SYSTEMATIC VOCABULARY INSTRUCTION
THROUGH MORPHOLOGICAL ANALYSIS
WITH POST-SECONDARY STUDENTS

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
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By

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** ** **

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DEDICATION

To My Parents,
To the Ohio Bell 16 Fall Quarter, 1987, and
the Ohio Bell 16 Winter Quarter, 1988
ACKNOWLEDGEMENTS

I express sincere appreciation to Dr. John O. Cooper for his guidance and help throughout my research and entire doctoral program. Thanks to you I have learned to appreciate the smallest measure of positive behavior as success from students. Otherwise I might not have known they were really giving their best effort. My behavior has been shaped by a master. Gratitude is expressed to Dr. Joseph P. O'Rourke, my sixth grade teacher in public school and my vocabulary advisor during this dissertation research. You expect friendships to last a lifetime; this teacher-pupil-friend relationship has spanned thirty years. To my role model as a teacher, thanks. Thanks go to the other members of my advisory committee, Drs. Daryl Siedentop and Peter V. Paul, for their suggestions and comments. Thanks to the many faculty and staff members at Walnut Township and Columbus Technical Institute who helped me become the teacher I am. Special thanks to Greg for his meticulous graph work on short notice. The assistance of Sherry and Gary is acknowledged. Without you there would not be a finished product. To my brother, Lynn, his wife, Sandy, and their children, Tara and Tammy, thanks for being there if I needed you and patient when I ingored everything but this research. To my parents who have given the obvious, but without whom this project would have been delayed or not finished on time. You are more than parents; you have become colleagues.
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CHAPTER I

"Curriculum planners have made no concerted effort to present a workable, systematized approach to vocabulary development per se as a means of improving comprehension in all areas of the curriculum, particularly language arts skills.

The typical attitude toward vocabulary development is exemplified in asking students to learn lists of words (often unrelated in context or construction). Another technique is the teaching of words 'when they come up,' an unsystematic haphazard approach to vocabulary instruction.

The concept of 'vocabulary development' deserves greater scope, a wider field of investigation and application than it now receives in the curriculum. Vocabulary instruction has typically been viewed in a narrow context, taught in an unstructured, incidental (or accidental) manner. Teachers are often inordinately concerned with the how and what (the mechanics of vocabulary instruction), neglecting the why --the principles at work in vocabulary and language development" (O'Rourke, 1970, pp. 16-17).

"I have come to believe that vocabulary instruction should be both deliberate and comprehensive. It should not be undertaken lightly, without careful weighing against other possible uses of valuable classroom time. It ought to be intentional, begun with clear purposes in mind beyond mere 'word learning'. Instruction in the uses and meanings of words must be sustained and steady, not short-term or sporadic. And finally, no single method of promoting vocabulary development is sufficient by itself, since the goals of instruction, the kinds of words to be learned, and the learners themselves will vary widely" (White, 1985, p. 3).
"...some principles about learning words: First, language development and vocabulary development are parts of the same fabric. All vocabulary development is language development.... Second, language development is concept development. Every word is a concept but many concepts include related concepts.... Third, vocabulary development is an ongoing process. Hence the need for a concentrated, systematic effort to improve the way we learn words. A systematic program of vocabulary development from grade one through college is one of the best ways to increase reading ability" (Dale, 1975, p. 6).
INTRODUCTION

Reading instruction has traditionally received a major emphasis in the school curriculum. Since the 1940's researchers (e.g., Davis, 1944; Gray, 1948; Graves & Duin, 1985; and White, 1985) have agreed that vocabulary and reading are related. Studies by Beck and McKeown (1985) and Nagy and Herman (1984) show that the number of words known is a strong correlate of reading ability.

Research (Nagy, Herman, & Anderson, 1985; Jenkins, Stein, & Wysocki, 1984; Beck, Perfetti, & McKeown, 1982), authoritative opinion (Just & Carpenter, 1987; Anderson & Freebody, 1979; Mezynski, 1983; Jenkins, Pany, & Schreck, 1978), and professional practice (Brown, 1980; Shepherd, 1987; Glazier, 1985) have demonstrated the importance of vocabulary study for skill development in reading and the other language arts. However, acceptance of these results by educators has been minimal as reflected by the minor position of vocabulary study in the school curriculum.
Investigations of students' listening 
(Seashore & Eckerson, 1940), speaking (Lorge & 
Chall, 1963), reading (Johnson & Pearson, 1984), 
and writing (Nagy & Anderson, 1984; Graves & Duin, 
1985) vocabularies have been undertaken. Petty, 
Herold, and Stoll (1968) however, were the first to 
highlight adequately the need for an "understand-
ing" vocabulary. "There are words that are known 
to the extent that a response can be made to them, 
perhaps only in some particular context or with 
some 'prompting' by the persons measuring the 
vocabulary or by an extension of the context. This 
category may represent a particular level of 
vocabulary learning; in some instances it may be 
only surface learning and in others it may be that 
the word is in the 'permanent' vocabulary but has 
not been used for such a period of time that 
instant recall might not occur" (Petty, et al, 
1968, p. 10). Dale and O'Rourke (1971) refer to 
this concept as "twilight zone" words. Johnson and 
Pearson (1984) use a continuum to explain slightly 
known words through instantiatous terms. Gray 
(1951) labeled this idea "permanent" vocabulary.
A student's ability to understand and use the various meanings of a word both in oral speech and in written work have received too little attention in the research literature. Too often, vocabulary development has been narrow in scope, focusing on the meaning of a word. Deighton (1959) notes that a word seldom has just one invariant meaning. Words have many meanings depending upon the context in which they are used (Paul, 1984).

Professional publications (e.g., Thorndike, 1944; Horn, 1926; Rinsland, 1945) on vocabulary prior to 1950 focused on frequency counts of words used, producing basic word lists (Kucera & Francis, 1967; Carroll, Davis, & Richman, 1971), and debating whether to teach words from a list or in a context (Gipe, 1978; Herber, 1970; Jenkins, Stein & Wysocki, 1984; Nagy, Herman, & Anderson, 1985).

There was little or no vocabulary research from 1950 to 1975. Petty, et al, (1968) located less than a dozen studies to include in their report The State of Knowledge About the Teaching of Vocabulary. Dale, Razik, and Petty (1973) found only a few studies related to the
direct, imaginative teaching of vocabulary. Weintraub, Robinson, Smith, Plessas, and Rowls 

The 1980's has generated recent research in several areas that may affect the teaching of vocabulary. For example, Wysocki and Jenkins (1987) investigated the extent to which morphological generalization of derivational suffixes can account for increases in vocabulary size. Stahl and Fairbanks (1986) demonstrated the need for deep processing and rich instruction. Anderson and Freebody (1979) defended the theory that most words are learned through context and wide reading. Jenkins and Dixon (1983) stressed the need for direct instruction of words. Graves and Prenn (1986), compared methods for teaching words that are appropriate in different circumstances. Coomber, Ramstad, and Sheets (1986), reported the levels of processing in memory. O'Rourke (1985), was concerned with the reciprocal relationships between experience and word production (i.e., "experience generates words, but words also generate experiences"). Nagy and
Herman (1984), examined the heterogeneity of English vocabulary and how to adapt instructional methods to different types of words. Beck, McKeown, and McCaslin (1983), studied vocabulary development within pedagogical contexts and natural contexts.

The 1980's have been prolific to date in vocabulary research as more and more investigations have been conducted with both children and adults on vocabulary acquisition. It is known that vocabulary and reading are interrelated. Critical reading skills are vital in a fast changing technological society in order for modern consumers to understand the information the media continuously broadcast and publish. If people must spend more time on critical reading and understanding the writers' meanings then a broad, discriminating vocabulary should be a decided help in the attainment of useful knowledge.

PURPOSE

The purpose of this study was to analyze experimentally the effects of programmed instructional materials on the acquisition of morphological definitions, generation of words
containing the taught morphemes, and the use of these definitions for decoding unknown words. The programmed materials applied structural analysis supplemented by contextual analysis to teach definitions of twelve morphemes, recognition of these morphemes in unknown words, resulting in at least partial knowledge of unknown words.

The major emphasis of this thesis was to show that it is possible to develop a theoretically sound and empirically-based approach to the systematic introduction and use of vocabulary with post-secondary students. This approach may provide more systematic opportunities for strengthening and expanding students' knowledge of words with meaning-bearing elements than are currently available in most educational materials.

The formulation of this purpose was determined by (1) relevant research findings indicating the importance of vocabulary to knowledge in general and specifically to reading comprehension, (2) the influence of O'Rourke's (1970) ideas on systematic instruction of vocabulary through the direct teaching of morphographs with an emphasis on concept learning, and (3) the researcher's personal
experience working with adult learners who want to improve their reading and study skills but have been frustrated by the lack of good materials and/or effective teaching.

