Normal Curve.............. 76
Figure 6 Boxplots of All Latin-Based Mean Scores ............................................................. 80
Figure 7 Boxplots of All Non Latin-Based Mean Scores....................................................... 82
Figure 8 Boxplots of All Native English Speaker Mean Scores ............................................. 84
CHAPTER 1
THE PROBLEM AND ITS CLARIFYING COMPONENTS

Introduction

The commitment of the community college to open enrollment, coupled with society’s belief in higher education as a means toward personal and career success, has led to a dramatic influx of under-prepared, non-traditional students in pursuit of an Associate’s degree or beyond. For students to overcome barriers in pursuit of this goal, developmental, or remedial, programs have been created to cover the essential skills of reading, writing, and mathematics. In a study conducted by the National Center for Education Statistics, Parsad, Lewis, and Greene (2003) reported that 42% of first-time students entering a public community college took at least one developmental course during the fall of 2000. At the time of the present study, two-year colleges assumed more than 60% of developmental programs throughout the nation. Since the 1980s, 30 states have proposed policies that would relegate remediation to the community colleges, and 7 states, one of which was Florida, have passed laws reducing or eliminating developmental programs from four-year institutions (Ignash, 1997).

Florida’s community college intervention programs have been targeted for improvement. A report released by the Office of Program Policy Analysis and Government Accountability (OPPAGA) listed the following as its first recommendation: “The Legislature has recognized that colleges need to do more to help students with
certain barriers, such as those who need remediation or who are economically disadvantaged” (Fletcher, Elwell, Bigos, Chavis, Gray, Logan, & Smith, 1999, p. iv).

While help is certainly needed in all skill areas, perhaps the most significant barrier to be addressed is in the area of reading. With reading being the salient skill utilized across the curriculum, program completion often hinges on this very skill. Adelman (1996) cited a longitudinal study conducted by the National Center for Education Statistics in which data reflecting student remediation and completion were garnered. The data indicated that students requiring only developmental math eventually fared better than students who were in need of developmental reading: "Deficiencies in reading skills are indicators of comprehensive literacy problems, and they significantly lower the odds of a student's completing any degree" (p. A56).

Juxtaposed against the native English speaker (NES) in need of remediation are the foreign students whose lack of English language proficiency is their primary barrier to pursuing higher education in the United States. Students whose first language is not English (L2) often enroll in courses designed specifically for their language needs. They may take one or more classes that offer assistance in discreet skill areas such as reading, writing, grammar, and/or speaking. Adult students enrolled in such courses will often cite vocabulary acquisition as their primary need. International students polled at the University of California, Los Angeles (UCLA), cited inadequate vocabulary to be the main contributor to problems in academic reading (Crow & Quigley, 1985; see Zimmerman, 1997). Language programs aiming to facilitate student vocabulary acquisition often relegate the teaching of this discreet skill to the reading classroom.
Deficiencies in vocabulary will impede reading. This in turn can hamper success in academia. Hague (1987) noted,

Learning a second language may, at first, appear deceptively simple. In fact, students may mistakenly assume that the new language is like a mirror image of the native language, only with a new set of symbols. Such thinking may work well at first, but may also be the source of problems that arise as students move into the intermediate and advanced levels of language learning. Reading is an area where such difficulties quickly manifest themselves. (p. 217)

These two divergent groups of students comprise the college preparatory reading classroom. Each group typically has its own intrinsic needs; however, the native English speaker and the L2 student enrolled in a college preparatory reading course share the same common skill deficiency. Both are in need of targeted assistance to improve their ability to comprehend text. Reading comprehension assumes a prominent place in students’ college success; additionally, reading comprehension is principally linked to the extent of the students’ vocabulary. Meeting the vocabulary acquisition needs among the increasingly diverse student population in the community college reading course may indeed be a formidable task.

**Purpose of the Study**

The purposes of this study were to see the extent that pre-existing knowledge of Latinate word parts and morphologically complex vocabulary differed among groups based on language origin, and to what extent direct instruction in morphological analysis resulted in change among the same groups after one semester of instruction. Language origin was deemed the principle concern as students’ language background (i.e., Romance languages) may prove advantageous in learning the predominantly Latinate-based vocabulary found in academia, or second language interference experienced by
some students (i.e., Asian) might reveal a severe limitation in the use of morphological analysis. Though it was deemed important to assess native English speakers’ preexisting knowledge of Latinate word parts and corresponding vocabulary and to assess the influence of one semester of instruction, the NES group additionally served as a control to perhaps highlight any advantages or limitations imposed by the foreign students’ native language. Thus, college preparatory reading students were grouped into one of three categories based on language origin—native English speakers (NES), L2 Latin-based (LB), and L2 non Latin-based (NLB).

A pretest was administered prior to instruction to assess students’ existing knowledge of Latinate roots, prefixes, and vocabulary comprised of Latinate word parts. At the conclusion of one semester of study, a posttest was then administered. Results from the two tests were analyzed to note any patterns and/or distinctions among the groups in order to determine what affect language origin had upon vocabulary acquisition that focused on word parts and word families.

Statement of the Problem

The principle focus of this investigation was to determine the extent that morphological analysis served as an effective vocabulary acquisition strategy across three diverse groups comprising the college preparatory reading class in the state of Florida: native English speakers, L2 Latin-based students, and L2 non Latin-based students. Comments by researchers who conducted vocabulary studies with college native English speakers suggest that these students enter higher education with limited knowledge of word part analysis. Levin, Carney and Pressley (1988) speculated, “One probable reason
that adults cannot reliably infer compound-word meanings from their components is that the meanings of the relevant word components may not be well known” (p. 317).

Shepherd (1973) came to a more definitive conclusion with his work among college freshmen (junior college and university) students,

> It was found that there are college freshmen who are uncertain of the meanings of some very common formative prefixes, and that college freshmen differ in their ability to apply knowledge of the meanings of English words and formative prefixes to determine the meanings of derivations formed from these elements. (p. 162)

In another study encompassing both NES and L2 university students, researchers arrived at a similar conclusion. Schmitt and Zimmerman (2002) uncovered a lack of suffixation knowledge apparent in both groups with regard to an active vocabulary; “Perhaps even proficient speakers generate inappropriate word forms based on partial derivational knowledge” (p. 164).

With approximately one-half of the English language being attributed to Latin (Carr, Owen, & Schaeffer, 1942; Shepherd, 1973), it was of interest to see what role Latin-based language origin played in acquisition of English word parts and vocabulary derived from Latin. It was hoped that the pretest might offer insight into the extent of pre-existing knowledge of word parts and Latinate vocabulary among the different groups comprising the college preparatory classroom, while the posttest might offer insight into the extent of the efficacy of morphological analysis (MA) among those same groups. A number of non-Latin based languages utilize an entirely different orthography (e.g., Chinese and Arabic). Consequently, second language interference may inhibit MA usage, or the structure and rule governing properties of the more stable components of MA could prove to be an asset in their English language acquisition. It was hoped that
after one semester of instruction, a comparative analysis of the results from the pretest/posttest instrument would provide insight as to whether or not such a strategy would be productive across the diverse student population in the college preparatory reading classroom in the state of Florida.

Research Questions

1. As evidenced by a pretest, to what extent do mean word part and vocabulary scores differ among three groups (native English speakers, L2 Latin-based, and L2 non Latin-based) comprising the college preparatory reading class in one particular central Florida community college?

2. After one semester of instruction, to what extent do mean word part and vocabulary scores differ among the same three groups (native English speakers, L2 Latin-based, and L2 non Latin-based), as measured by a posttest?

3. At the end of one semester of instruction, to what extent does each group achieve gain scores as measured by a pretest/posttest comparison?

Hypotheses to be Tested

Hypothesis 1: There are no statistically significant differences among the three levels of language origin in regard to word part and vocabulary knowledge mean scores, as measured by a pretest.

\[ H_0: \mu_1 = \mu_2 = \mu_3 \]
Hypothesis 2: There are no statistically significant differences among the three levels of language origin in regard to word part and vocabulary knowledge mean scores, as measured by a posttest.

\[ H_0: \mu_1 = \mu_2 = \mu_3 \]

Hypothesis 3: For each group analyzed separately, there is no significant difference between pretest/posttest word part gain scores, and there is no significant difference between pretest/posttest vocabulary gain scores.

\[ H_1: \mu_d = 0 \]

**Definition of Terms**

To assist in the readability of this paper, an attempt has been made to use the following terms consistently even though ideas synthesized from the various authors covered in the literature review may have used synonyms. In certain cases where direct quotations were cited, the terms below may have been used instead of their synonyms; if so, the terms were placed in brackets.

**Active Vocabulary**: In-depth knowledge of a word whereby the user can generate semantically correct communication either through speaking or writing (in contrast with passive vocabulary).

**Adult Students**: American students having either a high school diploma or equivalent (i.e., GED), and L2 students having the equivalent of a high school diploma or beyond (college or university) from their native country.
**American Student:** For the purpose of this study, students born and raised in the United States of America and whose primary language is English.

**Base (root, stem):** The part of a word that carries the central, or primary, meaning. In this paper, the word *root* will be used predominantly.

**Bound Morpheme:** A word part that must be affixed to another morpheme in order to create a meaningful word in English. The root /ceive/ must be affixed to a prefix, i.e. /re-/ in order to create an English lexical unit, *receive*.

**College Preparatory Course:** Coursework for post-secondary adult students (American and L2) whose skill deficiency prohibits them from taking certain core-curriculum classes. Technically, L2 students may enroll in a sequence of college preparatory courses entailing several semesters. In this study, the L2 student enrolled in a college preparatory course will refer to the highest level of language preparation prior to enrolling in core-curriculum coursework.

**Derivation:** A morpheme added to a base by which the meaning and/or word class of the word changes, i.e., inform, information.

**First Language (L1):** Refers to a student with reference to his or her primary language. In this paper, L1 students will refer predominately to American students whose native language is English.

**Second Language (L2):** Refers to a student learning a second language. In this paper, L2 will refer to non-native speakers of English, i.e., students born outside of the United States. Additionally, for the purpose of this study L2 students have been subdivided based on language origin, either Latin-based (LB) or non Latin-based (NLB).
Inflectional suffixes: Markers of grammatical categories such as plurality /-s/ and tense /-ed/ with little change to the word’s overall meaning.

Latin-based (LB): Non-native English speaking students whose language origin (L1) derives from a Romance language, e.g., Spanish and French. (In contrast, note the definition for non Latin-based.)

Morpheme: The smallest lexical unit of meaning. For example, the word singer is comprised of two meaning-parts—the base sing, which is a vocabulary unit, and /-er/, which conveys the meaning of being the agent, or doer, of the base word.

Morphological Analysis (MA): Pertains to breaking a word into its constituent meaning parts (prefix, root, suffix) to either uncover the meaning of unknown words or to recall previously learned words.

Non Latin-based (NLB): Non-native English speaking students whose language origin did not derive from a Romance language, e.g., Arabic or Russian.

Passive Vocabulary: Words that are understood when encountered either in listening or reading but not actively produced by the same person.

Polysemous Words: Multi-meaning words, e.g., state (Florida, condition, say); this classification also includes homographs (bear—verb, and bear—noun).

Semantic Opaqueness: A word that does not evidence a clear parts-to-whole relationship. The meaning of a word cannot be clearly derived from its constituent parts. For example, animosity is comprised of /animus/, mind, and the noun-abstraction suffix, /-ity/. The meaning of “ill-will” is not clearly conveyed by the constituent parts of the word.
**Semantic Transparency**: A clear parts-to-whole relationship exists between a morpheme and the overall word. The word *telephone* is composed of tele (distance) and phonos (sound). A telephone provides sound from a distance.

**Word Family**: A base word along with its inflections and derivations, extended to include words for which there is a transparent, predictable relationship in both form and meaning. Eject, ejection, and ejector along with inflections (e.g., ejected, ejecting, and ejects) comprise an immediate word family, whereas reject and inject, along with their respective derivations and inflections, are transparent enough to be deemed “cousins” and would, therefore, be grouped into the same word family.

**Assumptions**

1. A major assumption of this study was that reading is a highly complex, cognitive process. Parsing all the underlying factors involved in reading, even investigating the cognitive and metacognitive aspects behind morphological analysis, was beyond the intent of this research.

2. Vocabulary acquisition is essential to improving reading comprehension.

3. NES college preparatory students are assumed to be part of the same population of NES college students believed not to possess adequate word part knowledge.
Methodology

Selection of the Population

A non-random sample was derived from students attending a single community college in the central Florida region. Native English speaking students (n = 44) were enrolled in three different course sections of REA0001 during the fall of 2003. The L2 students (n = 88) were enrolled in EAP 1520, and a sufficient sample size was obtained through replication over the course of several semesters (2001-2002). The L2 sample was dichotomized into the Latin-based (LB) group (n = 37) and the non Latin-based (NLB) group (n = 51).

Instrumentation

A multiple-choice test instrument (Appendix A) was used to gather pretest data that determined the extent of students’ knowledge of Latinate word parts and Latin-based vocabulary. The same instrument was used again as a posttest. The instrument consisted of two sections. Section A was comprised of 15 word parts (10 roots and 5 prefixes), and Section B was comprised of 15 vocabulary items. Each of the 30 questions had 4 possible answers; all word parts and vocabulary items were taken from the text that was used during the semester of instruction. Vocabulary items were verified for difficulty. A more comprehensive discussion about the participants, instrumentation, setting, and course materials is taken up in chapter three.
Significance of the Study

Researchers have long known the important relationship between vocabulary knowledge and reading ability. Davis (1944) performed a factor analysis on items from a reading instrument administered among college students and stated, “It is clear that word knowledge plays a very important part in reading comprehension and that any program of remedial teaching designed to improve the ability of students to understand what they read must include provision for vocabulary building” (p. 191). Sternberg (1987) posited that, “One’s level of vocabulary is highly predictive, if not determinative, of one’s level of reading comprehension” (p. 90).

The importance of direct vocabulary instruction recently has been reaffirmed. Folse (2004) called attention to the need for the promotion of strategies to empower students as active word-learners:

If it is accepted that acquisition of more vocabulary is our goal but that there are simply too many words in the language for all or most of them to be dealt with one at a time through vocabulary instruction, then what is the next logical step? Thus, one of the main classroom activities for teachers of vocabulary is the direct teaching of learning strategies related to vocabulary. (pp. 89-90)

In Florida, community college-preparatory reading programs have been established to address the reading comprehension needs of incoming students whose scores, based on a state-mandated placement test, have targeted them for special assistance. Developmental programs for native English speakers have focused on the remediation of key competencies related to reading. This highly diverse group of students has displayed particular needs indigenous to the population. EAP (English for Academic Purposes) courses prepare L2 students for college coursework. These students
have come from an equally diverse background. The one notable distinction between the
two groups is that students comprising the latter group may have already received an
advanced degree from a college or university from their native country. In the state of
Florida, it has not been uncommon to have both groups populate the same college
preparatory classroom. At the time of the present study, some campuses had not yet
established an upper-level EAP program to address the English language needs of their
more proficient L2 students, and nearly half of the community colleges in the state of
Florida did not have an EAP program at all.

In the community college developmental reading program, a strategy robust
eough to transcend such diversity while efficacious enough to warrant the time
allotment for direct instruction, is needed. It was the contention of Folse (2004), in his
research among the L2 population, that “Teachers need to explicitly teach as much
vocabulary as reasonably feasible. Strategy training is secondary” (p. 99). He expressed
his belief that no vocabulary strategy should usurp the primary role of knowing the
vocabulary itself. Morphological analysis may provide students with a comprehensive
strategy to equip them as independent word learners while simultaneously building a
large quantity of college-level vocabulary that will serve as a scaffold to assist them in
proceeding from the known to the unknown.

**Limitations of the Study**

1. Conclusions reached in this study were limited to the described participants of
the study.
2. In the test instrument, word parts were identified as root or prefix based on information derived from the course text, though more definitive texts (e.g., Ayers, 1986; Schaeffer, 1960, 1963) differ in interpretation.

3. Word parts and vocabulary that comprised the pretest/posttest instrument were limited to the items obtained from the required textbook.

4. The instructor for the students was the researcher of the study.

Delimitations of the Study

1. Though this study limited word parts and vocabulary to Latin origin in an effort to observe LB students’ Romance language influence, students were also taught items that were derived from Greek, Anglo-Saxon, German, and French.

2. This research focused on passive vocabulary since students at the college level usually have concept knowledge for much of the new vocabulary they are likely to encounter; therefore, vocabulary depth as a measure was not taken into consideration.

3. In the test instrument and throughout the semester of instruction, word parts were written in their common form rather than in their linguistically correct classical form (i.e., capitus was taught as cap/capt).
Organization of the Study

Presented in Chapter 1 are the purpose of this study, the research questions to be addressed, the hypotheses to be tested, along with the significance of the study. Additionally, the first chapter provides definitions to key terms used throughout this paper, major assumptions of the researcher, a brief preview of the methodology employed, plus the limitations and delimitations of the study.

A review of the literature is contained in Chapter 2. Key topics addressed in that chapter include prior research demonstrating the rationale for direct vocabulary instruction, early studies on the efficacy of morphological analysis, the importance of semantic transparency, research on vocabulary acquisition strategies, and the key components requisite for the inclusion of morphological analysis into a college preparatory reading program.