The empirical research upon which this thesis was developed consisted of programmed learning materials to teach the vocabulary skills of structural analysis in conjunction with contextual analysis. The major emphasis was on 19 Latin roots which combine with affixes to form meaning-bearing units different from the roots themselves but which still carry the general meaning of the roots. In order to accomplish this goal, adequate opportunities for learning and applying structural analysis was provided. Pertinent questions centered on (1) which base words, roots, prefixes and suffixes to teach, (2) in what order they should be taught, (3) how many opportunities for response should be provided, and (4) whether or not the vocabulary skills of structural analysis transferred to non-taught exemplars. In the process of answering these questions, empirical data to support Skinner's (1954) approach to programmed learning was compiled. Data indicate
that successive approximations lead to a minimum of errors in learning morphological definitions.

RESEARCH QUESTIONS

Specifically, the research questions investigated were:

1. Will there be a functional relationship between a structural analysis approach to direct vocabulary instruction and an increase in the number of words written in response to a written root presented as a paper and pencil exercise?

2. Will the use of structural analysis increase the number of meanings of the roots used during instruction?

3. Will use of the acquired root meanings transfer from taught to unknown words?

4. Will the number of words generated from the presentation of the roots be retained over time?
CHAPTER II
REVIEW OF THE LITERATURE

Introduction

Chapter Two presents a review of the literature in vocabulary organized in chronological order beginning with experimental studies conducted prior to 1940. This seems a logical breaking point because the area of concern in vocabulary research changed around 1940 from basic research on word counts, frequency, and the importance of Latin, to applied research with Davis's (1944) monumental study on the basic skills needed for reading comprehension.

Another important study from an early period in vocabulary research was Deighton's (1959) research on the use of contextual analysis. His study highlights the period from 1940 to 1959.

The third period in vocabulary research was really a dormant period. Few experiments were conducted between 1960 and 1969. Foremost among the work done in this period was Petty, Herold, and Stoll's (1968) review of the literature.
A fourth natural break comes between 1970 and 1979. One of the greatest contributions to the field of vocabulary literature is O'Rourke's (1970) dissertation entitled *Towards a Science of Vocabulary Development*.

For the first time, systematic instruction with an emphasis on concept learning and meaning-bearing words, or word parts, is delineated. O'Rourke is one of the first, if not the first researcher, to stress active learning and semantic feature analysis in the area of vocabulary instruction. This period really marks the beginning of modern research in vocabulary. A trend in the research on the teaching of vocabulary is developing with more studies concerned with applied questions rather than basic research. Basic research is important since it is difficult to conduct applied research until problems have been pinpointed by basic concerns.

During the present decade, vocabulary research has become prolific with numerous studies being conducted on a variety of topics ranging from the number of word families in English to rich and varied instructional strategies with an emphasis on receptive and expressive vocabularies.

Studies are further subdivided into experimental research and authoritative opinion. A few articles
categorized as professional practice are included where needed for continuity of thought.

Later sections of this literature review cover college studies, studies using or defining applied behavior analysis, structural analysis, and research conducted previous to, or in 1988, which leads up to a systematic approach to vocabulary instruction using structural analysis with post secondary learners.

**Vocabulary Studies Prior to 1940**

Studies from this period are empirically based and deal mainly with word counts, frequency, and the transfer of word knowledge from Latin to English vocabulary.

Thorndike and Ruger (1923) conducted one of the earliest empirical studies. Using ninth grade students, they administered the Carr English Vocabulary Test. This instrument contains 25 words of Latin derivation and 25 of non-Latin origin. Pupils who had been studying Latin for one year made gains roughly five words to two over and above non-Latin students. The authors caution the reader that in a test of this type, the probability is that the higher the initial score, the greater the value of each unit of gain, i.e.,
the addition of one word from 24 to 25 is probably a greater semantic gain than one word from 11 to 12.

The first researcher to empirically check the reliability and validity of the four types of vocabulary tests most commonly used was Sims (1927). These four types include: identification (definition, use, synonym, illustration), multiple choice, matching, and checking (simple yes or no). One hundred children from grades 5 through 8 were tested on the same list of 70 words from the Thorndike Test of Word Knowledge, Form B. These 70 words have one common meaning each. The checking test was given first followed immediately by the Thorndike Test. Three weeks later the matching test was given followed by the identification test six weeks later. Some practice effect probably came into play even though more than the 70 target words were tested on the checking and multiple choice portions to disguise the target words. This would decrease the average but not cause a change in relative position within the group which was of primary interest. Average number correct on all four tests was similar but the checking test had the greatest range. The reliability of all four tests was .92 or .93 except the multiple choice test which was .84. This coefficient could probably be improved
slightly if the scores were corrected for guessing. Validity was determined by the method of intercorrelations. The matching, multiple choice, and identification tests measured approximately the same thing. The checking test did not correlate closely with any of the other forms or with the average of the three forms.

Using the Thorndike Test of Word Knowledge with ninth grade girls, Symonds (1927) found that children can recognize the meaning of a word even though they cannot use the word where it is appropriate. He notes that at no level of the test was their ability to recall words equal to their ability to recognize them. The Thorndike Test measures recognition only. Symonds concludes that vocabulary training should be more than merely learning words. Children should learn to use words with discrimination in order to convey precise shades of meaning.

Only three studies are presented in this first time period, but from these studies, it is obvious that one emphasis was upon testing. Latin was considered important. Symonds was hinting at the difference between recognition-type vocabulary knowledge and application of the word's meaning. This becomes an important factor in the 1980's.
Vocabulary Studies from 1941 to 1959

Two important studies date from this time frame: Davis's (1944) comprehension research and Deighton's (1959) research on using the context.

Davis (1944) constructed tests to measure the mental skills necessary for successful reading comprehension. He identified nine basic skills in reading comprehension; two of these basic skills are related to vocabulary: knowledge of word meanings and the ability to select the appropriate meaning for a word or phrase in the light of its particular contextual setting. Davis says "to read at all it is necessary to recognize words and to recall their meanings" (p.191). He concludes that word knowledge is an important part of reading comprehension and suggests that any program designed to improve comprehension must include vocabulary building provisions.

The goal of vocabulary instruction is word power, the ability to attach meaning to unfamiliar words and to make them part of an active vocabulary. In dealing with unfamiliar words, Deighton (1959) states the objectives of instruction should be to increase a student's active reading vocabulary and to provide the learner with an independent word attack strategy. The goal of phonics
is to help the reader approximate the sound of a word. The purpose of syllabification is to help the reader break an unfamiliar word into pronounceable parts. Structural analysis is used to obtain what meaning the parts of a word indicate in themselves. Pupils should be acquainted with prefixes, suffixes, and combining forms which have fixed and invariant values. Gaining meaning from context is a gradual process depending upon prior experience, proximity of enlightening context, and clearness of the connection between the context and the word it bears upon. Deighton warns against exclusive use of structural analysis since the spelling of a Latin root may be quite different than the spelling of the English word derived from it (deceive or deception from de- + capere meaning to take or seize). Many English words are derived from the past participle of the verb rather than from the infinitive form (e.g., visus rather than videre producing vision, visible, vista, etc.). English words can also be derived from the noun form (e.g., legislature is from the genitive case legis rather than from the nominative case lex meaning "law"). The study of structural analysis is an instance of synergism wherein the sum of the parts is greater than the whole. The meaning of a word is obtained through
experience, context, the dictionary, or through the skillful use of structural analysis. A word out of context has no specific meaning. "Dictionary meanings are only points of departure. The use of the words came first; the dictionary interpretations followed. They cannot, therefore, circumscribe a word. They express only the most common aspects, the least common denominators in all the many contexts in which a word occurs. Students ignore the differences, and it is these differences that we must uncover from context if we are to read with understanding" (p. 37).

Working with seventh graders, Otterman (1955) conducted a systematic study of prefixes and roots. Exercises were in manual format and took ten minutes a day to complete. A total of 250 words were covered in 30 lessons. The words themselves were judged familiar to seventh graders. They were chosen to illustrate prefixes and roots to be taught. Transfer of knowledge was statistically significant only with the high mental age group. This led Otterman to conclude that either the test itself was so difficult that only highly intelligent students could interpret it or interpreting new words from known elements is such a difficult task that only highly intelligent students succeed. Perhaps
direct instruction or good teaching are other variables to consider when interpreting results in this type of study.

Brown (1951) found that between the ages of 12 and 22 or 23, vocabulary steadily improves yearly as measured on a 150-item vocabulary test. This same test shows that between the ages of 23 and 50, only a total of 10 words is mastered. During a period of "approximately 25 years, vocabulary moved ahead no faster than in two average school years" (p. 274). Brown suggests that interest or individual motivation is a key to vocabulary learning. He has developed a visual approach to mastering vocabulary. His technique is a way to learn 1000 words at a time by learning 14 master-words containing the most frequently used Latin and Greek prefixes and verb elements found in over 14,000 common English words.

Working in a technical high school, Miles (1945) conducted a vocabulary experiment to discover to what extent the teaching of vocabulary by the direct method would affect general vocabulary. Tenth grade English students were directly taught words during a 10-minute recitation period. Activities included blackboard work, original sentences, spelling, and grammatical forms.
After only one semester of work, the experimental group gained 32.5 words or the equivalent of two years. This same group lost 3.5 words on the average when tested two and a half years later. No direct vocabulary instruction had taken place during the interval. Miles concludes that the original gain was significant enough to warrant further experimentation and study.

This second period in vocabulary research has three major thrusts: reading comprehension, contextual analysis, and structural analysis, and the research begins on a variable that will become important in later research: direct instruction. Brown advocates structural analysis, Deighton and Otterman find difficulties with this word attack strategy.

**Vocabulary Studies from 1960 to 1969**

The period from 1960 to 1969 is somewhat restricted in that there was no clear research pattern developed during this 10-year period. The review of studies teaching vocabulary by Petty, Herold, and Stoll (1968) is probably the most widely read authoritative opinion paper from this time frame.

Conducting an extensive review of the literature, Petty, Herold, and Stoll (1968) focused upon studies concerned directly with the teaching of vocabulary.
They concur with Gray (1951) that a word is presumably in the permanent vocabulary when it becomes known well enough to be used both in written and oral communication with sufficient understanding of its major shades of meaning. Petty, et al label this "understanding" vocabulary. Word meanings and concepts are closely related. Concepts develop gradually beginning with sensory experiences at one end of a continuum and evolving into logical, linguistic reasoning concerning a relationship between a word and its referent at the higher end of the continuum. "An individual is likely not to be able to gain the meaning of a word, without some understanding of the concept to which it relates; conversely, neither is it possible to teach many concepts to children of school age without their having considerable functional knowledge of word meanings" (p. 12). Petty, et al summarize their findings by saying vocabulary can be taught but no one method had been proven superior at the time of their literature review other than that of teaching versus not teaching vocabulary. To paraphrase Deighton (1959), these authors stress that what is needed is a sense of excitement about words, something often overlooked in vocabulary teaching.
In a study with seventh grade pupils, Eichholz and Barbe (1961) studied repetition as the dependent variable. This study dealt with general words using the one meaning judged to be the most widely known. A self-checking device constructed of masonite with 33 holes drilled in five columns of six or seven holes each was used. Students placed one of twenty word tests on top of the masonite, and chose the correct synonym by blackening the corresponding circle. Immediate feedback was available since the pencil point punched through the paper on correct answers. Each word test was written in story form of topical interest to the participants. The experimental group received thirty minutes of informal talks on word history, dictionary usage, or other vocabulary-related topics once a week. The participants also were given two practice forms of the test and the related story each week for eight weeks. The practice effect accounted for a 1.0 word gain. The experimental effect resulted in a 4.6 word gain. Pretest scores of 18.0 words reached 45.3 words after participation in the study. Even though 5.6 words were forgotten over time, 21.7 net words were remembered for a retention rate of 79.5%. The self-checking device allowed students to progress at their own rate.
Several new variables appeared in studies from the third period in vocabulary research. These variables include: shades of meaning, writing vocabulary, concept learning, motivation, practice, self-checking, and immediate feedback.

**Vocabulary Studies from 1970 to 1979**

A pattern is beginning to take shape during this research period. Studies tended to be applied with more and more researchers showing a specific interest in vocabulary. There is a gradual increase in the number of studies until the 1980's when vocabulary research and research on reading comprehension have begun to dominate the field. One extremely important work from this period is O'Rourke's dissertation entitled *Toward a Science of Vocabulary Development*. This work was later published by Mouton in The Hague under the same title in 1974.

A study to investigate the effects of word frequency and contextual richness of novice and partially skilled readers' word identification strategies was designed by Pearson and Studt (1975) for first and third graders. They found that when a word is less well-known to a child, many fixations are needed to achieve identification of a word even in rich
contexts. It was found that third graders were beginning to use the mature reading strategy of approaching the surface structure of the printed sentence from the deep structure or meaning representation of the sentences, sampling whatever data was needed from the surface structure to verify hypotheses made about the underlying meaning of the sentence. The findings of this study support the idea that the ability to use context increases as a function of age and therefore more experience with reading.

The St. Louis Vocabulary Development Project was described by Draper and Moeller (1971). This massive, systematic, long-term project used the school radio system for instruction in word meanings, illustrations of words used, unusual spellings, dictionary respellings and symbols, parts of speech, synonyms, and homonyms. During these activities, classroom teachers wrote the words on the board and students also wrote them in their notebooks. Instruction took place three days a week. After one year of such instruction, the accumulative effect resulted in a sizable gain of verbal ability as measured by standardized achievement tests and IQ measures.
Polysemy with fourth, fifth, and sixth grade students was studied by Mason, Kniseley, and Kendall (1979). They state that as the form and function of an object changes, so do the words and their meanings (cup, mug, bowl, dish, glass, pitcher, etc.). Word meaning also changes while the words themselves do not. Do children identify, use, and remember primary meanings of words? -- this was the question asked by Mason, et al. They found that children not only gloss over polysemic words, they do not attend sufficiently well to context. Mason, et al conclude that children should learn word meanings, secondary meanings, and how to choose the contextually supported meaning.

Dahl (1974) conducted a study with second graders where she trained the students to use minimal visual information while making maximum use of contextual clues. This study focused on high speed word recognition, an intermediate reading skill. Three methods were tested: hypothesis/test, flashed word, and repeated reading methods. The hypotheses/test method is based on word recognition (Samuels, 1970). Fluent readers use syntax and semantics to form hypotheses when reading a text which can be confirmed or not with minimal logical cues, most likely only the first letter
of a word. Decoding is done automatically so attention can be placed wholly on comprehension. "Recognition is a constructive process in which output is different from and greater than the input" (p. 2), i.e., synergism. The goal for students is to develop word recognition skills to the automatic level so accessing of meaning can go on simultaneously with, and not be interrupted by, the decoding process. The hypothesis/test treatment was best but repeated readings was also successful in this study. Superiority in comprehension results when both of these techniques are combined. "It is apparent that beginning and fluent readers are using different strategies in recognizing a word found in a passage. Beginning readers who are not yet automatic in their decoding tend to stay at the surface level rather than at the deep structure level. Consequently they would have difficulty in using context as an aid in word recognition" (p. 5). Accuracy in word recognition is not enough, automaticity must be developed.

The fourth time period in vocabulary research was very important. Many factors considered important today surfaced during the seventies. Factors researched include: frequency, contextual richness, surface and
deep structure, systematic instruction, synonyms, polysemy (multimeaning words), and automaticity.

The Prolific 1980's

Experimental Research

Numerous literature reviews have been conducted during the present decade in an attempt to summarize what has been done so far and to help guide future research. Empirical studies have covered a wide range of topics but there has been a definite focus on the teaching of vocabulary and the role vocabulary plays in reading comprehension that extends research first begun in the 1970's. Following up a study conducted in 1978-1979, Durkin (1981) examined teachers' editions of reading manuals for kindergarten through grade six. She found numerous application and practice exercises instead of direct, explicit instruction. When instruction hints are provided, the connection between the skill taught and how to read is minimized or missing entirely. The activities become ends in themselves rather than the means to an end, i.e., reading comprehension. Children may never make the connection between the instruction they are receiving and how to read independently. Questioning seems excessive whereas strategies to answer a question are nonexistent.
Hargis, Terhaar-Yonkers, Williams, and Reed (1988) conducted a word recognition study with learning disabled students aged 8 years 7 months to 13 years 9 months. Word recognition in this study was defined as "the student is so familiar with a word that s/he no longer needs to identify it. Instant recognition implies complete familiarity" (p. 322). The mean number of repetitions necessary for recognition was 50 with a range of 35-76. This should be compared with Gates's study (1930), the only other researcher to empirically study repetitions required for instant recognition. This study was with first graders. A table included in the Gates study shows 35 repetitions are needed for mastery of individual words for the average student (IQ 90-110). Hargis, et al considered three factors when studying repetition requirements of words: imagery level, context, and decodability. They found words in context required about 12% less repetition than words presented in isolation. High imagery words, measured by concreteness, required significantly less repetitions than low imagery words. Hargis, et al concluded by saying repetition is extremely important in learning to recognize words. "Supplying adequate repetition is probably the most important factor in teaching learning
disabled and mildly handicapped students to read" (p. 326). According to these authors, there is truth in the adage "the more you do, the more you can do."

Apparently, children more readily learn to recognize words after having polished reading skills through abundant reading.

A quantitative and qualitative study of third, fourth, fifth, and sixth graders' listening and reading vocabularies was undertaken by Graves (1980) to see if there was a difference in relative size. He was also interested in the depth of students' understanding of words. A 36-word multiple choice vocabulary test was administered followed by an interview. During the interview children were asked to give two meanings of a word, use each meaning in separate sentences, and explain the meaning of the word in each sentence. On the group test given to fourth and sixth graders, the sixth graders outscored the fourth graders, listening scores were higher than reading scores, students in each higher ability group scored better than those in lower groups, and easier words were mastered best. "Students of all ability levels appear to know the vast majority of the easy words. But as words become more difficult, the number of words known by the low ability readers
drops radically faster than the number known by the high ability group and a good deal faster than the number known by the middle ability readers. The high ability readers' scores on fourth and fifth grade level words were over 50% better than those of low ability readers on those words. Lack of vocabulary then, appears to be part of low ability readers' problems" (p. 18).