Chapter 3 covers the methodology behind this study. A description of the participants and the setting is given, as well as the instrumentation used for the quasi-experimental design. The dissemination of the content during the course of instruction, data collecting procedures, and the assessment procedure are also covered. Chapter 4 outlines the findings of this study, and Chapter 5 provides the summary, conclusion, recommendations, and the implications of the study concerning the inclusion of morphological analysis into the college preparatory reading program in the state of Florida.
CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

Reading has been termed the linchpin to academic success. This is accentuated in higher education where students assume an increasing role as independent learners; additionally, much of the course content is disseminated through reading. According to Perry, Menec, and Struthers (1996),

Reading remains the primary means by which educated people gain information; it is difficult to imagine a college course without reading assignments, almost always via the printed word. Even in today’s computer-rich times, when every college student must achieve a modicum of skill and comfort with computers as aids to writing or calculating, the importance of books in their many contemporary forms is undiminished. (p. 211)

Researchers have demonstrated a significant link between vocabulary knowledge and reading comprehension (Carver, 1994; Davis, 1944, 1968; Nagy & Herman, 1987; Stahl, 1982, 1990). Laufer (1997) pointed out that reading comprehension for both L1 and L2 students is “affected by textually relevant background knowledge and the application of general reading strategies . . . .And yet, it has been consistently demonstrated that reading comprehension is strongly related to vocabulary knowledge, more strongly than to the other components of reading” (p. 20). Anderson and Freebody (1981) summed up three distinct views in an attempt to explain this relationship between vocabulary knowledge and reading comprehension: the instrumentalist hypothesis, the general aptitude hypothesis, and the general knowledge hypothesis.
Briefly, proponents of the instrumentalist theory suggest that an increase in vocabulary size simply yields an increase in text comprehension. In the general aptitude model, the more able students possess both a larger vocabulary and are also better adept in reading comprehension; these are flip sides of the same coin with one not necessarily explaining the other. With the general knowledge hypothesis, or schema theory (Rummelhart, 1981), an organized framework of interrelated structures, or schemata, develops naturally with maturation as the result of accumulated life experience. Having background knowledge on a particular topic facilitates comprehension when reading something relevant to that same topic. The following statement might be found in a sports magazine, “It was first and goal on the five yard line.” This sentence is composed of ten, one-syllable, high-frequency, easy vocabulary items; however, for someone without an American football schema, this sentence would be meaningless.

These three hypotheses are not mutually exclusive (Anderson & Freebody, 1981; Stahl, 1982). What distinguishes them, maintained Stahl, is the implication for instruction. Of the three, only the instrumentalist hypothesis “suggests that teaching word meanings would be, in itself, a useful activity for improving reading comprehension, since only this hypothesis would predict that a student who learns more word meanings would therefore be able to comprehend more difficult texts” (p. 4). This prediction formed the rationale behind Stahl’s dissertation. His literature review highlighted weak evidence in support of the notion that a deliberate attempt to build students’ vocabulary transferred into improved reading comprehension. He cited procedural flaws as the primary reason behind the insignificant correlation. His own investigation, however, did yield a significant correlation between vocabulary instruction
and reading comprehension. The primary factors behind this positive correlation were
the inclusion of both contextual and definitional information as imperatives of the
instructional process.

Mezynski (1983) performed an in-depth review of eight studies involving direct
instruction of vocabulary and subsequent reading comprehension. She found that all
eight of the studies yielded gains in vocabulary acquisition, but results were mixed with
regard to increased text comprehension. Mezynski noted that this disparity was not
surprising given the fact that there were considerable differences in instructional design
and measurement across all studies. In those studies that did yield a positive correlation
between direct instruction of vocabulary and reading comprehension, she attributed the
following instructional components as decisive: the amount of time given to the words,
breadth of training in the use of the words, and “the degree to which active [deep]
processing is encouraged” (p. 273).

Proponents of deep processing suggest that the more involved a learner is in
storing a lexical unit, the better the retention. Instruction, therefore, that involved more
elaborate manipulation of the target words was believed to be more efficacious than
simple recognition activities such as cloze passages or multiple choice. Folse has
conceded that deeper processing results in better learning, but he has questioned the
instructional type that has generally been conceded as deep. He noted that research had
not produced evidence supporting one type of exercise over another as exhibiting more
depth of processing; “It remains unclear which factors specifically influence depth and is
therefore not operationalizable” (Folse, in press).
In Folse’s (1999) work among L2 students, he investigated the concept that more elaborative activities explicitly resulted in greater depth of processing. He challenged the reasons for higher gains in original written output in the following statement:

Since original sentence writing may require more cognitive processing of a word than merely filling in a blank with that word, these results [greater retention] are to be expected. However, it remains to be seen whether the higher gains for original written output are the results of deeper processing or simply more time on task. (p. 7)

Using a within-subjects design, Folse established three conditions with time on task being the critical variable. The elaborative condition required participants to compose an original sentence for each target word. In another condition, students practiced the vocabulary using a fill-in-the-blank procedure. For the final condition, students completed three fill-in-the-blank exercises using the target words. This last condition was chosen because a pilot study demonstrated that it took L2 students approximately three times longer to create original sentences than to complete one cloze exercise. Thus, this final condition was an attempt to equalize time on task with the so-called deep processing manipulation. His findings demonstrated that the (supposedly) more sophisticated productive task did not result in greater retention than the exercise providing multiple exposures. Both conditions, however, significantly differed from the remaining condition that afforded less exposure. The findings of Folse underscored the importance of repeated exposure to target words in order to strengthen memory links and facilitate retention.
The Prominent Role of Vocabulary

Students’ academic success in higher education has been positively correlated with their ability to read well, and reading well is contingent upon the extent of their vocabulary. “It is no wonder that vocabulary knowledge is closely related to academic success. The number of words students know represents the concepts and information they know” (Marzano & Marzano, 1988, p. 1). O’Rourke (1970) maintained that an expanded vocabulary accompanies expanded thought, for vocabulary development is concept development. Groeger (1998), synthesizing the work of several researchers, wrote: “Vocabulary affects concept development and has a strong relationship to reading comprehension” (p. 23). Specific to the realm of academic content knowledge, the following insight was provided by Nelson-Herber (1986):

The facts and concepts of content materials are communicated in words. If pupils have limited content vocabularies, they will be limited in their ability to comprehend the written materials of the content areas . . . .Further, many content area teachers have not been exposed to recent research findings that verify the importance of vocabulary in reading comprehension, [and] that confirm the effectiveness of direct instruction. (p. 626)

Numerous studies that have linked vocabulary acquisition to reading comprehension have been unchallenged for the most part; however, recommendations of specific strategies useful toward that end have been comparatively controversial. Controversial, too, is whether or not any strategy should be directly taught in the reading classroom. Earlier researchers reported that most vocabulary is learned incidentally (Nagy & Anderson, 1984; Sternberg, 1987) and suggested that vocabulary acquisition is best learned naturally in a context-rich environment (Krashen, 1985). This has discouraged some practitioners from building a deliberate, intentional, vocabulary-
specific program (Hulstijn, 1997). An experiment by Carver (1994) among both elementary and college level students suggested that large amounts of free reading, without direct vocabulary instruction, may increase depth of vocabulary knowledge, “but is not likely to increase breath [sic] of vocabulary” (p. 436). Students, as was noted, tend to read within their comfort level and seldom initiate the ascent to more challenging reading material. Carver maintained that, “these findings call into question the practice of devoting large amounts of classroom time to free reading if the purpose is to increase vocabulary or reading level” (p. 413). In the area of second-language acquisition, Folse (2004) has written an entire book exposing common myths that have prevented instructors from incorporating vocabulary instruction into the curriculum, and one chapter is devoted exclusively to the discussion of vocabulary building strategies. Concerning strategies, Nagy and Herman (1984) wrote,

> The fact that most of the words in the language are of very low frequency, and hence will be encountered only rarely, highlights the importance of teaching students strategies for dealing with unfamiliar words, rather than just teaching the meanings of specific words (p. 16). . . .To be effective, vocabulary instruction has to focus on more limited or specific goals. A chief goal should be to teach strategies which will allow readers to cope with unfamiliar words, and become better independent word learners. (p. 32)

**Morphological Analysis**

One strategy that has received attention, among native English speakers over the past nine decades and among the non-native speakers of English over the past two decades, has been the use of morphological analysis. Morphemes are “the smallest unit of language with a distinct meaning” (Brown & Attardo, 2003, p. 24). The word *dogs* is comprised of two morphemes, the base word *dog* and the plural marker /s/. In this
instance, the single letter /s/ bears meaning simply in that it conveys number, i.e., more than one dog. For the purpose of this study, the morphemes referred to in morphological analysis will correspond specifically to the meaning found in roots (stems), prefixes, and suffixes.

Morphological analysis separates words into their constituent meaning-parts. One assumption was that knowledge of one or more parts could transfer over to numerous other words containing the same part(s) (Breen, 1960; White, Power, & White, 1989). Others have mentioned the value of using the word parts as a type of mnemonic to facilitate recall of previously learned words (Ayers, 1986; Carroll, 1940; Nation, personal communication, January 2, 2004). Additionally, there is the contribution made by psycholinguistics (Corson, 1997).

Pedagogical processes of analyzing words into their stems and affixes do seem important in academic word learning. These processes help to embody certain conscious and habitual metacognitive and metalinguistic information that seems useful for word acquisition and use. Getting access to the more concrete roots of Graeco-Latin academic words in this way makes the words more semantically transparent for a language user, by definition. Without this, English academic words will often remain “hard” words whose form and meaning appear alien and bizarre. So this kind of metacognitive development that improves practical knowledge about word etymology and relationships seems very relevant for both L1 and L2 development. (pp. 707-708)

Proponents of the use of morphological analysis point to the vast majority of words that have found their way into English mostly through Latin, and to a lesser extent, Greek. These words tend to be morphologically complex and therefore lend themselves to being decomposed into manageable meaning units. A comprehensive review by Shepherd (1973) of the percentage of English derivations categorized by different language origin suggested that Latin accounts for approximately half of present-day
English vocabulary, “Greek for less than ten percent, and most of the rest is attributable
to the classification Native English or Germanic” (p. 36). This is in keeping with an
earlier in-depth report by Carr, Owen and Schaeffer (1942) in which the authors arrived
at a similar conclusion: “All these counts show that the Latin element represents about
one-half of the contributions made, while Latin and Greek combined represent a little less
than two-thirds” (p. 46). A researcher of one early study recognized that Latin elements
comprised 50%, and Greek 10% of the first 10,000 most frequently occurring words, yet
the respective percentages were 55 and 13.5 for the second 10,000 words (Oldfather,
1940). In the abovementioned study by Carr et al. (1942), their analysis of the 20,000
most common words found in literature for children and young adults identified a 16.15%
increase in Graeco/Latin vocabulary from the first 10,000 words to the second 10,000
words. Furthermore, it was noted in the same data that there was a 16.12% decrease in
vocabulary of Germanic origin. It has yet to be definitively demonstrated the degree to
which this trend of decreased frequency and increased classical origin continues. It was
this pervasive influence, specifically of Latin, upon the English language that led to
numerous investigations during the early 1900s inquiring into the extent that the study of
Latin could facilitate English vocabulary growth.

Early Studies Examining the Latin Curriculum

Originally, teaching Latin in American high schools and universities was an
academic imperative. By the 1970s when it became more of a rarity than a normality to
find Latin course offerings in school, a grass roots “back to basics” effort arose in
educational reform. It was in this context that the teaching of Latin was once again
advocated. According to LaFleur (1985), “During the late 1970s and early 1980s considerable public interest was generated in Latin for its usefulness in improving English vocabulary and reading comprehension” (p. 342). However, was a course in Latin efficacious in generating knowledge of English vocabulary? This was a return to earlier investigations that transpired in the early 1900s.

The practicality of teaching Latin in high school was challenged during the early part of the 20th century as the nation’s higher education institutions became increasingly utilitarian and democratized. Proponents of the Latin curriculum pointed to the indirect value for English. “An analysis of what is meant by the somewhat vague expression, ‘value for English,’ invariably brings out the fact that enlargement and enrichment of the English vocabulary is the chief item on the list of benefits claimed” (Carr, 1921, p. 193). To assess the efficacy of the Latin curriculum, appropriations were released by the General Education Board that allowed the American Classical League to conduct a nation-wide investigation into the methods and results of Latin education in the secondary schools. The committee involved in the investigation established objectives believed to be integral to the study of Latin. One of the stated objectives was, “Increased ability to understand the exact meaning of English words derived directly or indirectly from Latin, and increased accuracy in their use” (American Classical League, 1924, p. 42). According to the investigation, comprehension was perceived in terms of the expansion of a pupil’s passive vocabulary. Passive vocabulary refers to the intake of language either through reading or listening. In contrast, active vocabulary refers to usage, as in speaking and writing. This distinction is significant.
Morphological analysis, as examined in this literature review, will be viewed in relation to its utility as a vocabulary acquisition/word attack strategy as taught in a college preparatory reading class. The goal is to enlarge passive vocabulary in order for the student to better comprehend the course materials through which content is disseminated. If the aim of vocabulary instruction were to build an active vocabulary, then perhaps this technique, or another, would best be reserved for the writing classroom. Fortunately, storage of passive vocabulary is facilitated by the background knowledge of the college-age student. The richer schemata of the older students allow for less elaboration to grasp the primary import of a target word. These students may already understand the basic underlying concepts of the new word; therefore, a simple definition or synonym will often suffice.

Graves (1987) created a hierarchy based on the difficulty involved in learning new words. Learning new words representing known concepts was classified as one of the easier tasks since schemata already exist for the concepts. This was true for both native English speakers and L2 students. In Graves’ judgment, this was a common task through which most vocabulary is learned. Learning new words that represent new concepts was viewed as one of the more difficult tasks. For this, Graves suggested direct instruction. This latter task was seen as more indicative of the language needs of the younger student whose concept development is far inferior to that of the college-age student.

This present research delves into the utility of morphological analysis in the college preparatory reading classroom. From students’ perspective, morale could be lowered if they were required to learn numerous low-frequency words that the students
perceived they would never use (active vocabulary). However, in light of the fact that these students are being prepared for reading requisite to the collegiate experience, a more practical association is made. They will most likely come across in their future coursework the vocabulary they are learning in the preparatory class, and more so the particular word parts that transfer over to numerous other words they have yet to encounter.

In his investigation, Carr (1921) looked into the utility of Latin study for learning an English passive vocabulary. Carr felt that to limit one’s active vocabulary was one’s prerogative, as effective communication could be achieved with simple vocabulary. However, as a student proceeds on to higher education, external forces establish limitations, e.g., by the vocabularies of those speaking to him or those found in required reading. With an aim toward increasing a student’s passive vocabulary for the purpose of facilitating reading, Carr reported:

Inasmuch as most of these newly presented words, from the very nature of the English language, are sure to be of Latin origin, it seems likely that the ready knowledge of Latin roots, prefixes and suffixes would prove of immense value for this purpose, and further, since the power of analysis and of seeing familiar Latin elements in unfamiliar English words is not necessarily automatic, some definite training in the technique of word analysis and derivation would seem to be desirable to secure the best results. (p. 194)

The purpose of Carr’s investigation was to uncover the extent that one year of Latin study played in increasing the pupil’s understanding of English words derived from Latin. Additionally, he sought to understand whether such increase was the result of automatic transfer or dependent upon direct instruction in word analysis and derivations as taught in the Latin curriculum. Data were taken from seven high schools in three different states during the school year of 1919-1920. A vocabulary test incorporating 50
items, half of which were Latin in origin, was administered to students taking first year English. These classes were comprised of students taking, and not taking, Latin courses; student scores were subsequently paired based on the overall performance on the pretest. If Latin students’ scores on a posttest were much greater than the non-Latin students’ scores, yet results were similar for the non-Latin words, the difference might be attributable to the Latin instruction.

Results indicated a marked difference in performance between the two student samples on knowledge of English words derived from Latin; gain scores, however, for the non-Latin words were nearly identical. In the second part of the investigation, Carr sought to determine whether increased knowledge of Latin-based vocabulary was the result of automatic transfer or the implicit teaching of derivations. For this inquiry, a questionnaire was sent to the Latin instructors from the participating high schools. Teachers were asked if any special attention had been given to English derivation instruction during the year, and if so, what supplementary materials, if any, were used.

All but two of the schools incorporated some form of English derivational instruction. Of note, the performance by the students from the two schools where derivation knowledge was not directly taught was lower than students’ performance in the other five schools. Additionally, the schools demonstrating the most comprehensive derivational instruction, as reported in the questionnaire, had the best results. Carr summarized,

The evidence of this point, therefore, while not conclusive, seems to indicate that the transfer of training received in the study of Latin to the field of English vocabulary depends largely upon definite instruction and training in the technique of derivations. (p. 198)
This finding was in keeping with later research by Hamblen (1924), who found that the automatic transfer from Latin to English was small. If derivatives were taught, without rules and principles as aids, transfer increased. When derivatives were studied with the aid of rules and principles, transfer was better still (as summarized by Douglass & Kittelson, 1935).