The study by Kameenui, Carnine, and Freschi (1982) contains two experiments to determine whether (1) substituting difficult words for easy words in a text makes that text more difficult to comprehend, (2) embedding redundant information specific to difficult vocabulary words significantly contributes to text comprehension, (3) learning the meanings of the difficult words facilitates text comprehension, and (4) if a passage integration vocabulary training strategy is more effective than a vocabulary training strategy that does not include passage integration. Experiment 1 randomly assigned fourth, fifth, and sixth grades to five treatment groups: easy vocabulary passage/no training, difficult vocabulary passage/no training, difficult vocabulary and redundant information passage/no training, difficult vocabulary passage/vocabulary training, or difficult vocabulary passage/vocabulary and passage
integration training. Materials included vocabulary words and their meanings on 4 x 6 index cards, statements with a vocabulary word omitted, and three passages with redundant information in some passages. Results showed no difference on literal level questions but difficult vocabulary words did limit comprehension on inference level questions. Passages containing redundant information proved difficult to analyze since questions designed to test specific vocabulary word meanings could be answered from the redundant information only. Learning the meaning of difficult vocabulary words enhanced comprehension. An integration strategy that incorporates practice of word meanings during passage reading appears more effective than isolated vocabulary training. The second experiment tested for generalization from conditions present in experiment one. Kameenui, et al conclude the substitution of familiar words for difficult words makes a test easier to comprehend. This study was unique in that a pre-established mastery criterion was used during vocabulary training.

Working with primary grade children, Wiesendanger and Bader (1987) conducted a study on easily confused words, or lookalikes. One group was given lookalike
words simultaneously, both were taught together. In

group two, nontarget and target words were taught
separately at first, then compared. Group three
received no remediation for substituted words. Words
were taught in the context of a story. Students made up
sentences containing the word and listened for it while
others read their sentences aloud. Then the target word
was printed on a card, cut into letters, scrambled, and
remade several times. Words were then printed on the
board, scrutinized, visualized, and reproduced on paper.
The final step was a sentence fill-in on the board.
This process describes the context-isolation-context
(CIC) sequence introduced by Cunningham (1980). Gains
were made by all three groups, but target and nontarget
words taught separately, then compared, was the best
treatment. Teaching both the target and nontarget words
simultaneously was least successful.

The assertion that little vocabulary instruction
takes place in the classroom (Durkin, 1978-1979) was
found to be incorrect by Blachowicz (1987). She chose
fourth grade to observe since so much more new
vocabulary learning starts to take place when children
are exposed to content reading in the middle grades.
Classroom teachers were observed 20-40 minutes on 10-15
different school days. Slightly less than half of the
time observed was coded as instructional interaction
time. Instructional interaction time refers to active
teaching of the group (teacher highlights a word,
phrase, or list of words as needing attention) not
monitoring progress, management, or individualized work.
Fourteen percent of instructional time was devoted to
vocabulary instruction, 19% if you count general concept
development based on words relevant to the selection.
"Teachers' own post lesson analyses showed that they had
a strict criterion for instruction. They tended to make
a distinction between concept development, comprehen-
sion, and vocabulary instruction, resulting in an
estimate of about 15% of instructional time devoted to
vocabulary" (p. 134). The major instructional focus was
on using the context to determine meaning. Specific
vocabulary instructional activities such as categoriza-
tion, mapping, or brainstorming received 7% of
instructional time. One instructional strategy that was
lacking was attention to independent word learning
skills such as discussion of word structures, an
important independent learning clue. Instruction seems
to be guided by resources presented in teachers'
manuals. Blachowicz concludes by saying more explicit
ideas for modeling strategies and developing lessons around direct teaching experiences need to find their way into commercial materials. Commercial materials greatly influence the structure of classroom instruction.

Two experiments were conducted by Freebody and Anderson (1983) to assess the effect of difficult vocabulary on text comprehension. Previous studies (Marks, Doctorow, and Wittrock, 1974; Wittrock, Marks, and Doctorow, 1975; Tuinman and Brady, 1974; Jenkins, Pany, and Schreck, 1978) have had equivocal results when searching for a relationship between vocabulary and reading comprehension. Freebody and Anderson assessed whether or not difficult vocabulary placed in important text elements interfered with comprehension. Sixth grade students read 400-500 word passages that contained easy, medium, or difficult words. The easy condition contained high word-frequency words while the medium condition contained approximately one substance word substitution in six, and the difficult condition contained one substance word substitution in three. The results show that a high proportion of difficult and unknown words are needed to interrupt comprehension significantly. Normal text contains so much redundant
information that predictions can be made by readers without a need to comprehend every word. These authors suggest that the reader simply skips over unfamiliar words and continues reading. A difficult word acts as a signal to slow up, reread, or rephrase a proposition. This has been called the "minimum effort principle". "It may also be the case that, particularly for school texts, writers do not use rare words trivially in peripheral propositions whose meanings cannot be constructed from elsewhere in the text" (p. 37).

The current decade in vocabulary research has been revitalized. Vocabulary research is prolific in the 80's. Many applied studies have been conducted on the teaching or lack of teaching vocabulary, vocabulary and reading comprehension, repetitions needed for mastery, context vs. isolation, disadvantaged readers, mastery criterion, time on task, and location of difficult vocabulary within a text.
Authoritative Opinion

Students' knowledge of multiple words in isolation and in context were investigated by Graves, Slater, and Cooke (1980). This is a follow-up study to Graves (1979). The current study was conducted with second, fourth, and sixth graders. Two words at difficulty levels of pre-fourth, sixth, and tenth grade levels were printed on 3x5 cards. For the isolation task, students were shown the word, asked to pronounce it, give a meaning, and to provide a second meaning. For the words in context, students were shown a word, asked to pronounce it, read a sentence containing the word, provide the meaning of the word in that sentence, and to repeat the last two steps with a second sentence. Scores were 50% greater with words in context than in isolation. Students produced three times as many correct responses to 6th grade words as to 10th grade words and did about 35% better with pre-4th grade words than on 6th grade words. High ability students performed distinctly better (75%) than low ability students, e.g., high ability 2nd graders produced 95% as many correct responses as low ability 6th graders. The authors state that "the task with words in isolation is distinctly a vocabulary task while that with words in
context is a more general comprehension task" (p. 6). Less able readers' vocabulary skills seemed to be more retarded than their general comprehension skills.

Wixson (1986) was interested in the effect of preteaching words of central and noncentral importance to a text on children's comprehension, whether an instrument to measure question specificity concerning pretaught words would produce different results than a general recall measure of comprehension, and what the effect of teaching words using a dictionary method would be. The results of this study support direct instruction, i.e., children pay attention to, learn, and remember what has been directly instructed. Preteaching central vocabulary is the best way to facilitate comprehension of central story ideas while preteaching noncentral vocabulary is the best way to facilitate comprehension of noncentral ideas. In other words, teach whatever you want the students to learn.

Johnson and von Hoff Johnson (1986) note that making inferences requires a marriage between prior knowledge and passage vocabulary, i.e., reading connected discourse. These authors list and provide examples of ten major inference types: location, agent,
time, action, instrument, category, object, cause-effect, problem-solution, and feelings-attitude.

Teaching vocabulary through opposition or polarity is suggested by Powell (1986). Polarity provides definitiveness, precision, and limitations to meaning, as well as setting the extremes of a word's meaning. Scalarity, meaning a continuum or gradation of word knowledge, provides the shading, nuances, and fineness of words' meanings. Since antonyms are powerful generators of superordinate categories of meaning, the theory of antonymy should be used to teach the three major types of basic word oppositeness: contradictives, also called complimentaries, which are mutually exclusive (single/married), contraries which allow for gradations (ascend/descend), and reciprocal or converse terms which reverse or undo meaning (buy/sell).

Anders and Bos (1986) suggest that vocabulary should be taught based on its relationship to the major ideas presented in a text. Using semantic feature analysis may allow the students to activate prior knowledge and to think about the relationships between and among prior knowledge and superordinate/subordinate concepts. Students will be predicting, confirming, and integrating as they read.
Two activities to change bored uninterested passive vocabulary memorizers into active learners who invent words are suggested by Parker and Perez (1987). Inventing words is a 3-day class activity based on brainstorming in small groups. The teacher introduces a concept for which there is no word, such as, the opposite of catastrophe, and asks students to coin a new word by using either new combinations of existing words (ethnocentric), employing old words to accomodate new meanings (stereotype, culture), or deriving new forms from existing words (interdependence). On day two, classmates decide which coined word is most likely to become popular with the public, which words are least likely to be used widely, and which word best names the concept. This work is done in small groups. Day three is reserved for whole-class discussion. The second activity is renaming concepts. In the past, great emphasis has been put on learning the names of concepts (democracy, communism, etc.) rather than on understanding the concept itself. In this activity, students learn the conventional term but also note that the label may not entirely convey the essence of the concept. Students think up a one-or two-word nickname or label that they could use for the concept. After
hearing everyone's selections, one choice is made and discussed with examples and nonexamples of the concept. "Student understanding of the concept is strengthened when the teacher occasionally uses one of the students' labels rather than using only the conventional label" (Parker & Perez, 1987, p. 166) in classroom discussions.

Blachowicz (1986) comments that students should actively create semantic connections between their prior knowledge and new vocabulary by using new words in contextual situations. She suggests four alternatives to a vocabulary notebook: (1) semantic gradient (cold, hot, lukewarm, boiling), (2) concept ladder (made of? part of? kinds of? parts of? made or used for?), (3) predict-o-gram or predicting how the author will use the new words in the story to tell about the setting, actions, characters, resolution, and goal, and (4) exclusion brainstorming (predicting which words will not be used in a story given the title and 6-8 words listed on the board.) This activity capitalizes on organizing vocabulary in relationship to a larger whole through classification.

Many of the articles in this section reflect professional practice as well as authoritative opinion. Factors discussed because of their importance to the
teaching of vocabulary include: isolation vs. context, central and noncentral relationship of ideas, pretaught words, direct instruction, inferences, prior knowledge, opposition or antonyms, shades of meaning, super- and subordinate concepts, semantic feature analysis, inventing words, theory of antonymy, renaming concepts, semantic gradient, concept ladder, exclusion brainstorming, and classification by relationships.

**College Studies in Vocabulary**

A study with college freshmen to determine the extent to which they possessed the skill of using the context to construct meaning of an unknown word was conducted by Gibbons (1940). She found that 45% of the students could not construct meanings of the 30 test items. Gibbons found that individuals vary in their ability to use context in figuring out the meaning of unknown words. Students with higher intelligence appeared better able to use this skill successfully than students with less ability. She concluded that since an accurate meaning vocabulary is fundamental to success in every school subject it is therefore the job of every teacher in every grade to help students construct accurate word concepts necessary to understand the content of a given subject.
Another study with college students, conducted by Baechtold and Algier (1986), utilized rhyming as a mnemonic device to activate long term memory for retention of story events. Four previous studies had shown rhyming did not help children but actually distracted them. Baechtold and Algier conclude that children have not yet mastered the technique of mnemonic devices.

Marked relationships among vocabulary, structural analysis, and reading at the college level were found by Hunt (1953). He used four tests to infer ability in structural analysis: word-derivation, word-elements, word-meaning construction, and context. The word-derivation test consisted of twenty common words selected because their elements have common meanings and were etymologically simple. In order to be considered correct, the identification of the stem or root (audio, audi, or audit in auditorium) with its meaning of "to hear" and the suffix -orium, meaning "a place for" both had to be given by the students. Hunt found the subject of combining forms more closely related to other measures than either prefixes or suffixes. Students who could recognize the greatest number of elements of familiar words were superior in unlocking the meanings
of unknown words. The more intelligent students possessed greater structural analysis ability than less intelligent students even at the college level. Hunt concludes that the ability to use structural analysis is more than a matter of general intellectual ability since it seems to be related to vocabulary and reading even when the intelligence factor is held constant.

The Morpheme Recognition Test was developed by Carroll (1940) to be used with university students to test reliably the ability to recognize morphemes and their meanings and to see what relation exists between knowledge of morphemes and vocabulary. Twelve Latin roots: -clud, -dict, -duct, -fin, -jac, -ject, -magn, -pon, -pos, -rupt, -sect, -tact and two Greek roots: -gram and -graph were included on the test. Carroll found some separate entity in addition to general ability but independent of intelligence and not affected by Latin study which is associated with morpheme recognition and correlated with vocabulary. This entity may be "interest in words" or "awareness of linguistic units." Carroll contradicts the findings of Thorndike and Ruger (1923) by stating that Latin influences the ability to recognize morphemes and the knowledge of their meanings but has no definite effect on English
vocabulary. This result is in spite of the fact that morpheme recognition ability is partly related to vocabulary. Carroll states "the interpretation seems to follow that the teaching of word derivation per se in Latin classes does not aid in enlarging English vocabularies unless, possibly, specific attention is directed towards words not already known or used by students." Baer (1981) would say, if you want generalization to take place, teach it.

Studies done with college students have looked at the variation in ability to use context, the use of mnemonic devices such as rhyming, combining forms, morpheme recognition, and interest in words. Gibbons believed in 1940 that content area teachers, in addition to primary school reading teachers, should teach vocabulary.

**Applied Behavior Analysis**

**Introduction**

Since 1974 when Birnbrauer, Peterson, and Solnick highlighted the potential of using single-subject designs for interpreting empirical research, the demand for single-subject designs has increased.

Hersen and Barlow (1976) discuss the dissatisfaction with the reversal or withdrawal design because
of three potential problems: 1) the behavior under study is not likely to return to the baseline level, 2) treatment effects carry over to periods when the manipulation is withdrawn, and 3) a return to the baseline condition presents either ethical problems or staff resistance. The multiple baseline design is not limited by the three previous restrictions. With this design it is possible to study the response of one individual across several different behaviors. After steady state performance is achieved in baseline, the independent variable is first applied only to one behavior. If there is a change in the response to which the independent variable has been applied, either positive or negative, evidence begins to build to assert a functional relationship between the treatment manipulation and the dependent measure. The identical procedure is replicated sequentially on the other behaviors of interest. Treatment is begun on the second behavior only when an obvious effect, hopefully a robust one (Baer, 1977), has taken place on the first behavior. A change in each successive target response, but not other behavior still in baseline, as a function of manipulation of the independent variable provides additional evidence of experimental control. "The
design is effective in ruling out maturation, history, and other confounding factors that could account for change in the dependent measure. Subsequent to demonstrating the effectiveness of an instructional program with a multiple-baseline design, the effect should be replicated with additional single-subject or group studies to increase the external validity of the results" (Cuvo, 1979, p. 220).

One of the most frequently cited limitations of the multiple-baseline design (Baer, Wolf, & Risley, 1968; Hersen & Barlow, 1976; Kazdin, 1973) is that it requires behaviors under study to be independent of each other. If the behaviors co-vary with manipulation of the independent variable, demonstration of experimental control is weakened considerably. When selecting concurrent and plausibly related multiple baselines, the logical basis for verifying the prediction of a behavior that has undergone manipulation by the independent variable must satisfy two conditions: (1) the two measures must be measured concurrently, and (2) all of the relevant variables that influence one behavior must have an opportunity to influence the other behavior (Cooper, Heron, & Heward, 1987, p. 208). "Exposure [to the independent variable] does not have to be
simultaneous for the different behavior/setting combinations, [but] it must be the identical treatment conditions along with the associated extraneous variables that impinge on the two responses and/or settings. This is because the conditions imposed on one behavior/setting combination must have the opportunity of influencing the other behavior/setting combination at the same time, regardless of the condition that actually prevails for the second [behavior/setting combination]." Cooper, et al, p. 208, cited in Johnstone & Pennypacker, 1980, pp. 276-278). Since replication of effect is more or less demonstrated each time a steady state is changed by the introduction of the independent variable, the potential confounding due to concurrency and plausible influence is controlled (Cooper, et al, p. 208).

Another problem with the multiple-baseline design is that there is no opportunity to perform the behavior under observation, i.e., a person is unlikely to be able to work division problems if he cannot subtract correctly. Collecting extended baseline on such a behavior is merely a pro forma procedure; it looks like steady study responding of zero, but actually represents no opportunity to respond.
The potential pitfalls of measurement that have concurrency and plausible influence are described by Cuvo (1979). He also recommends strategies for avoiding or minimizing the effects of measurement confounding, and highlights a measurement advantage of using the multiple baseline design to evaluate instructional progress.

Because of the repeated and often frequent measurement that characterizes the multiple-baseline design, two issues may confound the data. The dependent variable often represents maximal rather than typical performance, and it is frequently administered directly by the experimenter to the subject. This interpersonal context rather than the normal surreptitious measurement collected in many single subject designs may introduce subject reactivity into the study.

The extended baseline used in the multiple-baseline design enables monitoring of behavior for effects of history, maturation, or other sources of interval validity (Campbell & Stanley, 1963), as well as determining whether practice on the task provides the opportunity for learning to take place without intervention. Since feedback is not given during baseline, a measure of the pretraining level of behavior
is collected, against which behavior after instruction may be compared.

Repeated or demanding measures during baseline without contingent consequences may create unwanted side effects such as reactivity.

"In order to minimize the possible deleterious effects of repeated test trials during baseline, experimental control could be preserved by administering a minimum of two pretests prior to training. All subjects could be tested at the outset at approximately the same time in order to provide an initial baseline measure. Trainees could be assessed once again immediately before they enter the treatment phase of the experiment. Such a baseline procedure would provide data to compare directly the pretraining performance of all participants (i.e., the initial pretest) and examine effectiveness of control for history, maturation, and other confounding effects (i.e., shown by no difference between Pretest 2 and Pretest 1).... Minimal testing is especially reasonable when the baseline level is low or when there is no opportunity for subjects to acquire the target response(s) without direct training" (Cuvo, 1979, p. 222).
Two baseline data points are the minimum required to demonstrate experimental control (p. 222). If the second data point differs greatly from the first, additional data points should be collected until stability is attained. If the baseline shows great reactivity, an extended baseline is necessary in order to control for history, maturation, practice, habituation to novel stimuli, and adaptation effects.

Test length could be a potential contributor to the problem of extended baseline measurement. The use of frequent probes of the terminal behavior is a possible alternative to extended baseline measurement. Warner and Baer (1978) recommend the multiple-probe technique as a design substitute for the extended baseline necessitated by the multiple baseline.