An investigation by Orleans (1922) into the transfer value through the study of Latin yielded valuable insight pertinent to 21st century college preparatory reading students. Orleans analyzed Thorndike’s *Teacher’s Word Book* (1921). This book is a compilation of 10,000 commonly occurring words that have been rank-ordered based on frequency. For this investigation, nine judges were given a list of Latin-based words taken from the *Teacher’s Word Book*, and a composite rating from these judges was used to determine the likelihood that a student would be able to infer the meaning of the English derivative had he or she known the Latin original. Orleans noted that, as words decreased in frequency, the possibility of transfer from the study of Latin increased. Additionally, he pointed out “that the greatest gain from Latin is with the less common words” (p. 560). This corresponded to the observations years later by Just and Carpenter (1987):

> It is interesting to note that [the] unpredictability of a derived word’s meaning from its structural constituents is much more common among frequent words than among infrequent words (Nagy & Anderson, 1984). Thus, a reader’s structural analysis of a new word he encounters is more likely to be correct if the word is an infrequent one. This is fortunate, because it is precisely an infrequent word that a fluent reader is likely not to know. (p.125)

Symonds and Penny (1927), in their work, initiated a shift in the direction of the research in derivational study. The results of their investigation led to the following
statement, “The conclusion is inescapable that if increase in English vocabulary is the
goal, time spent in the English class on vocabulary is of much greater aid than time spent
in the Latin class” (p. 98). Perhaps the most obvious reason for any investigation that
maintained Latin coursework held little transfer value in English vocabulary growth
stemmed from the methodology and/or emphases covered in Latin classes which indeed
differed from the emphases in English classes. As research shifted from the value of the
Latin curriculum in promoting English vocabulary growth to the value of teaching word
part analysis in the English class, investigators sought empirical evidence of the latter’s
benefit.

Early Studies in Morphological Analysis

Sisson (1941), offering expert opinion, found merit in the knowledge of some of
the key roots and affixes derived from Latin and Greek. Still, he believed that for the
most part, derivations contributed little to knowing the meaning of English vocabulary
comprised of them. This, according to Sisson, was due to the transformation of the
original Latinate meaning over time. Barnes (1942), in his quasi-experiment among
university students (n = 75), found that even when students knew the meaning of a
specific root contained within the vocabulary item in question, students did not fare well
in deducing the meaning of the target word. Similar to comments made by Sisson,
Barnes expressed that the meanings of the derivations had so changed over the course of
time that their utility for present usage may have been lost. He concluded that the results
“seem to indicate that a knowledge of root meanings alone is not of great value in
determining the current meanings of English words” (p. 611).
Related concerns had been voiced as to whether or not the classical language was growing obsolete. Oldfather (1940) studied the vocabulary taken from the writings of Shakespeare and the *King James Version of the Bible*. Of all the words found in Shakespeare that had become obsolete, approximately 44% of those were of classical origin and roughly 50% were traced to native English. Likewise, of the obsolete words extracted from the Bible, a little less than half were of classical origin, and a little more than half were of Germanic or Keltic origin. He reasoned, “It is clear that the native Germanic element is dying out distinctly faster than are the classical elements” (p. 40).

In a different approach, another study was undertaken to determine the derivation of new words that had come into the English language since 1800. The *New Oxford English Dictionary* (1933) was used for reference. By the date of Oldfather’s publication of his paper, only words taken from the first half of the alphabet had been studied (n = 210,780); it was noted that a little over four times as many new words were derived from the classical origin as opposed to Germanic. Oldfather stressed the importance of knowing classical elements and further surmised that Latin was a living language that would continue to contribute to the English lexicon.

Hunt (1953) used correlation procedures to determine the relationships among vocabulary, morphological analysis, and reading with college students (grades sophomore through senior, n = 168). Though a positive correlation between high intelligence and success with morphological analysis was revealed, one of his conclusions was, “Ability to use structural analysis is more than a matter of general intellectual ability, since it tends to be related to reading and vocabulary even when the effect of intelligence is controlled” (p. 201). Additionally, Hunt found that Latin and
modern language study had either a low or negligible relationship to MA, reading, or vocabulary; this finding mirrored early classical studies that determined derivational study was best served in the English classroom if the goal was to improve vocabulary based on such derivations.

Otterman’s (1955) work focused on the use of prefixes and roots among seventh-graders. The samples (experimental and control) consisted of a total of 440 students (220 in each group, with roughly equal numbers based on gender). Intelligence was determined before program implementation based on the Otis Quick Scoring Mental Ability Test, and a reading average was based on the Gates Reading Survey for Grades 3 to 10. Knowledge of word parts to be taught were pretested and posttested using an instrument constructed for this specific purpose (reliability coefficient of .939, split half technique incorporating the Spearman Brown Prophecy Formula). Finally, the Gates Vocabulary Test was administered at the end of the program to determine the effect of instruction on vocabulary gain. Results regarding students’ ability to infer the meaning of new words demonstrated statistical significance only with students possessing superior intelligence. (Neither p value nor alpha level was reported.) “Either the special vocabulary test was so difficult that only the most intelligent pupils could interpret it, or the interpreting of new words from known elements is such a difficult process that only the most intelligent can succeed” (p. 612). Given the ages comprising the sample, the students’ burgeoning concept development may not make for a practical comparison with college preparatory students.

Neither the results from the reading test nor from the Gates vocabulary instrument demonstrated significant gains for the control group. Groeger’s (1998) evaluation of nine
studies on morphological analysis noted that Otterman’s experiment was only one of two that used standardized tests in the assessment. “To appropriately measure the effect of MA training, the evaluation materials should be adapted to the population under study and should include morphemes taught during training” (p. 34). Without this, explained Groeger, it would be difficult to evaluate the training effects. The only instrument specifically made for the Otterman experiment was the one used to assess delayed recall of the prefixes and roots taught. Analyses of these data revealed “a definite superiority of the experimental group over the control group” (p. 613). The conclusion based on the test-specific instrument suggested the viability of word part instruction in promoting long-term (six weeks) recall.

Deighton (1959) wrote a practical book on vocabulary acquisition and explained the limitations of using MA. Though one entire chapter dealt with problems associated with using word part analysis (e.g., change in meaning, absorbed prefixes that have lost their influence, and lack of parts-to-whole relationship), another entire chapter provided coping mechanisms for dealing with these limitations (i.e., selecting useful word parts based on their invariant meaning).

In-depth dissertations advocating or disparaging morphological analysis included the following. Hogan (1961) found morphological analysis training (11th and 12th grade students) to be a valuable vocabulary building aid with the technique of inductive discovery being the key variable. Hoisington (1968) stated that direct instruction in MA significantly improved reading comprehension. Though vocabulary gains were not statistically significant (p = .09), the latter results, according to Hoisington, were close enough to the alpha level (.05) to warrant further investigation. The lack of significance
found when isolating the vocabulary variable may be viewed in light of the earlier
comments by Groeger (1998); Hoisington was the second of two studies, from a total of
eight reviewed by Groeger, to use a standardized test. To reiterate, not creating a unique
test that contained specific morphemes that had been directly taught may have made it
difficult to evaluate the effects of training. Additionally, the sample (sixth grade
students) minimizes generalizing conclusions to the college preparatory student.

Shepherd’s (1973) unpublished dissertation appeared to be one of the more
antagonistic discussions covering MA usage. “It was hoped this study would contribute
to the findings of the existing research so educators might reevaluate the advisability of
teaching the meanings of Latin forms for the purpose of increasing English word
knowledge” (p. 5); and again, “No research has shown there is anything in word-part
vocabulary instruction which should be perpetuated” (p. 10). In his research, a
distinction was made between complex words that contain a recognizable English word
as its base and those which contain a bound morpheme as its base. As an example of the
former, the word immature is comprised of the prefix /im-/ (not) and the word mature.
Therefore, someone who is immature is simply not mature. A bound morpheme refers to
a word part that cannot stand alone as a lexical unit (it would not be listed as a standard
dictionary entry). The word eject is comprised of the prefix, /e-/, which means out, and
the root /ject/, which means to throw. The root /ject/ is not an independent word one
would find in a standard dictionary. Consequently, it must be “bound” to an affix in
order to create meaning. It was Shepherd’s contention, with some limitations, that
complex words comprising a prefix and complete word are worthwhile to learn, whereas
prefixes joined to bound morphemes “would best be abandoned if the purpose is to increase knowledge of such derivatives” (p. 161).

Finally, by the close of the 1980s the pendulum swung yet again as research began to cast morphological analysis in a positive light. White, Power, and White (1989) demonstrated positive results using MA training with middle grade children, and Wysocki and Jenkins (1987) advocated the use of MA to promote vocabulary growth; “If students take advantage of morphological information, they have a powerful generative tool for expanding vocabulary beyond those words directly taught or those learned through contextual analysis” (p. 69). Investigation during the 1980s affirmed the use of MA and highlighted the important contribution of semantic transparency as a critical component to MA instruction.

Frequency Lists and Semantic Transparency

Studies in word frequency demonstrated that higher frequency words are recognized more easily than words of lower frequency, and that only a relatively small number of high frequency words comprise a substantial portion of any reading material. Nation (2001) claimed that 80% of almost any reading material consists of words taken from the first 2,000 most frequently occurring words. Regarding their composition, research has shown that high frequency words are predominately Germanic in origin, monosyllabic, and polysemous (multi-meaning). In contrast, low frequency words are predominately classical in origin, multi-syllabic, and singular in meaning.

Numerous frequency lists have been compiled, e.g., Thorndike and Lorge, the Brown University Corpus, the American Heritage Corpus, the COBUILD Corpus
(Breland, Jones & Jenkins, 1994), and the often referenced “A General Service List of English Words” (West, 1953). With the L2 college student in mind, two academic frequency lists were also compiled. The University Word List (Nation, 1990) was a collection of 800 commonly occurring words from academia. The more recent Academic Word List (Coxhead, 2000) has been considered more productive than its predecessor in that its 570 words are smaller in number, greater in coverage (occurring with a measure of consistency across a broader range of academic disciplines), and slightly greater in overall frequency.

Frequency lists, however, are not without their limitations. Few compilations have incorporated a semantic count (R. Waring, personal communication, June 30, 2004). Items comprising the lists have often been based solely on frequency encountered in a running text taken from a broad spectrum of reading material, but few have accounted for the variety of meaning (polysemy) a particular item may contain. Even when a semantic count has been built into the compilation, the rank order has not been adjusted based on frequency of meaning. Therefore, a word with multiple meanings (e.g., state: Florida, condition, say) may rank high (very frequent) on such a list; however, when the word is parsed into its respective meanings, no single meaning may be particularly high. It is quite possible that a less frequently occurring word, perhaps one that is not even on the list, could rightfully usurp the polysemous word if the single-meaning word was more ubiquitous than any one of the isolated meanings from the multi-meaning word. An additional limitation entails knowing the various meanings of a multi-meaning word. The learning burden to adequately know such a word undoubtedly increases. To illustrate, 83 definitions for the word run were found in the Webster’s New Universal
Unabridged Dictionary (1983). Therefore, what may appear on the surface to be an easy lexical item may in fact be rather complex, more so, in fact, for the L2 student. The word run, fortunately, does have one primary meaning, but other polysemous words have multiple meanings varying in frequency, and oftentimes, quite distinct in meaning. This is especially true for homographs; the animal, bear, is totally distinct from the verb, bear, which means to carry. Howards (1964) suggested,

It may be more efficacious to teach longer words and words from the sciences than it is to teach little “easy” words, since polysyllabic words can be attacked with word structure skills, and since such words are typically one-meaning words. Rarely does one find a scientific word or even a polysyllabic word which has more than one meaning attached to it, whereas we have seen that the so-called “easy” words, monosyllabic words, normally have dozens of meanings attached to them. (p. 381)

Howards’ study directly challenged the long-held assumption that frequently occurring words were automatically easy words. In doing so, he challenged the reliance upon word lists and readability formulas used to evaluate reading material, noting that frequency of occurrence does not guarantee word comprehension for the reader. Nagy, Anderson, Schommer, Scott, and Stallman (1989) contended that the best measure of frequency is not the individual word itself, but the family or those words closely related in form and meaning:

The word inactivity, for example, is a relatively low-frequency word, occurring less than once in a hundred million words of school text ... If word recognition were determined only by the frequency of the individual word, independent of morphological relationships, this word would be accessed slowly. However, when related words such as active, inactive, activity and activities are taken into account, the family frequency of inactivity is 10 thousand times as great as the frequency of this individual member. (p. 264)

Word families, then, do not multiply a word’s frequency but appear to operate exponentially. In order to place words into families, the first thing to determine was what
precisely constituted a word. Nagy and Anderson (1984) contrasted the studies of Dupuy (1974) and Smith (1941) who estimated the typical vocabulary size of American third graders as 2,000 and 25,000, respectively. This inconsonance can be traced to how a particular researcher defined what was meant by a vocabulary word. This is not a case of straining over minutia, but this is a relevant concern more complex than one might initially fathom. For example, proper nouns are seldom a part of any vocabulary count. Numbers, which are infinite, are not included, either. Many technical terms are also omitted due to their content-specific meaning; often it is difficult to tease out borderline words from the mainstream. Furthermore, though walks, walked, and walking, are easily seen as inflected forms of the headword, walk, and are, therefore, learned as one word, nearly all forms of the verb, be, are initially learned as individual words: am, is, are, was, were, been, being. Similarly, basic rules are employed to change the adjective hot into the comparative hotter or the superlative hottest; thus, many comparatives and superlatives are considered extensions of the headword and are not tabulated as separate words. However, the irregular comparative of good (better) and its irregular superlative (best) are initially learned as three independent words.

In an attempt to estimate the number of distinct word families found in school text encompassing grades three through nine, Nagy and Anderson established a six-scale classification system whereby words could be categorized along a continuum ranging from semantically transparent (0) to semantically opaque (5). Words classified as SEM 0 included clever/cleverly and dark/darkness. These words are so similar that knowing one assumes knowing the other. Examples of SEM 5 vocabulary included fix/prefix and pepper/peppermint. The meaning contained in each of these pairs is obviously unrelated.
This six-point classification system was then categorized into two broad sets: SEM 0-2 was collectively deemed semantically transparent, and SEM 3-5 was deemed semantically opaque. Words comprising SEM 0-2 were compressed into families; these word clusters, typically three to five words, were so close in form and meaning that knowing one word would imply knowing the others. Thus, gun, guns, (SEM 0) and gunner (SEM 2) would all come under the heading of one family. Words comprising categories SEM 3-5 would remain separate and distinct due to their lack of clear interconnectedness. If a word were identified as SEM 3, another as SEM 4, and yet another as SEM 5, even though each had the same root, a student learning these words would most likely have to learn each of them separately as the distinctive meanings could not be inferred from the shared component(s).

All of the lexical items used in Nagy’s and Anderson’s study were verified for grade level by corroborating the *Word Frequency Book* (Carroll, Davies & Richman, 1971). Using a random sample of 7,260 words, the extrapolated estimate of 139,020 semantically transparent words (SEM 0-2) were grouped into 45,453 separate and distinct word families. These were added to the 43,080 words comprising SEM 3-5, so Nagy and Anderson’s estimate of English word families totaled 88,533. “If materials for higher grade levels and for adults were included, [this figure] would be substantially higher” (Nagy & Herman, 1984, p. 4). Interestingly, more than half of the words found in the semantically opaque set were classified as SEM 3 (26,599 words); Nagy and Anderson discussed the implications for drawing inferences:

. . . which means that although the meaning of the derived form [from SEM 3] is not completely predictable from the meanings of its component parts, the meanings of the component parts do in fact contribute something to the derived
meaning. Even in these cases, then, knowledge of word formation processes will be helpful to the reader trying to figure out the meaning of words in context. (p. 314)

The researchers’ assumptions about a reader’s inferencing skills being limited to the SEM 2 level could, feasibly, be extended to SEM 3 if the population were college students. Nagy and Anderson contended that if ninth grade students were able to make use of SEM 3 relationships to learn or interpret new words, the total number of families would be reduced to 61,934. These indirectly inferable derivations comprising SEM 3 might point to relevant application for college preparatory students. Skill in morphological analysis could reduce the word-learning burden for college preparatory students, who are apt to encounter an increasing amount of low frequency, multi-syllabic, Latinate vocabulary in their studies. Nagy and Anderson (1984) recognized “an important role for morphology in the learning of vocabulary” (p. 326).

An Experiment Involving Semantic Transparency

Levin, Carney, and Pressley (1988) analyzed the effectiveness of root/affix instruction among college students by establishing a control group that received no instruction and three independent variables based on instructional types. Target words were equally divided between semantically transparent and semantically opaque. Ten prefixes, ten roots, and the ten composite words (five transparent, five opaque) were tested along all conditions. Controlled time on task was administered across all variables, a criterion-based multiple-choice test was given at the end of instruction, and a delayed (three days) posttest was also administered. The three instructional groups significantly outperformed the control group, but no statistically significant differences across the
three methods of instruction were observed. In fact, descriptively, the means were almost identical. In contrast, a significant difference was noted between the two categories of word types. The mean score for the performance of the three groups on semantically transparent items was 94.9; conversely, the mean score for the semantically opaque items was 60.7.