Procedural contrast between training and testing phases of a multiple-baseline experiment was not a problem with the present study. There were no training phases. If there had been, the contrast could have been minimized by explaining to the subjects that reinforcers will be available during the testing phase.

A third potential problem mentioned by Cuvo (1979) is inaccurate generalization during training. Since there was no training phase in this study, this was not
a problem. If a researcher suspects inaccurate generalization might disrupt the experimental findings, the instructional design could include test-blocked and random-blocked procedures with random ordering during the pretest, posttest, and follow-up.

The option of examining covariation is a plus with the multiple baseline design. Generally covariation leads to possible weakened experimental control, but by combining the multiple baseline design with a companion design whose function is to ensure experimental control, you turn a possible weakness into a strong point. "As generalized responding occurs sequentially across subjects, the replication of the effect reduces the probability that the onset of extraneous factors would be perfectly correlated with the initiation of training" (Cuvo, 1979, p. 226).

The use of single subject designs, especially the multiple-baseline design was discussed in this section. Topics discussed were robust variables, experimental control, covariation, confounding variables, steady state responding, pro forma procedure, maximal performance, interpersonal context, extended baseline, minimal testing, and baseline reactivity.
Structural Analysis

The skill of structural analysis has not been widely taught to or used by students. Apparently the contradictory results found in early studies concerning the transfer of Latin knowledge to English vocabulary coupled with authoritative opinion such as Deighton's (1959) has kept researchers away from this word attack skill. Fluent readers use whatever skills they possess to help them unlock words and comprehend written text. Less fluent readers can be taught to use structural analysis in combination with phonetic analysis, contextual analysis, and rote learning when needed in order to obtain meaning from print.

The studies included in this section have been cited earlier in this literature review. They are mentioned here a second time to show that there has been some interest, albeit little, in structural analysis over the years. This is one area of vocabulary that needs more research to prove the viability of morphological analysis.

Thorndike and Ruger (1923), found that first year Latin students outgained non-Latin students five to two on the Carr English vocabulary test. Carroll demonstrated the important role structural analysis can
play in vocabulary learning. He also hints at an unknown factor influencing student learning of words. He called this factor "interest in words or awareness of linguistic units" (p. 109). Otterman (1955) conducted a study on prefixes and roots. He found only the highly intelligent students could transfer the knowledge gained to novel situations. Could it be that only the most intelligent students could make the tremendous leap necessary from Latin to English without direct instruction on how to generalize?

Little research with positive results has been conducted on structural analysis. The three studies cited in this section stress the importance of Latin to English vocabulary, the role morphemic knowledge can play in vocabulary learning, and work with prefixes and suffixes that seems to benefit better students more than less able students. Carroll (1940) also hints at a motivation factor or an "extra linguistic" factor.

**Systematic Vocabulary Instruction**

Articles discussed in this section support O'Rourke's systematic instruction in the teaching of vocabulary. Direct instruction with an emphasis on meaning, using varied approaches and teaching students to become independent learners are prime factors to be
considered when teaching vocabulary. Throughout the past forty years or so, there have been few researchers who approach vocabulary teaching the same way as O'Rourke. However, since about 1980, more and more researchers and teachers are emphasizing the need for rich instruction and motivating students to want to learn for the sake of learning rather than for some other reason. The goal is to develop intrinsic learners.

A new release by Marzano and Marzano (1988) entitled A Cluster Approach to Elementary Vocabulary Instruction provides a needed resource for teachers who want to teach new vocabulary stressing meaning and words located within a superordinate concept. These authors believe, as several others interested in the teaching of vocabulary, that words represent concepts (Seashore & Eckerson, 1940; Dewey, 1954; Carroll, 1964; O'Rourke, 1970; Speidel, 1985; Nelson-Herber, 1986). The more words a student knows the more concepts he understands. "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).
Nagy & Herman (1984), who found a 4,700 word difference between high achieving versus low achieving students, think vocabulary instruction should be a focal point of education for students lacking general knowledge.

When working with linguistically disadvantaged students, Becker (1977) recommends intensive vocabulary training. Nagy & Anderson (1984) disagree. They argue that there are too many words (88,500 distinct word families) to teach directly. Nagy & Anderson believe children acquire the majority of their words from context, by reading widely. Beck, McKeown, and Omanson (1987) have demonstrated that direct vocabulary instruction is successful. Marzano & Marzano (1988) take a compromise position: "Some vocabulary should be taught directly using varied instructional approaches and some should be reinforced via wide reading and language development activities" (p. 2).

Learning words is more than just learning labels for concepts. "Vocabulary knowledge implies a rich understanding of the word" (Marzano & Marzano, 1988, p. 3). O'Rourke (1970) calls this breadth and depth of learning. Pearson (1985) refers to this as attaching meaning to a word rather than just recognizing it (name
calling), he says this is knowing a word in its fullest sense. Beck (1984) calls this owning a word. This richness of a word's meaning could be compared to surface and deep structures in reading comprehension.

Direct teaching of vocabulary has been successful with numerous researchers (Beck, Perfetti, & McKeown, 1982; Becker, 1977; McKeown, 1985; McKeown, Beck, Omanson, & Pople, 1985; Stahl, 1983; Wixson, 1986). But mostly, the transfer of learning from vocabulary to reading comprehension is equivocal. That is not surprising since Baer (1981) tells us that if we want generalization (transfer of knowledge) to take place, we must teach for it. This seems like an oversimplified statement but it makes sense if you think about the difference between primary level reading in first and second grades and intermediate level reading beginning around third grade. Beginning readers must learn to recognize the printed word and match it with the oral word for which they have already learned a meaning or have already established a classification structure to organize information. Independence in reading comes after the basic skills of phonics, word recognition, and thinking skills have been developed to an automatic
level so they don't overload memory when attention must be devoted to comprehension.

We already know that direct vocabulary instruction is important. Other variables to be considered include: time on task, frequent encounters, multifaceted techniques, working from the known to the unknown, learning words within a context rather than in isolation as in memorizing word lists, and words for instruction clustered semantically (Marzano & Marzano, 1988, p. 69).

Perhaps the links missing between vocabulary and reading comprehension are independence in word attack skills and an emphasis upon the end goal of reading and getting meaning from the words as the author intended, or at least close enough to it so that the reader can react, i.e. agree or disagree with the author.

Nagy and Anderson (1984) are right in questioning the utility of direct vocabulary instruction of specific words. But what about systematic direct instruction in independent word skills? Words can be learned by sight (memorized), by sounding out the individual letters or letter combinations and then blending them together to get the whole word (phonetic analysis), separating the whole word into recognizable parts (structural analysis), and using clues from the surrounding text to
guess the word (contextual analysis). Fluent readers probably use whichever strategy works out at the moment on a particular word or, more than likely, a combination of two or more of these strategies.

Marzano and Marzano (1988) take a middle position in the direct instruction vs. wide reading philosophies saying "wide reading should be the primary vehicle for vocabulary learning, yet some selected words can be the focus of direct vocabulary instruction" (p. 11). The words that need direct instruction are words for which a concept has not yet been developed or fully developed by the students. When students read a word, they need a concept with which to associate the word not only for better retrieval but for simple understanding. Jenkins, Stein, and Wysocki (1984) remind us that incidental learning of vocabulary is not an automatic given. If you want the students to learn a word or words, tell them so. That is the whole purpose of behavioral objectives. Children are usually eager to please if they know what you want and how to accomplish it. They will try to please you and learn at the same time even if it is for extrinsic rewards. Later they may internalize the need or desire for learning and become
self motivated. Not everyone reaches this stage of reading (learning).

The most important need in vocabulary instruction is to teach students how to learn words the teacher does not have time to teach directly (Marzano & Marzano, 1988, p.15). Marzano and Marzano (1988) chose a categorical or cluster approach to vocabulary instruction. Categorization works from the known to the unknown (O'Rourke, 1970). These authors have established 61 superclusters semantically arranged from elementary textbooks. These superclusters are subdivided into 430 clusters which are further subdivided into 1,500 plus miniclusters. Miniclusters have the most characteristics in common. Each word is labeled for grade level, part of speech, and whether or not it is a basic word. Basic words are considered the building blocks of an English vocabulary. Dupuy's (1974) and Becker, Dixon, & Anderson-Inman's (1980) lists of basic words were compared, sorted through, and supplemented or deleted by the authors. This process left 5,084 basic words (Marzano & Marzano, 1988). "Any word not classified as basic ... in the opinion of the raters [authors] has the basic word from which it is
commonly considered derived written in parentheses" (Marzano & Marzano, 1988, p. 33).

Morphology can be used by teaching words together as families. If a frequent word in a family is known, this knowledge bridges the gap from the known to the unknown, e.g. drama, dramatist, dramatize, dramatization. Calling attention to the process of word formation may lead students to take advantage of semantic relationships when learning words independently. Students can add suffixes to words in a cluster and note changes in the words' meanings. By creating real and fabricated words and explaining their meanings students become familiar with semantic relationships among words. Johnson & Pearson (1984) recommend direct instruction on inflectional endings or morphemes: plural - s, es; comparison - er, est; tense - ed, ing, s; and possessive - 's.

A two-step strategy for teaching students to use information available from affixes has been developed by Durkin (1976): (1) mentally separate prefixes and suffixes from the root to see if the root is known; if not, use phonetic analysis to sound it out, and (2) once a root is identified, teach the suffix first, then the
root, and add the prefix last, i.e. unenviable-enviable-envy-enviable-unenviable.

A new release entitled The Psychology of Reading and Language has been written by Just and Carpenter (1987). Many techniques individually tested by other researchers and by the authors themselves are given as ways to suggest improvement in the acquisition of word meanings. Just and Carpenter believe that conceptual knowledge and vocabulary are closely related (Seashore & Eckerson, 1940; Carroll, 1964; O'Rourke, 1970). They also believe that vocabulary learning is continuous throughout the school years (O'Rourke, 1970; Speidel, 1985; Nelson-Herber, 1986).

The idea that repeated exposures to a word in a variety of contexts will gradually add to the reader's richer understanding of a word is similar to O'Rourke's (1970) idea of breadth and depth of concept learning. Along this same line of thinking is the idea of connotation and denotation. Since many words have slightly different meanings in different contexts, part of vocabulary learning involves acquiring subtle distinctions or nuances of meaning.

Knowing a word well includes its part of speech, the superordinate category (Marzano & Marzano, 1988) to
which the concept belongs, and its typical and distinguishing features.

Just and Carpenter (1987) probably believe in the aptitude hypothesis (Anderson & Freebody, 1979, 1982, 1985; Mezynski, 1983; White, 1985) to some extent. "Vocabulary acquisition reflects both language specific processes and general learning mechanisms" (Just & Carpenter, 1987, p. 116). They agree with other researchers that good readers seem to have more skill in inferring unknown words' meanings, and appear to have larger vocabularies than poor readers (Davis, 1944, 1968; Sternberg & Powell, 1983; Tuinman & Brady, 1974). "One possible explanation that fits in with current analysis is that good comprehension and vocabulary acquisition are related. The mechanisms used to comprehend the text when the vocabulary is known can also be used to infer the meanings of unknown words" (Just & Carpenter, 1987, p. 113). Readers obtain meaning from unknown words by using the same lexical, syntactic, semantic, referential, and inferential processes that they use with known words. Therefore, readers who excel at comprehending easy passages will likewise excel at comprehending more difficult text if
the only difference between the writing is word difficulty.

Just and Carpenter (1987) believe that an encounter with a word in text reveals only part of the unknown word's meaning (Dale & O'Rourke, 1986). Since readers encounter many more words than they can learn through direct instruction or memorization, vocabulary programs should teach students to become independent word learners.

These authors point to Deighton's (1959) emphasis on the role motivation plays in vocabulary acquisition. "What is needed for all learning is interest. A sense of excitement about words, a sense of wonder, and a feeling of pleasure - these are the essential ingredients in vocabulary development" (Deighton, 1959, p. 59). O'Rourke (1970) simply says learning should be enjoyable.

Even college students are not always aware of the general strategy of structural analysis of separating a word into its parts in an attempt to guess its meaning (Sternberg & Powell, 1983 cited in Just & Carpenter, p. 987, p. 121). O'Rourke (1970) found that many students between fourth and twelfth grades could not match definitions with common affixes. Students do not infer
meanings of affixes on their own, they must be taught the meanings of affixes directly. In this same work, O'Rourke reported eighth graders mixing and matching affixes and roots to invent words. Today these are known as sniglets (Atkinson & Longmann, 1985) as popularized on late night television. "Producing new words is a stringent test of the ability to decompose words, more stringent than is necessary for interpreting unknown words during reading. Consequently it is good evidence of the students' mastery of this skill" (Just & Carpenter, 1987, p. 121).

"Morphemes that occur with many different words are often productive; that is, they can be used to create and interpret new words. For example, one can easily interpret new words created with an un-, such as, uncompiled, unpeppered, or unscooped. In contrast, the prefix apo- occurs in only a few words, including apocalyptic, apogee, and apoplexy. Consequently, the meaning of a prefix like apo- is much less likely to be learned than that of a prefix like un-. Thus, an unknown word that contains frequent component compound morphemes is likely to be structurally analyzed during reading" (Just & Carpenter, 1987, p. 124).
Structural analysis works best on infrequent words. Fortunately, low frequency words are most likely the words a fluent reader is unlikely to know. "The phenomenon of the meanings of infrequent derived words being more rule governed is one example of a trend that is detectable at many levels of language, namely, that infrequent forms are more regular than frequent forms" (Just & Carpenter, 1987, p. 125.)

Speidel (1985) says "a study of word meanings is a study of concepts and concept formation. This is because word meanings (except for proper nouns) do not refer to any particular referent but generalizations" (Speidel, 1985, p. 28). Vocabulary instruction is a central part of a child's intellectual development and should have a much more important role in the educational curriculum. Interestingly, Speidel (1985) states that complex concepts are easier to learn than less complex concepts. Words heard more often are easier to learn than words heard infrequently. Particular words which are more important to a particular child are learned more easily than non-meaningful words.

Speidel (1985) is able to bridge the gap between the instrumentalist thesis (Beck's fertile vocabulary
instruction) and the knowledge hypothesis (Nagy's incidental word learning) by suggesting that the former position should include organizing schemata for word learning that are experiential or narrative based while the latter position should include word definitions and more explicit connections between terms.

Motivation and independent learning strategies should not be overlooked. To develop independence, Speidel suggests increasing motivation and awareness of the importance of word meanings, and also, teaching word structure (prefixes, roots, and suffixes).

A sequence for teaching vocabulary and word analysis skills has been suggested by Stotsky, (1978). She suggests this teaching order: (1) simple base words should be taught first, (2) base words with common inflectional endings second, (3) simple compound words third, (4) suffixed and prefixed words containing known base words fourth, (5) words such as telegraph, microphone, or tricycle composed of combining parts which usually have a clear and invariant meaning and which are regularly used in coining new words in our language fifth, and then (6) complex noncomposite words containing roots and initial or final elements related to prefixes and suffixes already taught.
Brown (1951), discussed earlier in this review on page 18, has developed 14 master words. He believes by learning the 20 prefixes and 14 roots contained in these 14 words, over 14,000 English words can be derived.

Studies concerned with the effects of vocabulary instruction on the learning of word meanings and on comprehension were reviewed by Stahl and Fairbanks (1986). They found three method-specific and two general setting factors could influence a method's effectiveness. The three method-specific factors are relative emphasis on definitional or contextual information, depth of processing, and number and type of repetitions. The two general setting factors are group or individual study and number of minutes allocated per word.

In order for vocabulary instruction to be meaningful, Thelen (1986) reminds us that it must be taught in conjunction with the learner's preexisting vocabulary. Teachers should analyze a text and list key concepts to be learned, then make a judgment as to which words the students need to know in order to facilitate comprehension. She compares cognitive structure to a filing cabinet and existing ideas or schemata to file folders.
Dale and O'Rourke (1986) say that the more experiences you have had, the more likely you are to have come across new words. Since teachers know that there is a close relationship between vocabulary and comprehension, they should plan to accelerate the rate at which experience-based words are understood and mastered by students. Experiential vocabulary acquisition results in incremental acquisition. To help students increase the number of words in their active vocabularies, teachers should introduce students to the structure and context of language by modeling how meaning can be derived from external (sentential, syntactical) and internal (meanings of word parts within the word itself) context clues. Vocabulary instruction should be related to all school endeavors cutting across the curriculum to encourage students to develop a "vocabulary consciousness" -- a critical awareness of the importance of vocabulary in their lives. Students should generalize about words, first classifying them according to broad meaning and later learning specific definitions and discriminating among shades of meaning. Since the goal of instruction is the development of concepts, it is best to remember that vocabulary development is synonymous with concept development. A
final reminder from these authors is that vocabulary improvement should be enjoyable.

Four guidelines to assist teachers in the identification of instructional procedures that lead to expanded word knowledge, increased reading comprehension, and strategies for independent learning have been suggested by Carr and Wixson (1986). Their guidelines include: (1) integrate background knowledge, (2) develop elaborated word knowledge, (3) provide for active student participation, and (4) develop independent word learning skills. Carr and Wixson think one way of becoming an independent word learner would be to use the concept of a strategic reader. "Strategic readers are those who are responsible for their knowledge, cognizant of that responsibility, and motivated to learn. In this concept, control includes awareness of a variety of methods to acquire word meanings, ability to monitor one's understanding of new vocabulary, and the capacity to change or modify strategies for understanding new words if comprehension is not forthcoming" (Carr & Wixson, 1986, p. 591). An evaluation matrix applying these four guidelines is included along with examples of four specific procedures. The four procedures described
are: (1) the structural overview, (2) free form outlines, (3) brainstorming, and (4) capsule vocabulary.