Differences between the instructional and control conditions were much more marked for the [semantically transparent] items than for the [semantically opaque] items. In particular, instruction greatly enhanced the former but not the latter … The findings leave little doubt that explicit root-word instruction can facilitate college students’ ability to derive the correct meanings of directly inferable compound vocabulary items. (pp. 320-321)

Critical Components of Morphological Analysis

Morphological Analysis as a Strategy

In the field of second language vocabulary acquisition, research in vocabulary learning strategies has proliferated over the past decade. Though a balanced approach utilizing diverse strategies has been linked to good readers (Folse, 2004; Gu, 2003; Gu & Johnson, 1996), higher education students in particular appear to have an affinity toward the use of morphological analysis (Schmitt, 1997). This is important as college-level vocabulary tends to be multi-syllabic, less polysemous, and more likely to be Latinate in origin. Important, too, is the research linking reading success to a student’s ability to decompose morphologically complex words (Hoisington, 1968; Kaye, Sternberg & Fonseca, 1987). Nagy, Anderson, Schommer, Scott, and Stallman (1989) reported the following reader differences in their discussion concerning NES school children:
An important characteristic distinguishing good readers from poor readers is the ability of good readers to recognize words with speed and efficiency. This difference appears to be more pronounced for longer words. Given that most longer words are morphologically complex, deficiencies in morphological knowledge may be a cause of poor readers’ difficulties with long words. Studies have found large differences between readers in their knowledge of English derivational morphology and with differences in reading ability. (p. 264)

Vocabulary strategies are techniques employed by the reader to unlock the meaning of an unknown word when encountering it in text, and/or a deliberate attempt to learn a word for the purpose of future recall. Schmitt (1997) compiled a list of 58 vocabulary acquisition strategies, and then in the form of a questionnaire, asked L2 students to identify strategies they themselves employed, and to rate the strategies based on their perception of how helpful they found the particular strategy. The sample was comprised of 600 Japanese students. A total of 150 students were drawn from each of the following age groups: middle school, high school, university, and adult (programs for professionals that were sponsored by corporations). “The study was designed to isolate changes in strategy use and perceptions as Japanese learners progress through the school system and into adult English classes” (p. 223). Broadly, the list of strategies was dichotomized between discovery strategies (n = 44) used to understand an unknown word, and consolidation strategies (n = 14) used to commit a word to memory for future use. Schmitt noted that the analysis of affixes and roots was one of only a few strategies that clearly functioned as both a discovery and consolidation strategy. Of the 58 total strategies, 8 of them would most likely be used exclusively by an L2 student, i.e. “using a bilingual dictionary.” The remaining strategies were representative of those used by both native English speakers and L2 students.
A close look into the different strategies revealed that most of them were intuitive or simply required common sense. For example, some of the listed strategies included asking classmates for the meaning of a word, asking the teacher for the definition, and using a dictionary. In contrast, roughly a quarter of all the strategies (an equal percentage from each category) required some form of direct instruction; additionally, these particular strategies varied in the depth of instruction required. Furthermore, the results of the survey indicated that certain strategies appeared to be more beneficial than others relative to student age. For example, word lists were used less often and deemed less helpful at each progressive stage of the four levels, and the more mature learners (university and adult) held a positive inclination toward breaking complex words into their component parts. With each successive age group, students demonstrated a higher frequency of use, and recorded a higher perception of helpfulness, for both the discovery and consolidating strategy of breaking words into their component parts. Schmitt concluded, “Given the generally favorable response to strategies utilizing affixes and roots, both to help discover a new word’s meaning and to consolidate it once it is introduced, it may be time to reemphasize this aspect of morphology” (p. 226).

Word Part Selection

As early as 1922 the critical components necessary to derive meaning from English vocabulary based on Latin word parts were formalized. “The possibility of transfer from the Latin to the English is determined by such elements as similarity of form, similarity of meaning, and perhaps number of derivatives” (Orleans, p. 559). Two essential aspects stressed by O’Rourke (1974) pertaining to affix instruction were that
prefixes and suffixes be consistent in meaning and occur frequently. (See Just & Carpenter, 1987, p. 121.)

A blend of stable form, transparent meaning, and ubiquity is most noted when the common form of a word part, rather than its classical original, is taught. For instance, the word part *malus* (bad) is often observed in English vocabulary as /mal/, from which are derived such English words as *maladjusted, malevolent, malefactor, malicious, malign* and *malignant*. Apart from its stable form (appearance) and ubiquity (it is found in numerous words), its meaning, *bad*, is transparent; in other words, the morpheme’s meaning is conveyed in each of the example words. In contrast, as an illustration of non-transparency, the root /fer/, which means to bear, or carry, is not clearly conveyed in the words *vociferous* or *ferocious*.

Options for dealing with word parts that vary in form/meaning are to either eliminate them if more confusion than help is the outcome or to teach the predominate form/meaning if one clearly prevails. The college preparatory classroom is not the venue for Latin purity but practical utility. Prefixes were the basis of a study by Graves (1979) because they tended to be “relatively constant in meaning” (p. 2). Prefixes were excluded from a study by Swisher (1988) because “very few have only one invariant meaning or one most commonly used meaning” (p. 203). Suffixes were given more weight by Thorndike as they can provide meaning and determine the word’s part of speech, e.g., noun or verb. Thorndike (1941) compiled a book of suffixes that listed the various meanings for each suffix and its respective part of speech. Additionally, he provided a hierarchy to identify the most salient meaning. Conscientious word part selection, then, appears to be an imperative since researchers have disagreed regarding which word parts
to emphasize, and there has been disagreement about the efficaciousness of the same word part. It is not, therefore, a matter of which category of word parts (roots, prefixes, or suffixes) to incorporate but a matter of carefully selecting specific morphemes from each of the three categories.

A word part that is stable in form and transparent in meaning would not serve much utility if it could only help unlock the meaning of one or two words. Ubiquity is an additional criterion. Just and Carpenter (1987) argued that just as words are more likely to be learned if encountered frequently, this generalization holds true with the meaning found in morphemes that occur in many different words. Holmes and Keffer (1995) sought to increase Scholastic Aptitude Test (SAT) scores through a computer program that enlarged students’ vocabulary by using classical word parts. In determining which roots to incorporate into the program, the criterion for root selection was determined by whether or not a minimum of five English derivatives per root were found on a particular frequency list. Nagy and Anderson’s (1984) concept of word families that extend beyond inflections and immediate derivations sheds light on this idea of ubiquity. For instance, if the word part found in one word retains its meaning in another word (indirectly derived but directly inferable), then knowledge of the known transfers to the unknown. Had one been instructed in the meaning of the word part mal, in addition to learning the meaning of the word malicious, then knowing the meaning of its derivation, maliciously, would logically follow. Knowing the basic import of those two words plus the root could assist the student in inferring the meaning of the word maladjusted if it were not previously known. The latter word, though not a direct derivative, is based on the previously learned word part that clearly conveys its basic meaning in this newly encountered word.
Additionally, the saliency of that word part would provide repeated exposure and opportunity to continually recall its meaning.

Ubiquity in and of itself has its limitations. Brown (see Thompson, 1958) compiled a list of 14 master words that were taught to his adult education students. Based on 20 prefixes and 14 roots, it was claimed that these word parts pertained to “over 14,000 words in the Webster’s Collegiate Dictionary and a projected 100,000 words in an unabridged dictionary” (p. 62). Such claims appear hyperbolic. Regardless, ubiquity is not synonymous with utility. One of the master roots in Brown’s study was /fer/. As previously mentioned, its lack of transparent meaning brings to question how helpful this particular root is. An empirical study by Swisher (1988) found the root /fer/ to be “the most difficult to master based on the number of words generated and retention of its meaning after instruction over time” (p. 204). The criterion of stable form can also be used to question the practicality of some of the morphemes found on the list of Master Words. One of Brown’s master words was precept. The prodigious vocabulary derived from /capere/, the root in this word, comes into question when one considers the variant spellings provided by Brown: cept, cap, capt, ceiv, ceit, and cip. More problematic is the question of transparency. How many of the words containing this root clearly convey its meaning, to seize?

Stauffer (1942) analyzed the first 20,000 words taken from Thorndike and Lorge’s (1941) Teacher’s Word Book and noticed that nearly one quarter (4,922) of those words contained prefixes. Furthermore, fifteen prefixes in particular were found to account for 82% of the 4,922 prefixed words. Though prolific, a look at the list revealed that stable form was not apparent across all 15 prefixes. For instance, the prefix /ad/ was
the third most prolific prefix; in Shepherd’s (1973) criticism of nonformative prefixes, he pointed out that this highly assimilative prefix could be spelled ten different ways. Morsberger (1962) recorded eleven variant spellings to this one prefix.

Limitations

Language strategies offer no panacea, and morphological analysis is no exception. Laufer (1997), in her research, cautioned against deceptive transparency, false cognates, and polysemy. Words that are deceptively transparent appear to offer clues to the word’s meaning based on its constituent parts. Laufer pointed out, “infallible looks as if it were composed of in-fall-ible and meant ‘something that cannot fall’” (p. 25). Similar to this would be a string of letters that function as a morpheme in one setting yet is nonmorphemic in another setting (Feldman, 1991). For instance, the suffix /-er/ usually refers to the person or thing performing the action of the root. Hence, a singer is a person that sings. However, /-er/ is merely a part of the non-suffixed word summer and carries no intrinsic meaning. White, Power, and White (1989) wrote that, “Linguists and vocabulary theorists are fond of presenting examples of words whose meanings cannot be accessed through morphological analysis alone. . . .However, we do not know what percentage of affixed words will cause these kinds of problems” (p. 287). The research of White et al. among grade school children addressed that particular issue. They found that affixed words, when reviewed in isolation, are generally transparent enough to provide a parts-to-whole relationship 60% of the time. By the researchers’ estimation, this increased to 80% when context was factored in.
Pertaining to prefixes, Groeger (1998) suggested that instruction regarding exceptions be taught to students as a conscious-raising device; in other words, exceptions are to be introduced in order to demonstrate a limitation, but elaboration, for example, into the various meanings of particular word parts (rather than focusing on the most salient meaning) would be counterproductive. This principle, one could reason, might carry over well to both roots and suffixes.

False cognates are words that look similar to words found in a student’s L1. Obviously, this problem is unique to the L2 student. The word *novella* refers to a short story in Hebrew; this is quite different from its meaning in English. A third limitation noted by Laufer concerns polysemy. Words having multiple meanings tend to be problematic for native English speaking children and beginning L2 students of any age. Both grapple with multi-meaning words because both groups are building their initial vocabularies. As mentioned previously, polysemy is most likely to occur with the more frequent, monosyllabic, Germanic vocabulary. Polysemy may be less problematic in the college preparatory classroom. What can be problematic is polysemy at the morphemic level. Just as high frequency words have multiple meanings, morphemes can be polysemous as well. Fortunately for the vocabulary learner, there are a comparatively low number of polysemous morphemes. Restricting the teaching of multi-meaning word parts to the predominate meaning, at least initially, is one plausible coping mechanism.

Even with the imposition of the noted limitations, the extent of useable word parts and the vocabulary comprising them can be sufficient to build the language confidence of students in a college preparatory reading classroom. Some of the criticism leveled
against the limited use of morphology is unfounded when taking into account stable form, transparent meaning, ubiquity, and the benefits of direct instruction.

Shepherd’s Limitation

It is at this point that a return to a comment extracted from Shepherd’s (1973) dissertation be analyzed in view of the above-mentioned components and limitations that are to be addressed in an MA program.

The findings of this study support the conclusion that the practice of instructing students that the meanings of Latin roots and nonformative prefixes are related to the meanings of derivations would best be abandoned if the purpose is to increase knowledge of such derivations. (p. 161)

Shepherd’s mention of “Latin roots and nonformative prefixes” referred to connecting bound morphemes to a prefix in order to establish a lexical item. Prefixes, in his study, were used with both bound and unbound (free) morpheme bases, such as /iect/ and /heat/, respectively. The prefixe /re-/ would be termed “nonformative” if it were attached to the base /iect/ (reject), yet the same prefix would be termed “formative” if it were attached to the free morpheme /heat/ (reheat).

According to Shepherd, since the base /iect/ is considered a bound morphemes, it would not be productive to teach this particular word part. Insight by researchers brought out subsequent to his dissertation suggested the following criteria: a word part is to be a blend of stable form, transparent meaning, and ubiquity. In each of the following words, the base /iect/ is spelled the same (form), its meaning “to throw” is conveyed (transparency), and the six words derived from this base (ubiquity) are sufficient to warrant its inclusion in an MA program. In addition, the meaning of the prefix in each of the words assists in determining the gist of each word. Eject is to throw out (to throw out
a player from the game). *Inject* is to throw in/into (to throw in medicine by using a hypodermic needle). *Interject* is to throw between (to throw a comment between statements). *Project* is throw forward (to throw forward an image of oneself). A *Projector* is that which throws forward (a machine which throws forward an image onto the screen). *Reject* is to throw back (throw back an application to the applicant). The criteria of stable form, transparent meaning, and ubiquity warrant the inclusion of at least one third of the morphemes deemed by Shepherd as not to be taught due to the limitation of their bound nature.

**Summary**

In this chapter, the critical role of reading comprehension and its connection to academic success at the collegiate level was highlighted. The literature review revealed the important link between reading comprehension and vocabulary knowledge. Less conclusive, though generally conceded as true, is the link between direct attempts to increase vocabulary with the resultant increase in reading comprehension. To successfully assist college preparatory students in their vocabulary growth, and hence, reading comprehension, a rationale for the need of direct vocabulary instruction along with strategies as a generative technique to attack untaught words was provided.

The study of Latin during the early part of the 20th century and its transfer ability to English vocabulary was investigated due to the preponderance of English language derived from Latin. The emergent pattern from those studies revealed that only when direct instruction centered on derived relationships was the gain in English vocabulary
noteworthy. The focus on derivational study in the English classroom provided a more relevant look into the critical components of vocabulary growth. Subsequent research in word families and semantic transparency was helpful in supplying the rationale for investigating the utility of morphological analysis (MA).

With the critical components of MA delineated, what now remains to be seen is whether or not such a strategy can be effective among the diverse student population that comprises the college preparatory reading classroom in the state of Florida. In particular, by segmenting this sample based on language origin, a more stringent analysis is afforded to distinguish possible limitations and/or advantages this particular technique affords. To this end, the present research seeks to add new knowledge to the extant body of literature in the realm of morphological analysis.
CHAPTER 3

METHODOLOGY

Introduction

This quasi-experimental study investigated the effect of morphological analysis as a vocabulary acquisition strategy among a heterogeneous student population enrolled in college preparatory reading classes at a particular central Florida community college. Heterogeneity was viewed specifically with regard toward language origin. This served as the independent variable from which three levels were obtained: Latin-based (LB), non Latin-based (NLB), and (NES). A pretest was administered during the first week of instruction to assess the extent of students’ prior Latinate word part and vocabulary knowledge; the same test was utilized as a posttest 12 weeks later in order to note gain scores and to note similarities and contrasts among the three levels.

Selection of the Population

Non random samples were derived from students attending a relatively large community college in the region of central Florida. A description of the three distinct groups follows. NES students from three different course sections (n = 44) were enrolled in REA0001 (developmental reading) during the fall of 2003. These students were placed into this course based on their results from the Computerized Placement Test (CPT) administered prior to the commencement of the semester. The CPT is a placement
test given to students who have either been out of school for three or more years or whose SAT/ACT scores were deemed too low for admittance into a credit-bearing program of study.

The original number of students from the NES group that had taken both the pre and posttest instrument was 54; of this, the data from 10 students were eventually dropped from the dataset. Four students were self-identified as L2; five others were born in the United States but came from households where English was not the primary language; and the score of one student from one section of the test instrument registered as an outlier. For this latter student, a box plot analysis highlighted this person’s unusually high pretest score on the vocabulary section of the test instrument. This student had posted a perfect score of 100 on the vocabulary component while posting a 33 on the word part section. Relatively low test scores subsequently earned on weekly tests and on the mid-term/final exams, in additional to the student’s mediocre performance on class assignments, did not coincide with the unusually high pretest score. After one semester of instruction, this student’s posttest scores on the same test instrument yielded a 73 on the vocabulary section and an 87 on the word part segment. It is the opinion of this researcher that this student’s unusually high score of 100 on the vocabulary portion of the pretest was simply evidence of the limitation of a multiple choice test instrument. Apparently, this student’s fortuitous guesswork had merely deviated from the norm. Tight control in handling the test instrument, the fact that this student was in a satellite campus class that was geographically separated from where the other courses were held, and the inconsequentiality of a pretest score that did not affect one’s grade, all contributed to the unlikelihood that something unscrupulous had occurred.
The L2 students were enrolled in EAP1520 (English for Academic Purposes, advanced-level reading). They had either taken the CPT or had followed the sequence of language courses and were now in their highest level of English language instruction (1500 sequence) prior to full assimilation into an American institute of higher education. Only one section of this class was offered per semester. In order to derive a sufficient sample size, the design was serially replicated. In total, six consecutive semesters spanning from spring 2001 to fall 2002 provided an adequate number of LB students (n = 37) and NLB students (n = 51). The LB population initially comprised 38 students. However, it was later discovered that one student who had self-identified as French speaking, turned out to be equally proficient in Arabic; these language origins are mutually exclusive. Similarly, due to mutually exclusive language origins, one student was exempted from the original NLB population. This latter student was from the Philippines. Though one might assume the Philippine language, Tagalog, to be NLB in origin, the influence of both Spanish and English in the Philippines raised the issue of confounding effects. The questionable nature of the Romance language influence on Tagalog appeared warranted as this individual’s pretest and posttest means very closely approximated those of the LB group mean on both sections of the test instrument.

Table 1 provides a concise overview of the specific languages comprising each of the three separate groups of the independent variable. The data are rank ordered within each of the respective groups.
<table>
<thead>
<tr>
<th>Language</th>
<th>NES</th>
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<th>NLB</th>
<th>Total</th>
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<td><strong>37</strong></td>
<td><strong>51</strong></td>
<td><strong>132</strong></td>
</tr>
</tbody>
</table>
Setting

All participants had attended the same community college in central Florida. For the L2 population, two classes from the spring semester (2001, 2002), two classes from the summer semester (2001, 2002), and two classes from the fall semester (2001, 2002) controlled for the seasonal affect. All courses were held in the same classroom and during the same class days and time, Monday through Thursday, 9:40 a.m. until 11:00 a.m., for the duration of 12.5 weeks (environmental control).

NES students, in contrast with their L2 counterparts, attended classes in one of three settings. One of the two morning classes was held in the same location where the L2 students attended. This class met Monday and Wednesday from 10:00 a.m. until 12:00 p.m. A Tuesday/Thursday class met from 10:30 a.m. until 12:30 p.m. on a branch campus approximately 30 miles away. The third class was held during the evening on Tuesday and Thursday from 7:00 p.m. until 9:00 p.m. This third class was held at yet another branch campus that was situated equidistant from the other two campuses. Also, an additional hour per week was scheduled for laboratory time for each of the REA0001 classes. All three of the NES classes were 15 weeks in duration. As with the L2 population, all classes were taught by the same instructor and utilized the same course materials.
Vocabulary and Word Part Instruction

The vocabulary and word part items used in all classes were learned mostly through independent text reading. An outline that highlighted word parts and vocabulary specifically from the text, along with the respective chapter/section/page number, was provided to facilitate content focus; the students were responsible only for those target word parts and vocabulary. A portion of class time was allotted one day prior to each test in order to answer students’ questions. This informal interaction typically lasted from five to fifteen minutes. Ethical considerations prevented the researcher from maintaining strict control regarding time allotment for this segment. Of interest, prior studies indicated that group discussion covering target vocabulary made a significant contribution toward acquisition of that vocabulary (see Stahl, 1983).

In sum, 65 roots were taught, which accounted for 315 distinct words—or approximately 5 words per root. Students were required to utilize inflectional and derivational knowledge in order to correctly identify or produce different word forms based on parts of speech (e.g. noun abstraction, noun agent, noun thing, adjective). Therefore, the amount of potentially different words the student could be expected to know more than tripled the fixed number of words explicitly taught. Additionally, students were taught 42 different prefixes and 24 suffixes. Though researchers often have reported that suffixes rarely carry intrinsic meaning, the majority of suffixes (17) for this study were chosen because they did, in fact, add meaning to the overall word and did not merely supply the part of speech. For example, the suffix –itis (Greek origin) denotes
a noun while additionally conveying the meaning of inflammation, as in *tonsillitis* and *tendonitis*.

**Assessment**

Ten weekly tests, a comprehensive mid-term, and a comprehensive final examination were administered as a part of ongoing assessment. Each of the ten weekly tests included a review section, which was in keeping with pedagogy that emphasized multiple exposures to the target words and number of retrievals as key components toward facilitating long-term recall (Folse, 1999; Hulstijn, 2001). An item-by-item review was conducted at the conclusion of each weekly test. For the two major examinations, a computer-generated item analysis highlighted the more troublesome items. These were given priority and addressed in class; subsequently, individual questions for the remaining items were addressed on a need basis only. Review of each of the major exams took approximately 15 minutes.

The weekly tests varied in format, e.g. item selection, matching, and response generation. Major exams had several sections and each section differed in format, but these tests were exclusively multiple-choice (two to five possible answers per question). The posttest data-collecting instrument was administered during the last week of class. Students had not previously seen the results of the pretest, were unaware of which particular items they had answered incorrectly, and were unaware that a posttest was going to be administered. Time between the final weekly test and the posttest was
approximately one week. The posttest was administered one day (or more) prior to the final exam to prevent exposure to the exam from facilitating recall of the posttest.

Data Collecting Instruments

A multiple-choice test instrument (Appendix A) was used to gather pretest data that determined the extent of students’ existing knowledge of Latinate word parts and Latin-based vocabulary. The same instrument was used again as a posttest to obtain gain scores. Both pretest and posttest mean scores were used to furnish data for later analyses across groups. The instrument consisted of two sections. Section A was comprised of 15 word parts (10 roots and 5 prefixes), and Section B was comprised of 15 vocabulary items. Each of the 30 stems had 4 possible answers. Word parts and vocabulary were taken from *Word Power Made Easy* (Lewis, 1978). The same book was used to distinguish word parts as being either a root, prefix, or suffix. Since this text was utilized in all courses, posttest gain scores were based on mastery of course content as primarily derived from this book. Vocabulary items on the test were not to contain word parts found on section A. This was purposely done to discourage students from cross-referencing the two sections of the instrument as an aid to facilitate guessing. It was not until far into the research that it was discovered that one vocabulary item, vociferous, also had one of its roots, voc, utilized in the word part section.

Subsequent to the creation of the test instrument, the vocabulary words were reviewed for level of difficulty by using *The Living Word Vocabulary* (Dale & O’Rourke, 1981). The mean grade level for the 15 vocabulary items used in the instrument was 11
with a standard deviation of 2.9. The mode was 13 (n = 5) and the median was 12 (negative skew: mean < median < mode). The vocabulary level was cross-referenced by using *A Revised Core Vocabulary: A Basic Vocabulary for Grades 1-8 and Advanced Vocabulary for Grades 9-13* (Taylor, Frackenpohl, & White, 1969). The mean grade level was 10.6 with a standard deviation of 2.3. Additionally, the mode was 12 (n = 4) and the median was 11; this resulted in a negative skew (mean < median < mode). Apart from the lower mode, the slightly lower mean obtained from the latter reference text was partly attributed to grade level assignments for the individual words. The Taylor et al. text did not identify grade levels beyond college freshmen (grade 13) whereas Dale and O’Rourke registered grade level 13 and then jumped to 16; one word, vociferous, was ranked with a grade level of 16. This higher number, which was not possible in the other text, partially accounted for the slightly larger vocabulary mean for the Dale and O’Rourke text. Additionally, the Taylor et al. text did not provide data for two of the words used in the pretest/posttest instrument (n = 13).

Students recorded their answers to questions from the test instrument on an accompanying computerized scan sheet (Appendix B). A portion of the scantron above the student’s name was designated for students to write in their primary language and country of origin; this information determined L2 student categorization as either Latin-based or non Latin-based. For the NES group, the same information was requested. A student whose primary language was not English, or whose country of origin was not the United States, was excluded from the dataset so as to eliminate any confounding effect. One advantage this researcher had in being the instructor was the familiarity with the students that was afforded him. This provided the instructor with an opportunity to know
students on an individual basis and thus qualitatively verify students’ language origin as self-identified on the scantron. This proved beneficial in one particular instance where a student had identified herself as LB (French). It was uncovered during the course of the semester that this student had also lived in North Africa and was equally conversant in Arabic. Since, for this study, these respective language origins (LB and NLB) are mutually exclusive, her scores were subsequently purged from the dataset.

Research Questions

1. To what extent do mean word part and vocabulary scores differ among three groups, based on language origin, as evidenced by a pretest? A one-way fixed-factor ANOVA was used to assess whether or not significant differences existed among the variables. The independent variable, language origin, consisted of three levels: native English speakers, L2 Latin-based, and L2 non Latin-based. The alpha level for all analyses was set at .05. If statistically significant differences were noted, Tukey’s b post hoc multiple comparison procedure (for unequal ns) was used to identify the significantly different dependent variable(s).

2. To what extent do mean word part and vocabulary scores differ among the same three groups after one semester of instruction, as evidenced by a posttest? A one-way fixed-factor ANOVA was used to assess whether or not significant differences existed among the variables. If statistically significant differences were found, Tukey’s b post hoc multiple comparison procedure was used to identify the significantly different dependent variable(s).
3. At the end of one semester of instruction, to what extent will each group have achieved gain scores as measured by a pretest/posttest comparison? A dependent samples t-test was used to conduct three separate analyses.
CHAPTER 4
DATA ANALYSIS

Introduction

Chapter 4 has been organized to sequentially address the research questions and their respective hypotheses as they were previously proposed. Tables and figures have been used to visually display the descriptive data. Major assumptions are discussed along with rationale for proceeding with a particular analysis when assumptions were not fully met. Since most of the research questions were addressed using a one-way analysis of variance, the use of post hoc analyses and their subsequent results have also been included. Finally, the rejection or failure to reject the null hypothesis for each original research question has been reported in each respective section of this chapter.

Research Question 1

Vocabulary Pretest

To what extent do mean word part and vocabulary scores differ among three groups (native English speakers, L2 Latin-based, and L2 non Latin-based) as evidenced by a pretest? The null hypothesis stated that results of a pretest would display “no significant difference among the three levels of language origin in regard to word part and vocabulary knowledge mean scores.” This first analysis isolated the data obtained solely from the vocabulary section of the pretest. Table 2 outlines the descriptive data
obtained from the analysis while Figure 1 displays a summary of the means for each of the respective levels.

Table 2
Descriptive Data for Vocabulary Pretest (N = 132)

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB</td>
<td>37</td>
<td>68</td>
<td>67</td>
<td>16.7</td>
<td>-.163</td>
<td>.118</td>
</tr>
<tr>
<td>NES</td>
<td>44</td>
<td>63</td>
<td>60</td>
<td>15.0</td>
<td>-.341</td>
<td>1.030</td>
</tr>
<tr>
<td>NLB</td>
<td>51</td>
<td>42</td>
<td>40</td>
<td>18.2</td>
<td>.658</td>
<td>.655</td>
</tr>
</tbody>
</table>

Note: LB = Latin-based; NES = Native English Speakers; NLB = Non Latin-based

Figure 1
Vocabulary Pretest Mean Scores for Each Level
Of the different measures of central tendency, the mean is most sensitive to extreme scores. Abnormally low or high scores of only a few students can dramatically affect the group mean (Brown, 1997). As a result, median scores were computed and the results are provided as part of Table 2. The distribution of scores was examined for skewedness and kurtosis and was found to be normal. The statistic for kurtosis of the NES population (1.03) suggested a slightly leptokurtic form. As a result, a follow-up procedure was conducted to confirm normality. The one sample Kolmogorov-Smirnov Test revealed that the test distribution was normal ($z = .826$, Asymp. Sig. [2-tailed]: .502). The most extreme differences were .125 (absolute), .103 (positive), and -.125 (negative).

The descriptive data appeared to indicate a difference among the means, so a one-way fixed-factor ANOVA was chosen to assess whether this observed difference was statistically significant. Table 3 provides the summary table of the one-way ANOVA. In general, the one-way ANOVA is used to compare means derived from three or more groups. This minimizes the chance of a Type-I error that is more likely to occur by applying the t-test across multiple pairs of scores. In conjunction with minimizing this risk, the ANOVA acknowledges any statistically significant difference(s) among the variables without pinpointing the distinctive variable(s). Subsequent tests in the form of Multiple Comparison Procedures (MCPs) are incorporated in order to isolate the distinctive variable(s).
Table 3
Analysis of Variance for Vocabulary Pretest

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Type III Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Origin</td>
<td>2</td>
<td>16504.2</td>
<td>8252.1</td>
<td>29.6*</td>
</tr>
<tr>
<td>Error</td>
<td>129</td>
<td>35977.4</td>
<td>278.9</td>
<td></td>
</tr>
</tbody>
</table>

*p < .0001.

The ANOVA revealed a statistically significant difference among the three groups, $F(2, 129) = 29.589$, $p < .0001$, $R^2 = .314$. This led to subsequent analyses using multiple comparison procedures. First, however, a brief discussion concerning assumptions is in order. The interval data used in the analysis of independent groups demonstrated a normal distribution. The Levene’s Test of Equality of Error Variances for the dependent variable, pretest vocabulary mean score, yielded a probability of .561, suggesting that the variances are equal.

Although both the descriptive data and the bar graph appear to indicate which level among the three is distinct, verification of statistical significance was sought through the use of the Tukey’s b post hoc multiple comparison procedure to identify the significantly different dependent variable(s). Table 4 displays the results of the analysis, indicating that the lower mean score of the non Latin-based group significantly differed from the other dependent variables. Based on the results of the one-way ANOVA and subsequent post hoc test, the null hypothesis of equal pretest vocabulary means was rejected.
Table 4
Tukey’s b Post Hoc Comparison for Vocabulary Pretest

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>N</th>
<th>Subset 1</th>
<th>Subset 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLB</td>
<td>51</td>
<td>42.4</td>
<td></td>
</tr>
<tr>
<td>NES</td>
<td>44</td>
<td></td>
<td>63.0</td>
</tr>
<tr>
<td>LB</td>
<td>37</td>
<td></td>
<td>67.6</td>
</tr>
</tbody>
</table>

Note: Uses Harmonic Mean Sample Size = 43.251. Group sizes are unequal. Type I error levels are not guaranteed. Alpha = .05.

Research Question 1

Word Part Pretest

The null hypothesis for the word part section of the pretest stated that there would be, “no significant difference(s) among the three levels of language origin.” Table 5 outlines the descriptive data obtained from the analysis, and Figure 2 displays a summary of the means for each of the respective levels. Additionally, the results of a multiple comparison procedure and the results of an application used to compensate for a failure to meet one of the assumptions follow.
Table 5
Descriptive Data for Word Part Pretest

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB</td>
<td>37</td>
<td>66</td>
<td>67</td>
<td>16</td>
<td>-.111</td>
<td>.512</td>
</tr>
<tr>
<td>NES</td>
<td>44</td>
<td>51</td>
<td>47</td>
<td>13</td>
<td>.173</td>
<td>-.024</td>
</tr>
<tr>
<td>NLB</td>
<td>51</td>
<td>46</td>
<td>47</td>
<td>23</td>
<td>.305</td>
<td>-.566</td>
</tr>
</tbody>
</table>

Figure 2
Word Part Pretest Mean Scores for Each Level
The descriptive data appear to indicate noted differences among the means; questionable, however, is the extreme variation evident within the NLB group (the standard deviation is slightly more than one-half of the mean). A one-way fixed-factor ANOVA was used to assess whether or not significant differences existed among the variables. Assumptions were not met for the homogeneity of variance. The Levene’s Test of Equality of Error Variances for the dependent variable pretest word part yielded $p < .01$. Rejection of the null hypothesis for homogeneous variances across groups is in order. Lomax (2001) stated that the effect of this violation is small with equal or nearly equal n’s across groups. According to his interpretation, nearly equal n’s “might be defined as a maximum ratio of largest $n$ to smallest $n$ of 1.5” (p. 286). In this instance, the ratio between the largest n, 51 and the smallest n, 37 is: $51/37 = 1.4$. Therefore, the analysis proceeded due to the robust nature of the one-way ANOVA within the confines of this acceptable ratio. Table 6 provides the summary table of the one-way ANOVA.

Table 6
One Way Analysis of Variance for Word Part Pretest

<table>
<thead>
<tr>
<th>Source</th>
<th>Df</th>
<th>Type III Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Origin</td>
<td>2</td>
<td>8506.7</td>
<td>4253.3</td>
<td>12.52*</td>
</tr>
<tr>
<td>Error</td>
<td>129</td>
<td>43823.7</td>
<td>339.7</td>
<td></td>
</tr>
</tbody>
</table>

*p < .0001.

The data exposed a statistically significant difference among the three groups, $F(2, 129) = 12.52, p < .0001, R^2 = .163$. Due to the questionability of violations—both
unequal n’s and unequal variances across groups—the Welch and Brown-Forsythe tests (Norušis, 2002) were run to see if results agreed with what was apparent in the descriptive data. The results from both the Welch and Brown-Forsythe tests (p < .01) were in keeping with results obtained from the analysis of variance. A subsequent analysis to isolate the distinctive mean score, therefore, was conducted by incorporating Tukey’s b multiple comparison procedure for unequal n’s. Additionally, Dunnett’s C was used to compensate for the unequal variances. Results from the latter multiple comparison procedure indicated that the Latin-based group significantly differed (statistically) from the other levels, with p < .05. This was in line with the results from the Tukey’s b post hoc comparison; the results from the Tukey’s b MCP are illustrated in Table 7. Based on the results of the one-way ANOVA and subsequent post hoc tests, the null hypothesis of equal word part pretest mean scores was rejected.

Table 7
Tukey’s b Post Hoc Comparison for Word Part Pretest

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>N</th>
<th>Subset 1</th>
<th>Subset 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLB</td>
<td>51</td>
<td>46.06</td>
<td></td>
</tr>
<tr>
<td>NES</td>
<td>44</td>
<td>50.95</td>
<td></td>
</tr>
<tr>
<td>LB</td>
<td>37</td>
<td></td>
<td>65.59</td>
</tr>
</tbody>
</table>

Note: Uses Harmonic Mean Sample Size = 43.251. Group sizes are unequal. Type I error levels are not guaranteed. Alpha = .05.
Research Question 2

Vocabulary Posttest

To what extent do mean vocabulary scores differ among the three groups after one semester of instruction, as evidenced by a posttest? The null hypothesis stated that there would be “no significant difference among the three levels of language origin in regard to…vocabulary knowledge mean scores.” Table 8 displays the descriptive information obtained from the analysis, and Figure 3 depicts the summary of the posttest vocabulary mean scores for each of the respective levels in the form of a bar graph.

Table 8
Descriptive Data for Vocabulary Posttest (N = 132)

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB</td>
<td>37</td>
<td>88</td>
<td>87</td>
<td>8.2</td>
<td>-.520</td>
<td>.15</td>
</tr>
<tr>
<td>NES</td>
<td>44</td>
<td>83</td>
<td>87</td>
<td>10.5</td>
<td>-.179</td>
<td>-1.45</td>
</tr>
<tr>
<td>NLB</td>
<td>51</td>
<td>78</td>
<td>80</td>
<td>13.6</td>
<td>-.909</td>
<td>1.42</td>
</tr>
</tbody>
</table>
The mean scores recorded in Table 8 and visualized in Figure 3 appear to indicate that each of the three means was distinctly different from one another. The descriptive data revealed that the median of the NLB differed from the other group medians. The data for kurtosis from both the NLB (1.42) and NES (-1.45) non-random samples suggested departure from the norm. The data for the NLB group suggested a leptokurtic appearance, while the data for the NES group suggested a platykurtic form. As a result, a follow up procedure was conducted to assess normality. The one sample Kolmogorov-Smirnov Test revealed that the test distribution was normal for both the NES group and the NLB group.

Figure 3
Vocabulary Posttest Mean Scores for Each Level
The Levene’s Test of Equality of Error Variances for the dependent variable was 

\( p = .019 \). The null hypothesis for homogeneous variances across groups was rejected 

since the \( p \) value was less than .05 (unequal variances). Referring once again to Lomax’s 

(2001) statement, the effect of this violation is small with equal or nearly equal n’s across 

groups (no more than a 1.5 ratio of the highest n to the lowest n). The one-way fixed-

factor ANOVA was used to assess whether or not differences among the three levels 

were statistically significant. The results of the analysis are depicted in Table 9.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Type III Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Origin</td>
<td>2</td>
<td>2460.80</td>
<td>1230.4</td>
<td>9.67*</td>
</tr>
<tr>
<td>Error</td>
<td>129</td>
<td>16424.45</td>
<td>127.3</td>
<td></td>
</tr>
</tbody>
</table>

*\( p < .0001 \).

The statistically significant difference, \( F(2, 129) = 9.7, p < .0001, R^2 = .130, \) 

prompted a subsequent post hoc analysis. Since there were both unequal n’s and unequal 

variances across groups, the Welch and Brown-Forsythe tests were incorporated to see if 

results were in keeping with the ANOVA results and in keeping with what were 

suggested in the descriptive data. The results of both the Welch and Brown-Forsythe 

tests were consistent with the previous analysis, so Tukey’s b was utilized as the post hoc 

multiple comparison procedure. Additionally, Dunnett’s C was used since the
assumption of equal variances is not required for this particular MCP. Results from the Dunnett’s C indicated that each of the three groups significantly differed (statistically) from one another, with \( p < .05 \). The results from the Tukey’s b post hoc multiple comparison procedure (Table 10) illustrate the same findings. Based on the results of the one-way ANOVA and subsequent post hoc tests, the null hypothesis of equal posttest vocabulary mean scores was rejected.

Table 10
Tukey’s b Post Hoc Comparison for Vocabulary Posttest

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>N</th>
<th>Subset 1</th>
<th>Subset 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLB</td>
<td>51</td>
<td>77.63</td>
<td></td>
</tr>
<tr>
<td>NES</td>
<td>44</td>
<td></td>
<td>82.93</td>
</tr>
<tr>
<td>LB</td>
<td>37</td>
<td></td>
<td>88.30</td>
</tr>
</tbody>
</table>

Note: Uses Harmonic Mean Sample Size = 43.251. Group sizes are unequal. Type I error levels are not guaranteed. Alpha = .05.

Though the result of mean score comparisons revealed significant differences among all three groups, the descriptive data demonstrated equal median scores for the LB and NES groups with a lower median score for the NLB group. Additional information was provided through a frequency tabulation for each of the three levels. The data have been assembled together in Table 11 to facilitate comparison. A discussion of these data will be taken up in the concluding chapter.
Table 11
Frequency Summary for Vocabulary Posttest: All Groups

<table>
<thead>
<tr>
<th>Test Score</th>
<th>Frequency (N)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LB</td>
<td>NES</td>
</tr>
<tr>
<td>33</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>47</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>53</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>60</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>67</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>73</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>80</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>87</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>93</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>100</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Totals</td>
<td>37</td>
<td>44</td>
</tr>
</tbody>
</table>

Research Question 2

Word Part Posttest

To what extent do mean word part scores differ among the three groups after one semester of instruction, as evidenced by a posttest? The null hypothesis stated that there would be, “no significant difference among the three levels of language origin in regard to word part mean scores.” Table 12 displays the descriptive data obtained from the
analysis while Figure 4 is a bar graph depicting the summary of the means for each of the respective levels.

Table 12
Descriptive Data for Word Part Posttest

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>N</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>LB</td>
<td>37</td>
<td>95</td>
<td>93</td>
<td>5.2</td>
<td>-.86</td>
<td>.44</td>
</tr>
<tr>
<td>NLB</td>
<td>51</td>
<td>94</td>
<td>93</td>
<td>7.7</td>
<td>-1.40</td>
<td>2.08</td>
</tr>
<tr>
<td>NES</td>
<td>44</td>
<td>90</td>
<td>93</td>
<td>7.3</td>
<td>-.33</td>
<td>-.75</td>
</tr>
</tbody>
</table>

Figure 4
Word Part Posttest Mean Scores for Each Level
The leptokurtic form of the NLB group suggested by the descriptive data (kurtosis = 2.076) led to further investigation of the data. Subsequent analysis (the one sample Kolmogorov-Smirnov Test) revealed that the test distribution was normal. Negative skewedness (-1.4) resulting in a leptokurtic form is not problematic with a criterion-referenced posttest; rather, it is often indicative that learning objectives were met. Negative skewedness refers to the concentration of scores on the high end of the distribution in contrast with few scores on the low end of the continuum. Brown (1997) mentioned that a highly positive skew at the beginning of a semester, followed by a highly negative skew at the end of the semester, was a good indicator of how much students had learned during the semester. Figure 5 is a histogram derived from the NLB vocabulary posttest scores with the normal curve inserted.

![Histogram of NLB vocabulary posttest scores with normal curve](image)

**Figure 5**  
Non Latin-Based Word Part Posttest Mean Scores with Normal Curve
The data displayed in Table 12 indicate a perceptible ceiling effect that accounts for the negative skewedness. The Levene’s Test of Equality of Error Variance demonstrated no significant difference in variances among the three groups; hence, the failure to reject the null hypothesis of equal variances was in order. Having met the assumption of equal variances, a one-way fixed-factor ANOVA was used to note if any statistically significant differences existed among the posttest word part mean scores (Table 13). With the probability value under .05 (p = .0004), a subsequent analysis was warranted to identify the distinctive level.

Table 13
One Way Analysis of Variance for Word Part Posttest

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Type III Sum of Squares</th>
<th>Mean Square</th>
<th>F Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Origin</td>
<td>2</td>
<td>567.01</td>
<td>283.50</td>
<td>5.84*</td>
</tr>
<tr>
<td>Error</td>
<td>129</td>
<td>6260.53</td>
<td>48.53</td>
<td></td>
</tr>
</tbody>
</table>

*p = .0004.

The Tukey’s b post hoc multiple comparison procedure was used to determine wherein the difference lies. As seen in Table 14, the MCP isolated the NES group from the other two levels. Based on the results of the one-way ANOVA and Tukey’s b post hoc MCP, the null hypothesis of equal posttest word part mean scores was rejected. The slight differences between the means warranted further analysis to determine whether or not factors indiscernible through analyzing solely the mean scores could offer additional
insight. Toward that end, Table 15 displays the frequency data of all levels to aid comparison. A further discussion ensues in Chapter 5.

Table 14
Tukey’s b Post Hoc Comparison for Word Part Posttest

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>N</th>
<th>Subset 1</th>
<th>Subset 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NES</td>
<td>44</td>
<td>90.09</td>
<td></td>
</tr>
<tr>
<td>NLB</td>
<td>51</td>
<td></td>
<td>93.55</td>
</tr>
<tr>
<td>LB</td>
<td>37</td>
<td></td>
<td>95.22</td>
</tr>
</tbody>
</table>

Note: Uses Harmonic Mean Sample Size = 43.251. Group sizes are unequal. Type I error levels are not guaranteed. Alpha = .05.

Table 15
Frequency Data for Word Part Posttest: All Groups

<table>
<thead>
<tr>
<th>Test Score</th>
<th>Frequency (N)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LB</td>
<td>NLB (a,b)</td>
</tr>
<tr>
<td>67</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>73</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>80</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>87</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>93</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>100</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>Totals</td>
<td>37</td>
<td>51</td>
</tr>
</tbody>
</table>

\(a\)Kurtosis = 2.076 \(b\)Skewedness = -1.397
Research Question 3

Gain Score: LB Group

At the end of one semester of instruction, to what extent did each group achieve gain scores as measured by a pretest/posttest comparison? The null hypothesis stated, “For each group analyzed separately, there is no significant difference between pretest/posttest word part gain scores, and there is no significant difference between pretest/posttest vocabulary gain scores.” A dependent (paired) samples t-test was used to conduct the analyses. This was chosen because each participant received two observations: one score for the pretest and a subsequent posttest score for the same individual (the word part section and vocabulary section were analyzed separately). A group mean gain score was obtained from both sections of the test, and the difference between the pretest/posttest scores was analyzed to verify whether or not the scores significantly differed from zero—with zero indicating no gain. A two-tailed test was used as the possibility of a reduced score on the posttest could occur.

Each of the three groups will be addressed in isolation. This section will concern itself with the data obtained solely from the Latin-based group; this will be followed by gain score comparisons of the non Latin-based group and conclude with gain score comparisons of the native English speaking group. For each group, pretest/posttest comparisons for both the word part component and vocabulary component of the test instrument are addressed together. Included in the dataset is the effect size. The formula used to calculate the effect size (eta squared) is as follows: \( \frac{N(\text{mean}^2)}{N(\text{mean}^2) + (N-1)SD^2} \). The descriptive data obtained from the LB group are summarized.
in Table 16, and a visual representation of those data is depicted in Figure 6 in the form of a boxplot.

Table 16
Latin-Based Pretest/Posttest Gain Score Comparisons

<table>
<thead>
<tr>
<th>Test Section</th>
<th>Pretest Mean</th>
<th>Posttest Mean</th>
<th>Mean Difference</th>
<th>Standard Deviation</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary</td>
<td>67.6</td>
<td>88.3</td>
<td>20.7</td>
<td>15.3</td>
<td>-8.2a</td>
</tr>
<tr>
<td>Word Part</td>
<td>65.6</td>
<td>95.2</td>
<td>29.6</td>
<td>15.6</td>
<td>-11.5b</td>
</tr>
</tbody>
</table>

 apa < .01, eta squared = .65.  b p < .01, eta squared = .79

Figure 6
Boxplots of All Latin-Based Mean Scores
The results of a dependent samples t-test indicated that the mean posttest score of the Latin-based group for word part knowledge ($M = 95.2, SD = 5.2$) was significantly greater than the pretest word part mean score ($M = 65.6, SD = 16.0$), $t(36) = 11.5, p < .01$. The effect size (eta squared) was .79, a large effect. Additionally, the data revealed that the mean posttest score for vocabulary knowledge ($M = 88.3, SD = 8.2$) was significantly greater than the group’s pretest vocabulary mean score ($M = 67.6, SD = 16.7$), $t(36) = 8.2, p < .01$. The effect size, as measured by eta squared, was .65, a moderately large effect. Based on the results of the dependent samples t-test, the null hypothesis stating that there would be no significant difference between pretest/posttest word part mean scores and pretest/posttest vocabulary mean scores was rejected.

**Research Question 3**

**Gain Score: NLB Group**

It was expressed in the null hypothesis for the NLB group that there would be no significant difference between pretest/posttest word part gain scores, neither would there be any significant difference between pretest/posttest vocabulary gain scores. The results obtained from a pairwise (t-test) comparison of pretest and posttest mean scores of the non Latin-based group indicated that the mean posttest score for word part knowledge ($M = 93.6, SD = 7.7$) was significantly greater than the pretest word part mean score ($M = 46.1, SD = 23.2$), $t(50) = 15.4, p < .01$. The effect size was .83, a large effect. Additionally, the data revealed that the mean posttest score for vocabulary knowledge ($M$
= 77.6, $SD = 13.6$) was significantly greater than the pretest vocabulary mean score ($M = 42.4, SD = 18.2$), $t(50) = 14.4, p < .01$. The effect size, as measured by eta squared, was .81, a large effect. Thus, the null hypothesis of equal pretest/posttest scores for the NLB group was rejected (see Table 17 and Figure 7).

Table 17
Non Latin-Based Pretest/Posttest Gain Score Comparisons

<table>
<thead>
<tr>
<th>Test Section</th>
<th>Pretest Mean</th>
<th>Posttest Mean</th>
<th>Mean Difference</th>
<th>Standard Deviation</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary</td>
<td>42.4</td>
<td>77.6</td>
<td>35.2</td>
<td>17.4</td>
<td>-14.4&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Word Part</td>
<td>46.1</td>
<td>93.6</td>
<td>47.5</td>
<td>22.0</td>
<td>-15.4&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>p < .01, eta squared = .81.  <sup>b</sup>p < .01, eta squared = .83

Figure 7
Boxplots of All Non Latin-Based Mean Scores
Research Question 3

Gain Score: NES Group

The null hypothesis stated that there would be no significant difference between pretest/posttest word part gain scores for the NES group, and there would be no significant difference between pretest/posttest vocabulary gain scores obtained from the same group. The results obtained from the pairwise (t-test) comparison of pretest and posttest mean scores of the NES group indicated that the mean posttest score for word part knowledge ($M = 90.1, SD = 7.3$) was significantly greater than the pretest word part mean score ($M = 51, SD = 13.4$), $t(43) = 17.4, p < .01$. The effect size was .88, a large effect. Additionally, the data revealed that the mean posttest score for vocabulary knowledge ($M = 82.9, SD = 10.5$) was significantly greater than the pretest vocabulary mean score ($M = 63.4, SD = 14.9$), $t(43) = 8.4, p < .01$. The effect size, as measured by eta squared, was .62, a moderately large effect. Thus, the null hypothesis of equal pretest/posttest scores for the NES group was rejected (see Table 18 and Figure 8). The gain score results of all three levels for both parts of the test instrument are presented together in Table 19 to facilitate comparison among the groups.

Table 18
Native English Speakers Pretest/Posttest Gain Score Comparisons

<table>
<thead>
<tr>
<th>Test Section</th>
<th>Pretest Mean</th>
<th>Posttest Mean</th>
<th>Mean Difference</th>
<th>Standard Deviation</th>
<th>t Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary</td>
<td>63</td>
<td>83</td>
<td>20</td>
<td>15.7</td>
<td>-8.4$^a$</td>
</tr>
<tr>
<td>Word Part</td>
<td>51</td>
<td>90</td>
<td>39</td>
<td>15.0</td>
<td>-17.4$^b$</td>
</tr>
</tbody>
</table>

$^a p < .01$, eta squared = .62. $^b p < .01$, eta squared = .88
Figure 8
Boxplots of All Native English Speaker Mean Scores

Table 19
Pretest/Posttest Gain Score Summary: All Groups

<table>
<thead>
<tr>
<th>Language Origin</th>
<th>Pretest Mean</th>
<th>Posttest Mean</th>
<th>Gain Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wd Pt</td>
<td>Vocab</td>
<td>Wd Pt</td>
</tr>
<tr>
<td>LB</td>
<td>66</td>
<td>68</td>
<td>95</td>
</tr>
<tr>
<td>NLB</td>
<td>46</td>
<td>42</td>
<td>94</td>
</tr>
<tr>
<td>NES</td>
<td>51</td>
<td>63</td>
<td>90</td>
</tr>
</tbody>
</table>

Note: Wd Pt = Word Part
Summary

The results obtained from statistical analyses determined that the independent variable, language origin, played a key role in determining significant differences among the three groups analyzed in this study. In each instance, therefore, the null hypothesis was rejected.

1. For the vocabulary pretest, it was found that the NLB mean (42) was significantly lower than the NES and LB means (63 and 68, respectively).

2. On the word part section of the pretest, the LB group posted a significantly higher mean score (66) than the NES group mean score (51) and the NLB group mean score (46).

3. After one semester of instruction, it was found that mean vocabulary posttest scores among the groups significantly differed from one another. The LB mean score (88) was approximately five percentage points greater than the NES mean score (83), and the NES mean score was approximately five percentage points greater than the NLB group mean score (78). Secondary findings (the following section) highlighted a distinctively weaker performance by the NLB group.

4. After one semester of instruction, it was found that the lower word part posttest mean score obtained by the NES group (90) was significantly different from the mean word part score of the NLB group (94) and the LB group (95). Secondary findings derived from a frequency tabulation accentuated the practical significance of these differences.
5. Finally, for all three groups involved in the study, the higher posttest mean scores on both sections of the test instrument were significantly different from each group’s respective pretest mean score.

Secondary Findings

Further investigation was conducted regarding posttest mean scores for both sections of the test. The one-way ANOVA could determine the statistically significant difference(s), and the post hoc test(s) could identify the distinct variable(s). However, neither analysis provided the descriptive information helpful toward a fuller understanding of relative strengths and weaknesses among the groups. Frequency tabulations were run for all groups (Table 11 and Table 15) offering the following findings:

1. Mean vocabulary posttest scores among the groups significantly differed from one another (LB = 88, NES = 83, NLB = 78), yet the frequency tabulation appeared to highlight a relative weakness within the NLB group pertaining to vocabulary mastery. It was noted that seven students from the NLB group had scores of 60% or lower, whereas no student from the other groups recorded a posttest score of 60% or lower. Additionally, only a third of the NLB students scored higher than 80% on the vocabulary posttest, but more than half of the NES students and more than three quarters of the LB students scored higher than 80%.
2. For the word part posttest, a post hoc multiple comparison procedure identified the NES group mean (90) as significantly different from the other group means (NLB = 94, LB = 90), though with all groups having displayed an apparent ceiling effect, practical significance was questionable. The data from a frequency tabulation suggest a noted weakness within a segment of the NES group with regard to word part mastery. On the posttest, 23% of the NES group scored 80% or lower while only 10% of the NLB group and 2.7% of the LB group did likewise. On the high end of the spectrum, 21% of the students from the NES group reached a plateau (100%); in contrast, 45% of the NLB group and 46% of the LB group reached a full ceiling effect.

In this chapter, data were furnished to evidence decisions pertaining to the original null hypotheses. Further data were furnished in hope of providing additional insight into group differences based on language origin. The forthcoming chapter will deal with the practical significance of these differences, draw conclusions based on the data contained in this chapter, and conclude with implications and recommendations.
CHAPTER 5

DISCUSSION OF FINDINGS AND RECOMMENDATIONS

Introduction

This chapter has been organized to address the three research questions, each of which was operationalized in the form of a null hypothesis. The level of significance for rejecting or failing to reject the null hypotheses was established at the .05 level. To facilitate readability, data will be referred to in whole numbers unless deemed useful to extend into decimal figures. After the results for each of the specific research questions are addressed individually, along with the hypothesis decision, interpretation of the results will be discussed. Implications for the present findings and recommendations for future studies follow the interpretations.

Results and Discussion of Findings

Research Question 1

Vocabulary Data Analyses (Pretest)

To what extent do groups, based on language origin, differ in their pre-existing knowledge of English vocabulary derived from Latin? The results of a one-way fixed-factor analysis of variance that was used to analyze vocabulary pretest scores demonstrated a significant difference among the variables ($p < .0001$). The Tukey’s b
post hoc analysis attributed the distinctive mean to the non Latin-based language group. Hence, the null hypothesis stating that no significant differences existed among the three groups was rejected. The NLB group mean (42) was significantly lower than the NES (63) and LB (68) group means.

On the vocabulary portion of the pretest, the NLB group significantly underperformed relative to the other groups. This may be attributed to the exaggerated dissimilarity between the language origin of this group and English, whereas the languages comprising the LB and NES groups share common characteristics. Many languages comprising the NLB group have an orthography distinct from the symbols used in written English. Students from China or Korea would not find immediate parallels between their respective languages and English to facilitate vocabulary comprehension. Literature (Ard & Homburg, 1993) concerning the influence of orthography upon second language interference substantiates this, and orthographic interference appears to be heightened for the Arabic student. Folse (1999) provided three examples of the unique problems Arabic speakers face in learning English. First, the Arabic language is written from right to left using letters that consist of loops and curves (English letters stand vertical and consist of lines and angles). Second, consonant and vowel patterns differ completely from English. For instance, though vowels are pronounced in Arabic, they are not written. Third, there is a dearth of Arabic cognates (words similar in form and meaning) in English to assist the Arab reader.

In contrast, apart from using almost the same alphabet, Spanish speakers learning English are facilitated by a large amount of vocabulary that is nearly identical between the two languages, i.e., cognates such as bank (English) and banco (Spanish). Cognates
often share a common heritage. Thus, English and Spanish have similar word structure that is based on a shared foundation in Latin. The limited visual cues afforded the NLB group could be an important factor behind this increased learning burden evidenced by the significantly lower vocabulary mean.

Similarly, English and the Latinate languages are phonetic in nature. For these languages, letters in the alphabet typically serve as symbols to a corresponding sound (phonemes). For many of the identical letters used both in English and the Latinate languages, the relationship between letters and their sounds are often similar across languages. This is particularly true for the LB sample in this study, which was predominately comprised of native Spanish speakers (30 out of 37). Conversely, NLB languages in the world that are phonetic do not have a sound system that corresponds to English, and a few languages utilize a pictographic/logographic writing style rather than phonetic (see Wang & Koda, 2005). Therefore, a Spanish-speaking student, for example, would have a relatively easier task of pronouncing an English word by sounding out its constituent parts; this aural aspect can furnish additional clues to assist in word recognition not afforded to the NLB student.

**Word Part Data Analyses (Pretest)**

To what extent do groups, based on language origin, differ in their pre-existing knowledge of Latin-based word parts? The results of a one-way fixed-factor analysis of variance demonstrated a significant difference among the variables \( p < .0001 \), while the Tukey’s b post hoc multiple comparison procedure isolated the Latin-based language group as possessing the distinctive mean. Hence, the null hypothesis stating that no
significant differences among the three groups existed was rejected. The LB pretest word part mean (66) was significantly larger than the NES mean (51) and the NLB mean (46). Of note, standard deviations lowered as groups were more homogeneous with respect to language origin. For example, the NES group was comprised solely of native English speakers and had the lowest standard deviation (13); conversely, the NLB group, with 51 participants derived from 13 distinctly different language backgrounds, was the most diverse and had the highest standard deviation (23). The LB group was quite homogeneous, being comprised of only three different language groups; its member homogeneity is further evidenced by the fact that 30 of the 37 participants were native speakers of one particular language, Spanish. The LB group had a standard deviation of 16.

It should be further noted that a standard deviation is relative to the mean from which it is derived. Therefore, technically the LB group demonstrated the least variance, for its standard deviation of 16 represented just over 24% of this group’s mean score of 66, while the NES standard deviation of 13 represented just over 25% of its mean score of 51. Regardless, one group was homogeneous with respect to language origin (NES) and the other (LB) was nearly homogeneous; group homogeneity seems to have resulted in relatively lower deviations from the mean. The NLB group was the most diverse with regard to language origin composition, and this appeared to be reflected in the group’s standard deviation of 23 comprising exactly half (50%) of its mean score.

Though the LB group demonstrated a statistically significant difference from the other groups with regard to pretest word part knowledge, all of the factors contributing to this difference have not been explained. Prior research has suggested that NES college
students (non-preparatory) enter higher education with limited skills in MA knowledge (Levin, et al., 1988; Shepherd, 1973), but the same speculation has yet to be made regarding L2 students. One might suggest that L2 students as a whole are taught a measure of word part analysis when learning the English language as adults. This would justify the LB group’s larger mean score but not explain why the NLB group performed more poorly than the NES group. A number of the L2 students in this study had progressed through the EAP language levels together; therefore, most of their English instruction was provided by the same language institute at one particular community college. For these students, the amount of instruction, if any, in morphological analysis prior to entering this highest level of college preparation would have been the same. The disparity in scores does not reflect this. Additionally, the distribution of professionals and the extent of group members’ prior (college) education were relatively similar between the two broad groups (LB and NLB) comprising L2 students. If the extent of prior education, and even intelligence for that matter, were primary determinants, the mean scores of the LB and NLB groups should have been more similar.

The discrepancy appears to lie principally in the variable isolated for this experiment, that of language origin. The lack of a Latinate component in the Japanese and Arabic languages, for example, may limit students from recognizing word part similarities found in their L1 that could otherwise facilitate second language acquisition. Latin-based morphemes in the form of roots and affixes used in Romance languages resemble the same word parts used in English. LB students that are proficient readers in their L1 may already possess a measure of morphological awareness; this skill could have quite possibly transferred over into their L2.
Research Question 2

**Vocabulary Data Analyses (Posttest)**

To what extent do groups, based on language origin, differ in their mastery of Latin-based English vocabulary after one semester of study? The results of a one-way fixed-factor analysis of variance demonstrated a significant difference among the variables \( p < .0001 \). The Tukey’s b post hoc comparison revealed that each mean score was distinctly different from the others (LB = 88, NES = 83, NLB = 78). Therefore, the null hypothesis stating that no significant differences existed among the three groups was rejected.

No group obtained a mean of 90% or above. This suggests that after one semester of instruction in word parts and vocabulary based on MA, mastery in Latin-based vocabulary is relatively challenging in comparison with word part mastery. (Each group had a mean score of at least 90% on the word part section of the posttest.) The LB group had a mean score five points greater than the NES group while the NES group had a mean score five points greater than the NLB group. Based on the descriptive data, it appears that the independent variable, language origin, played an important role when comparing the LB and NLB groups (a ten-point mean difference). The relatively large difference between means is most likely explained by the advantage LB students possess when learning English. As noted in the literature review, at least 50% of the English language is based on Latin (Carr, et al., 1942; Shepherd, 1973); this should prove advantageous for Latin-based languages such as Spanish. Spanish speakers can readily discern that the Latin root *viv* evidently means life, as the Spanish verb, to live, is *vivir*. 
Thus, members of the LB group would find it comparatively easy to utilize this base to learn and subsequently recall the meanings of English words such as vivacious (lively) and vivify (to make alive).

The three significantly distinct posttest vocabulary mean scores do not call attention to the relative strength of the LB group nor the relative weakness of the NLB group. The frequency tabulation compiled in Table 11 was useful in isolating extreme scores. On the high end of the scale, slightly over three quarters of the LB students scored over 80% on the vocabulary posttest; slightly over half of the NES students did the same. In comparison, only one third of the NLB students yielded a score of over 80% after one semester of instruction. Comparing the three groups by highlighting their low scores accentuates the same disparity. On the low end of the scale, not one student from either the LB group or the NES group scored 60% or less, whereas 7 NLB students (14%) did.

Isolating extremes scores from both ends of the spectrum emphasized the relative weakness of the NLB group. The overall lower mean was not attributed to extreme low scores obtained by only a few students, thus skewing the mean. With 14% of the NLB group scoring poorly and only one third scoring over 80% (extreme scores), the data suggest that this particular group had the most difficulty mastering explicit vocabulary. Second language interference (e.g., orthography and phonics) as covered in the discussion pertaining to the vocabulary pretest, is one plausible explanation.
Word Part Data Analyses (Posttest)

To what extent do groups, based on language origin, differ in their mastery of Latin-based word parts after one semester of study? The results of a one-way fixed-factor analysis of variance demonstrated a significant difference among the variables ($p = .0004$), while a post hoc multiple comparison procedure identified the NES word part mean score as distinct from the other two groups. The null hypothesis stating that no significant differences existed among the three groups was rejected. The mean difference of the NES group (90) in comparison to the NLB mean (94) and the LB mean (95) was statistically significant.

Descriptively, the data did not appear to suggest any difference of practical significance; additionally, all three groups had the same median score of 93. Another perspective was afforded through use of frequency data (Table 15). This display of data revealed a distinction specific to the NES group. By isolating extreme scores, it was evident that the NES group did not perform as strongly as its peer groups. On one end of the spectrum, relatively low scores ($\leq 80\%$) were obtained by nearly 23% of the NES group in contrast with only 10% of the NLB group and less than 3% of the LB group. At the high end of the range, a full ceiling effect, or plateau (100%), was obtained by only 21% of the students in the NES group in contrast with 45% of students in the NLB group and 46% of the students in the LB group. Stated differently, members of the NES group were more than twice as likely to score poorly in comparison with the NLB group, and more than eight times as likely to score poorly in comparison with the LB group. Additionally, students from the LB and NLB groups were twice as likely to obtain a perfect score in comparison to the NES group.
One possible explanation to this disparity might be the grammatical nature of morphemes. Word parts are not simple vocabulary items students are exposed to in their normal course of reading or conversation. Gaining expertise in the use of morphological analysis requires more of a studious approach to language acquisition than would mere rote memorization of vocabulary items. Students accustomed to studying grammar might have an advantage in working with morphemes and establishing relationships with morphologically complex words. In this respect, students from both groups comprising the L2 sample would have far greater experience. At the college preparatory level, L2 students are one semester away from full assimilation into an English-only higher education environment. These students have already spent much time and effort learning a second language—with much of the instruction based on grammar. This is especially true with many of the NLB students who have extensively studied English in their native countries. It is not uncommon for many of these students to enter the United States and place fairly high in an English language program since many placement measures emphasize grammar, yet these very students are unable to converse well in English and often have much difficulty in understanding the spoken word.

In contrast, native English speakers, as a whole, are seldom proficient in a second language. What is more, the amount of formal education in grammar is weak relative to other nations. Asselin (2002) stated that in the 1970s and 1980s a body of research about teaching grammar “began to show the cracks in traditional grammar instruction [in the United States]. However, instead of examining alternative approaches, many teachers simply stopped teaching grammar” (p. 52). In the NES developmental programs (both reading and writing) this weakness is sorely evidenced as it is not uncommon for these
students to enter higher education unable to differentiate among the basic parts of speech. In this respect, the L2’s grammatical schema may enhance their understanding of morphemes and how to use them.

Other factors such as student motivation and study habits that had not been controlled for could have quite possibly affected the results. The researcher of this study was the instructor for all classes; this provided the researcher with a vantage point to qualitatively observe facets not afforded via quantitative measures. It was observed that members from both subgroups comprising the L2 population often displayed greater interest than the NES group in regard to subject matter as indicated by the amount and types of questions asked by these students, quantity and quality of homework performed, and the number of students along with their frequency in attending after-class tutoring.

Nonetheless, all three groups reached mean scores of at least 90%. Though not devised as a criterion referenced test, items on the posttest were part of the instructed items students were expected to learn during the semester. It would be expected that results of the distribution be negatively skewed, as they were, since students subsequently mastered course content. Both the LB and NLB groups displayed a ceiling effect as evidenced by their respective standard deviations (5.2 and 7.7) that placed both groups over 100% at 1 standard deviation. The NES mean of 90 with a standard deviation of 7.3 evidenced the greatest feasibility for improvement.

With all three groups having attained a near ceiling effect on the word part portion of the posttest, it was apparent that mastery of discreet word parts was achievable. All groups performed markedly better on the word part section of the posttest than on the vocabulary section. Recall that an important part of instructional pedagogy is repeated
exposure to the target items (Folse, 1999). The students in this study had seen many of
the word parts repeatedly through the review section of the weekly tests as well as having
taken a comprehensive mid-term. (The final exam was administered after the posttest.)
Though students received a similar review of the vocabulary items, it would be expected
that students perform better on the word part section due to the transferable nature of
word parts that make them more ubiquitous. For example, students would only be
exposed to the word *retrospect* once on any given test, but students might encounter on
that same test other words comprising the prefix *re*, or *retro*, and the root *spect*.
Students’ memories for those word parts had been accessed more frequently throughout
the semester, thus establishing, reinforcing, and strengthening the memory link.

Research Question 3

**Gain Scores For Each Level**

After one semester of instruction, to what extent did each group achieve gain
scores on the word part and vocabulary sections of the test instrument? All groups, on
both sections of the test instrument, made statistically significant gains after one semester
of instruction in morphological analysis as measured by pretest/posttest comparisons
(Table 19). Overall, gains were greater on the word part section of the test instrument
than on the vocabulary section. Again, word parts are more ubiquitous, thus affording
more exposure for recall; additionally, word parts are less abstract and more unitary in
meaning than vocabulary items. The group displaying the greatest gains for both sections
of the test was the NLB group. This could be expected, as it was this group that had the
lowest pretest scores. Groups with lower scores have greater latitude for increase by virtue of the fact that a larger range for increase exists. For instance, the NLB group gain of 48 on the word part section of the pretest/posttest comparison would be mathematically impossible to achieve for the LB group. The latter group’s word part pretest score of 66 would allow for a maximum 34 point increase in order to achieve 100%. Compared another way, the NLB group gained 48 of 54 possible gain score points while the LB group gained 29 of a possible 34 gain score points. Viewed in this manner, all three groups capitalized on direct MA instruction with regard to Latin-based word parts.

The NES group was, in relative terms, the least successful as its gain score of 39 out of a possible 49 points evidenced the greatest margin between plateau and percentage points obtained. However, the NES mean score of 90% and median score of 93% on the posttest implied a measure of mastery within the group. As mentioned previously, there was an apparent dichotomization in the NES group as some students went on to master word parts while others performed relatively poorly. Notwithstanding, the significant increase across all groups suggested that all three groups, regardless of language origin, profited well from direct instruction in word parts. Consequently, the null hypothesis stating that groups will not differ from zero in obtained gain score was rejected.

The vocabulary gain score of the NLB group was considerably greater than the other two groups (both the LB and NES groups made a gain of 20 percentage points while the NLB group mean increased by 36 percentage points). This can be partially explained by the greater range afforded the NLB group since its members yielded the lowest pretest mean score(s). However, not one of the groups displayed a ceiling effect,
so a greater latitude for improvement was afforded to all groups. In relative terms, the LB group made a 29% increase from pretest to posttest on the vocabulary section of the test instrument; the NES group mean increased 32%; the NLB group mean increased 86%. Viewing the statistics in this manner highlights the substantial gain of the NLB group and suggests the positive use of MA as mnemonic aid to facilitate vocabulary recall. This group’s significantly (statistically) lower vocabulary pretest score, as previously mentioned, might be attributed to the heightened orthographical and phonetic differences. Yet the initial handicap with which this group entered the college preparatory reading class did not appear to hinder subsequent vocabulary acquisition.

Summary

Identifying groups within the college preparatory reading class based on language origin brought to light distinctive strengths and weaknesses relative to group identity. This is important since all of the students involved in this study were placed into the same course, based, theoretically, on similar reading ability. First, of the three distinct groups, students comprising the LB group demonstrated the greatest strength. On all four comparisons taken from the test instrument (word part and vocabulary pretest, word part and vocabulary posttest) the LB group out-performed all other groups. However, on only one of the four comparisons did the LB group obtain a statistically significant difference. This was observed on the word part section of the pretest (LB mean = 66, NES = 51, NLB = 46). This may be an indication of this group’s pre-existing knowledge of morphemes. Numerous cognates, which facilitate vocabulary recognition between one’s
L1 and L2, exist between the Latin-based languages and English; similarly, Latin-based morphemes in the form of roots and affixes used in Romance languages often resemble the same word parts used in English. LB students that are proficient readers in their L1 may already possess morphological awareness; this skill could have transferred over into their L2.

Second, the NLB group demonstrated the greatest weakness among the levels. This group scored the lowest on three out of the four possible group comparisons, and on the vocabulary pretest, the NLB mean difference was statistically significant (NLB = 42, NES = 63, LB = 68). With a pretest vocabulary score 21 percentage points lower than the native English speaking group and 26 percentage points lower than the Latin-based group, the NLB group entered the college preparatory reading class noticeably inferior in vocabulary recognition relative to its peers. Although this same group achieved the largest gain, a posttest vocabulary score of only 78% was lowest among the three groups—thus displaying an overall lack of mastery within this group. This revealed a sizeable need for further improvement. Additionally, even though all groups were significantly different from one another on the vocabulary portion of the posttest (LB = 88, NES = 83, NLB = 78), a frequency tabulation that highlighted extreme scores on both ends of the continuum accentuated the relative weakness of the NLB group. A greater proportion of students from this group posted scores on the low end of the range, and fewer NLB students, relative to the other groups, posted a high score. Variables not isolated in this study may have been a contributing factor, and second language interference, in terms of unique orthography and letter/sound correspondences, might provide a partial explanation. The NLB group did, however, demonstrate word part
mastery. In fact, the group gain from 46% on the pretest to 94% on the posttest was an increase of over 100%, with the posttest word part score surpassing that of the native English speakers.

Finally, the prominent distinction evidenced by the NES group was its statistically significant lower word part posttest score (NES = 90, NLB = 94, LB = 95). Though the observed scores do not appear to indicate any practical significance, results of a frequency tabulation emphasized a weakness among members within this group. A disproportionately larger number of NES students scored relatively poorly on this segment of the posttest while notably fewer students from the same group reached a plateau of 100%. The NES group also displayed the greatest disparity between the two sections of the pretest. LB means for the pretest were 66 on the word part section and 68 on the vocabulary section; NLB means were 46 and 42, respectively. In contrast, the NES pretest word part mean was 51 and the vocabulary mean was 63. The NES group mean of 51% on the word part pretest (significantly different from the LB group mean of 66%) confirmed results from previous research (Levin et al., 1988; Shepherd, 1973) which suggested that English speaking adults entering college possess a limited knowledge of word parts that comprise morphologically complex vocabulary. One important distinction between the participants that incorporated the previous research and those that comprise this present study is that the latter were preparatory students from a community college. The studies by Levin et al. and Shepherd incorporated both college and university freshmen, none of whom were classified as preparatory.

Synthesizing the results, it was apparent from the data that all groups profited from direct instruction in Latinate word parts and vocabulary. Apparent, too, was the
discrepancy between posttest word part mastery and vocabulary gains, as all groups performed noticeably better on the word part section; vocabulary items were more difficult to master. Comparing the three groups, the LB group performed the strongest, the NLB performed the weakest, and a disproportionately large number of students within the NES group appeared to have difficulty mastering word parts.

The fact that not one of the groups registered a score better than 68% on either section of the pretest indicates that direct instruction in morphological analysis and college-level vocabulary is warranted. College preparatory students, regardless of their language origin, enter the community college with limited knowledge of word parts and the Latinate vocabulary comprising these word parts. This is important since morphologically complex words are more prone to occupy the collegiate arena. Oldfather (1940) demonstrated that Latin was deemed as a living language and would continue to contribute to the English lexicon. Just and Carpenter (1987) reported that the use of morphological analysis was more likely to be used correctly with infrequent words—words of classical (Greek and Latin) origin typically found in academic reading. A perusal of the test instrument illustrates that the language chosen was not comprised of obscure items of little use to the reader. Neither was the level of difficulty for these words too great. The vocabulary level, verified by Taylor, Frackenpohl and White (1969) and Dale and O’Rourke (1981), had a composite mean of just under grade 11. Consequently, morphologically complex vocabulary taught at the college preparatory level along with a working knowledge of morphemes can make an important contribution toward student college-readiness.
Implications for Practice

Introduction

Bias against the use of morphological analysis due to the heterogeneous (i.e. language origin) make up of the college preparatory reading classroom is unwarranted. Faculty, program directors, textbook writers, and curriculum designers should not suppose that NES students automatically have a considerable advantage over their non-native English-speaking peers with regard to English vocabulary growth. Nor should they believe that students whose language origin is Latin-based have any advantage due to the influence of their L1. Each group is able to perform well and profit from the benefits of direct MA instruction. For all groups, it was evident that direct instruction in morphemes and Latin-based vocabulary was profitable in helping students to reach course objectives. This stands in contrast with a certain persuasion among language researchers that disfavors direct instruction of vocabulary and limits vocabulary acquisition primarily to immersion in a contextually rich environment (see Carver, 1994; Hulstijn, 1997).

Implications by Language Origin

Latin-based Language Origin

College preparatory students whose original language is Latin-based appeared to make good use of vocabulary cognates and morphological relatedness as demonstrated by their prior knowledge (pretest mean score) and course mastery (posttest mean score). On both sections of the pretest instrument, however, mean scores were less than 70%. This
suggests that this particular group of students enter college preparatory instruction without having mastered a sample of English vocabulary just under grade level 11 and are, therefore, in need of further instruction in order to be college ready. Upper limit gain scores demonstrated that this group responded well to MA instruction. No specialized form of pedagogical instruction is recommended for the LB group as students assimilated well, academically, in the heterogeneously populated college preparatory class.

Non Latin-based Language Origin

Of the three groups, the NLB group may need special assistance, or at the least, faculty, curriculum designers, and textbook writers should be made aware of noted linguistic features (orthographical and phonetic) possibly attributing to this group’s difficulty in English vocabulary mastery. This group’s ability, though, should not be underestimated. As noted previously, the NLB mean score increase from pretest word part to posttest word part was over 100% while the vocabulary gain score nearly doubled that of the LB and NES groups. Significant gain scores, both statistically and practically, underscore the efficacy of direct instruction to assist NLB students in building a college-level vocabulary in order to facilitate their reading. Nevertheless, additional reinforcement is warranted in order to master the more abstract concepts found in vocabulary items. To assist them in class, faculty members responsible for teaching college preparatory reading might consider providing additional direct instruction in order for these students to better recognize the parts-to-whole relationship that exists between particular morphemes and vocabulary items. Also, having students generate
new words or identifying other morphologically related words not required to learn but found in students’ reading could be a profitable exercise.

Native English Speaker Language Origin

Finally, a substantial number of NES students enter the college preparatory reading classroom with limited knowledge of morphemes. Furthermore, within this group there are a comparatively large number of students who do not proceed on to mastery of word parts after one semester of instruction. In this respect, the NES group is somewhat dichotomized as some students move toward word part mastery while others continue to lag behind. Particular variables responsible for this inconsonance have yet to be identified. It is recommended for this group that additional practice demonstrating the parts-to-whole relationship between morphemes and vocabulary be provided. Students can explore both inductive and deductive means of understanding morphologically complex words and form lists of words based on a shared composition.

Statistically significant gains for both sections of the test instrument coincide with observations noted by early 20th century researchers who maintained that Latin instruction aided vocabulary growth in English when training included practical knowledge of derivations (Carr, 1921; Hamblen, 1924) and when the emphasis was on English vocabulary and not Latin (Symonds & Penny, 1927). With Latin no longer a standard course-offering at secondary and post secondary institutions, to what extent have current college preparatory reading programs incorporated morphological analysis into the curriculum? Direct instruction to facilitate vocabulary acquisition and teaching strategies to empower students as independent word learners have become the subject of
recent L2 research (Folse, 2004), but research in this area relevant to adult native English speaking students is comparatively stagnant.

General Implications

Research concerning semantic transparency (Levin, et al., 1988; Nagy & Anderson, 1984), stable form, and ubiquity (Holmes & Keffer, 1995) can aid faculty, curriculum designers, and textbook writers in thoughtfully selecting the most serviceable word parts and vocabulary for program inclusion. Furthermore, pedagogy that highlights the role of repeated exposure to target items (Folse, 1999; Hulstijn, 2001) would better ensure student mastery of the selected items.

Advocates of morphological analysis have, in varying degrees, incorporated classical roots and affixes into the curriculum, but a perusal of the textbooks and software programs indicates somewhat of a haphazard approach in word part selection. The primary criterion appears to be morpheme ubiquity; the word part’s transparent meaning and consistent spelling (stable form) appear to be less of a consideration. The research suggests that all three of the critical components, as initially delineated by Orleans (1922), are to be present in order to achieve the desired results. Additionally, repeated exposure—in the form of weekly lessons and weekly assessment—will help students remain on task while simultaneously etching the content into their minds. The inclusion of a review section on each of the weekly tests will not only deeply embed previously learned material, but it will also encourage students to keep up with the present material since failure to do so will leave them constantly playing “catch-up.” A comprehensive mid-term and final exam will also promote student constancy.
Suggestions for Further Research

The principle limitation in this study resides in its participants not being comprised of a random sample. Any form of replication should seek a randomized base from which results can be generalized to the described population. To assist toward that end, recommendations follow.

First, it would be helpful to append a type of Likert scale questionnaire to the test instrument for students to self report their amount of previous MA instruction. One possible confounding effect on student pretest scores, and possible factor attributing to the large variances within the groups, may be connected to prior MA instruction. Knowing to what degree particular students received prior instruction in MA would enable the researcher to categorize subgroups and more definitively compare the different levels by matching subgroups based on the amount of prior MA instruction.

Second, the aforesaid questionnaire could include questions about students’ academic background (L2) in order to enable the researcher to further categorize participants based on the extent of prior education. This, of course, would be moot with the NES sample as members of this group are attending higher education for their first time. Ideally, controlling for intelligence would be another aspect to incorporate into the research, but since the predominant means of assessing intelligence are tied to vocabulary, second language interference would negate usage among such a linguistically diverse group as the L2.

Third, the test instrument itself should be enlarged to include more items. The present test utilized only five prefixes; this was a very limited amount used to assess
students’ pre and posttest knowledge of this particular word element. (Collectively, prefixes and roots accounted for 15 items on the word part section of the test instrument.) The instrument should be large enough to provide adequate coverage yet manageable enough so as not to fatigue the test-taker. Items for the vocabulary portion could be alternately Latin-based and non Latin-based words. A comparison could be made between the two sets of vocabulary items to see if the LB students were in fact facilitated by their L1. A significantly (statistically) greater score for words comprised of Latin-based morphemes would demonstrate this. A test comprised of 40 items might prove sufficient: 10 prefixes, 10 roots, and 20 vocabulary items (half Latin-based and half non Latin-based). One caveat, though, is that Greek words may not serve too well as non Latin-based items since many of the Greek roots and affixes, thus corresponding vocabulary, have infiltrated the Romance languages over time.

Fourth, replication is encouraged in order to derive a larger sample size. This would be particularly useful with the NLB sample. As noted previously, this being the least homogeneous group, it would be helpful to see if patterns emerged within subgroups. How do the Asian NLB students perform in comparison with the European students, and/or the Semitic students? As a group’s orthography becomes less similar to English, do scores derived from the test instrument decline? For instance, how would scores on both the pretest and posttest differ between Arabic students and Czech students? The former use an orthography totally distinct from English, but the Czech language has an alphabet almost identical to that used by native English speakers.

Finally, a similar investigation could isolate other variables such as age and gender. This present study limited heterogeneity in the college preparatory reading class
to language origin. A two-way ANOVA could incorporate age as an additional factor; a three-way design could additionally encompass gender. Do patterns emerge? Do certain ages within a particular language origin, and/or gender, enter or exit the college preparatory reading course with significantly different mean scores? Are gain scores affected by age and/or gender?

These recommendations should contribute to improving what has begun as an exploration into the influence that one’s native language has in acquiring a college level vocabulary. The imperfections noted, and those still blind to the researcher but evident to the astute reader, will hopefully serve not to diminish this present work, but provide a stepping-stone to an enhanced investigation. The intended outcome of such research would be to better serve the language needs and ultimate academic success of the increasingly diverse student body found in the college preparatory classroom.
APPENDIX A

TEST INSTRUMENT
Word Parts & Vocabulary

Do NOT write on this sheet; record all answers on scantron only.

Word Parts (A):
For each of the following word parts, choose the correct definition/synonym from the four given options.

1. cap/capt: a) rug  b) keep  c) head  d) truth
2. bene: a) old  b) good  c) false  d) humorous
3. dict: a) alphabet  b) copy  c) short  d) speak
4. scrib: a) work  b) write  c) shout  d) fast
5. man/manu: a) hand  b) horse  c) masculine  d) intelligent
6. ject: a) handsome  b) throw  c) foolish  d) outward
7. vit/viv: a) alive  b) two  c) speech  d) right
8. noc; nox: a) sick  b) nose  c) sad  d) night
9. voc; vox: a) kiss  b) fast  c) voice  d) short
10. cred: a) belief  b) government  c) card  d) lost

Word Parts (B):
For each of the following word parts, choose the correct definition/synonym from the four given options.

11. sub: a) rise up  b) under  c) lie down  d) away
12. post: a) with strength  b) after  c) containing holes  d) large
13. in: a) below  b) not  c) never  d) last
14. com: a) with  b) alone  c) whole  d) false
15. pre: a) early  b) before  c) old  d) stop
**Vocabulary:**
Each of the vocabulary words below is followed by **one** correct definition/synonym. Choose the response (a, b, c, or d) that best depicts the meaning of the *italicized* vocabulary word.

<table>
<thead>
<tr>
<th>Vocabulary_word</th>
<th>Definition</th>
<th>a)</th>
<th>b)</th>
<th>c)</th>
<th>d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. magnanimous</td>
<td>a) not happy</td>
<td>b) strong</td>
<td>c) generous</td>
<td>d) book smart</td>
<td></td>
</tr>
<tr>
<td>17. gratify</td>
<td>a) to grow</td>
<td>b) to please</td>
<td>c) to lie</td>
<td>d) to fight</td>
<td></td>
</tr>
<tr>
<td>18. spectacle</td>
<td>a) lost in space</td>
<td>b) falling star</td>
<td>c) a show</td>
<td>d) of little value</td>
<td></td>
</tr>
<tr>
<td>19. fidelity</td>
<td>a) trusted</td>
<td>b) finances</td>
<td>c) war hero</td>
<td>d) disorder</td>
<td></td>
</tr>
<tr>
<td>20. pedestrian</td>
<td>a) a walker</td>
<td>b) politically incorrect</td>
<td>c) politically correct</td>
<td>d) a wheel</td>
<td></td>
</tr>
<tr>
<td>21. vociferous</td>
<td>a) weak-minded</td>
<td>b) easy</td>
<td>c) difficult</td>
<td>d) loud outcry</td>
<td></td>
</tr>
<tr>
<td>22. parity</td>
<td>a) festivity</td>
<td>b) lightness (weight)</td>
<td>c) shortness (distance)</td>
<td>d) fairness</td>
<td></td>
</tr>
<tr>
<td>23. potent</td>
<td>a) angry</td>
<td>b) pretty</td>
<td>c) powerful</td>
<td>d) ugly</td>
<td></td>
</tr>
<tr>
<td>24. vivacious</td>
<td>a) funny</td>
<td>b) not honest</td>
<td>c) lively</td>
<td>d) always late</td>
<td></td>
</tr>
<tr>
<td>25. retrospect</td>
<td>a) to look back</td>
<td>b) small particle of dust</td>
<td>c) sleep often</td>
<td>d) to retire</td>
<td></td>
</tr>
<tr>
<td>26. unanimous</td>
<td>a) hateful of animals</td>
<td>b) kind toward animals</td>
<td>c) suspicious</td>
<td>d) all agree</td>
<td></td>
</tr>
<tr>
<td>27. herbicide</td>
<td>a) little energy</td>
<td>b) kills plants</td>
<td>c) extreme illness</td>
<td>d) talkative</td>
<td></td>
</tr>
<tr>
<td>28. ambivalent</td>
<td>a) two arms</td>
<td>b) conflicting feelings</td>
<td>c) loving; romantic</td>
<td>d) violent</td>
<td></td>
</tr>
<tr>
<td>29. gregarious</td>
<td>a) talkative</td>
<td>b) gracious</td>
<td>c) dangerous</td>
<td>d) sociable</td>
<td></td>
</tr>
<tr>
<td>30. omniscient</td>
<td>a) lover of science</td>
<td>b) everywhere</td>
<td>c) all knowing</td>
<td>d) egg-shaped</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B

SCORE SHEET
APPENDIX C

IRB APPROVAL LETTER
September 1, 2004

Tom Bellomo
English Language Institute (bldg. 120, room 109)
Daytona Beach Community College
1200 International Speedway Blvd.
Daytona Beach, FL 32120-2811

Dear Mr. Bellomo:

The University of Central Florida’s Institutional Review Board (IRB) received your protocol entitled, “Latinate Word Parts and Vocabulary: Contrasts Among Three Groups Comprising the Community College Preparatory Reading Class”. The IRB Chair did not have any concerns with the proposed project and has indicated that under federal regulations this project using de-identified data is exempt from review by our IRB, so an approval is not applicable.

Please accept our best wishes for the success of your endeavors. Should you have any questions, please do not hesitate to call me at 823-2901.

Cordially,

Barbara Ward
IRB Coordinator

Copies: Dr. Rose Taylor, College of Education, Education Technology and Leadership, Room 222L
IRB File
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