According to Nelson-Herber (1986), many content area teachers don't recognize that learning content vocabulary is different from learning a general vocabulary. She acknowledges generalizations established through empirical research by saying "extensive reading can increase vocabulary knowledge, but direct instruction that engages students in construction of word meanings, using context and prior knowledge, is effective for learning specific vocabulary and for improving comprehension of related materials" (Nelson-Herber, 1986, p. 627). One problem students encounter in content reading is that of trying to transfer skills learned in primary reading class to textbooks containing concepts and vocabulary that are unknown to them. Reading in grades one and two has as its major goal teaching word recognition skills. When students come to first grade, they already know most of the words they will encounter in reading. These words are already in their speaking and listening vocabularies. A first or second grader's job is to recognize the written word, pronounce it, and associate it with the meaning he has already attached to the oral form of the word. "The
problem is not that the students have not learned the basic reading skills; it is that the students lack the prior conceptual knowledge and the vocabulary knowledge to be able to 'recognize' words and construct meaning from the text (at the same time). Their lexicons are simply not sufficient for the task" (p. 628).

Difficult concept words must be taught by content area teachers. Text-books are designed for teaching vocabulary, facts, concepts, and values that are above the independent reading level of the majority of students. Students need multiple in-class experiences with new words demonstrating how the various words relate to each other in concept clusters. Nelson-Herber suggests the following teaching model. First, help students expand their knowledge of vocabulary by building from the known to the unknown. Second, help students refine their understanding of word meanings and the ways that words interrelate within concept clusters. Third, support students in the use of their word power in reading, writing, and speaking. "New and difficult words should be taught before students are expected to recognize them in reading or to use them in writing" (Nelson-Herber, 1986, p. 632).
Dale & O'Rourke (1981) have compiled a nationwide study of words based on meaning as known by fourth, sixth, eighth, tenth, twelfth, thirteenth, and sixteenth grade students. *The Living Word Vocabulary* (1981) is a reference book listing over 43,000 words. A percentage score for known words is given. Sixty-seven to eighty-four percent is the desirable range. If 66% of sixth graders knew a word, it would be tested with fourth graders to see what percentage of them knew the word's meaning. If 85% of tenth graders knew a word, it would be tested on eighth graders to see what percentage of them knew it. If 67%–84% of the students tested know a word's meaning, chance would give a score of 33% (representing no knowledge of the word). A word with a score of 50% or lower is generally a hard word and should be given considerable thought before being used in reading materials. A book of this caliber is a help for a curriculum writer or an author of a textbook, or for teachers interested in teaching meaning vocabulary necessary for comprehension in content areas. Activities could be planned to insure familiarity with a word before the concept is introduced.
Beck & McKeown (1985) state "vocabulary knowledge is multifaceted. That is, knowing a word is not an all-or-nothing proposition. Rather, there is probably a continuum from complete unfamiliarity (zero knowledge) to a trace of knowledge, to accurate but narrow knowledge" (Beck & McKeown, 1985, p. 11). Since reading comprehension involves semantic processes, accuracy of word knowledge, fluency of access to meanings in memory, and the ability to use rich semantic networks among concepts are important abilities for children to develop. Three dimensions of good classroom instruction include: (1) frequent encounters with words being instructed, (2) rich instruction, and (3) extension of activities beyond the classroom. One successful technique for extending activities beyond the classroom is that of becoming a "word wizard". Children can earn points toward becoming a word wizard by reporting the context in which they had read, heard, or used an instructed word outside of regular classroom activities.

Graves and Duin (1985) lament the fact that there are no recent studies dealing exclusively with the teaching of expressive vocabulary (speaking and writing). Their observations of classroom practice on
vocabulary for writing are the same as Durkin's (1978-1979) conclusions concerning vocabulary instruction in general; there is little or no direct instruction going on in the classroom.

The goal of these authors is to teach a body of words that students can and will actively use in their speech and writing. This should be done over the entire 12 years of schooling. A second goal is to "instill in children an understanding of what it means to know a word, an appreciation of the power of words, and, indeed, a real love of words" (Graves & Duin, 1985, p. 5).

To accomplish these goals, children must become independent word learners. The bigger their vocabulary to start with, the more words they will add to it through meeting new words informally in context. To accomplish this task, instruction must be deliberately planned and sequenced across the entire span of public schooling. Rich and varied instruction is needed, informally encouraging students' active use of words. Words at the edge of students' active vocabularies should be taught. Precise usage must be emphasized. Figurative language such as simile, metaphor, personification, allusion, synecdoche, meiosis,
hyperbole, riddles, and puns should be introduced, worked with in formal instruction, pointed out in the work of others, and encouraged in students' original work. Figurative language is not the sole possession of poets.

"We believe that the vocabulary curriculum is currently weak and poorly defined and that a strong program in vocabulary must, like a strong program in math or science, have some integrity, some progression, some sequence, and some rather definite goals.... We further believe (again in keeping with Boyer, 1983) that the mastery of English is the first and most essential goal of education" (Graves & Duin, 1985, p. 9).

Graves and Prenn (1986) compared methods for teaching words that are appropriate in different circumstances, since difficulty in learning words varies tremendously depending upon prior knowledge of the words, their meanings, and how well students need to know the words. Some teaching methods do not result in thorough mastery of words or help students to establish rich conceptual networks surrounding the words. Graves and Prenn describe three different kinds of word knowledge, explain three types of cost involved in
instruction, and discuss the costs and benefits of specific methods to teach vocabulary.

One level of word knowledge is learning to read words already in the students' oral vocabularies. This is the task presented first graders and is mastered by proficient readers by fourth grade. In other words, fourth graders should be able to read almost all of the words in their oral vocabularies.

The second level of word knowledge involves learning to read words for which students have an available concept but do not have the word in their oral or reading vocabularies. Perhaps the largest number of words learned in middle and high school belong in this category.

The third and highest level of word knowledge involves learning to read words for which students do not "own" a concept. There are also at least three, and possibly more, levels of word knowledge, depending upon whose classification scheme an author chooses. Beck, et al (1979) use a concept of known and unknown words. O'Rourke (1970) uses words arranged in zones going from words students use actively to twilight zone words, and then to unknown words. These words are just beyond the student's ability to use in his reading, writing, and
speaking vocabularies. Whatever the classification terminology, the major emphasis is on the second or middle category.

Learning a word thoroughly requires multiple exposures in different contexts. This involves a number of skills, such as associating it with a range of experiences, recognizing it instantly, being able to demonstrate understanding of the word, using it whenever appropriate and not using it when it is inappropriate.

No single encounter with a word will accomplish all of these goals but every time a word is read or heard or spoken, the student comes closer to owning a word with all of its various nuances, or shades of meaning. However, every encounter with a word will leave a trace of its meaning and the accumulative effect will be mastery of the word (Jenkins, Stein, & Wysocki, 1984). Brief instruction on vocabulary words immediately before a student reads a selection containing the word may be enough to prevent comprehension breakdown (Blachowicz, 1986). Graves and Prenn believe both types of instruction have their place in the curriculum.

The costs of instruction concern out-of-class teacher preparation time, in-class student-teacher
interaction, and students working independently in class. Each has its costs and benefits. Typically, in-class student-teacher interaction requires teacher time but has a strong benefit in knowledge gained.

The learning task should match the type of vocabulary to be mastered. For teaching students to read words they already have in their oral vocabularies, any association method matching the oral word (known) with the written word (unknown), such as writing the word on the board, will work. Students will need several exposures to the word before it is mastered, and some students will need more exposures than others. Wide reading in which students encounter the words they are learning is needed also.

Techniques for learning to read words for which students already possess conceptual knowledge vary greatly. The dictionary method has been criticized heavily. One fault with the dictionary method is that one encounter with a word will not result in rich conceptual knowledge. Students will not know which definition from the dictionary to choose unless the word was presented in a context. And, students cannot be expected to use a dictionary efficiently or effectively unless they have been taught to do so.
A second technique for learning words is the sentence plus definition method. This method is costly in that preparation time is high. Rich and thorough knowledge is not gained this way either.

A third method called context-relationship procedure (Graves, 1985) presents a paragraph using the word to be taught three times followed by a multiple choice question. This method costs a lot of time but the benefits include a fuller and more specific meaning of a word that will probably be remembered over time.

When teaching new or difficult concepts, Graves and Prenn (1986) suggest six steps: (1) define the new concept, giving its essential attributes, (2) distinguish between the new concept and similar, but different, concepts which students might mistake for it, (3) give examples and explain why they are examples of the concept, (4) give nonexamples and explain why they are nonexamples of the concept, (5) give students both examples and nonexamples and have them indicate which are positive instances of the concept and why, and (6) ask students to present their own examples and nonexamples and have them discuss why; then provide feedback on their performance.
O'Rourke (1970) laments that curriculum planners had made no effort to present "a workable, systematized approach to vocabulary development per se as a means of improving comprehension in all areas of the curriculum, particularly language arts skills" (p. 16). He thinks vocabulary development should be systematic from preschool through college with an emphasis on a continuum of conceptual growth. He decries a basic weakness in word lists since they do not take into account semantic variation or the multiple meanings of many words. Sheer number of words is important since "vocabulary development is concept development and the greater number of concepts we acquire the greater the number and variety of ideas we can understand and express. Expansion of vocabulary generally accompanies an expansion of thought" (O'Rourke, 1970, p. 28).

Significant factors governing success of a vocabulary program mentioned by O'Rourke are student interest and motivation. He states that "intelligence is not merely an innate gift but is a process of development" (O'Rourke, 1970, p. 46). And later, "language concepts are best learned in structures, for example, in phrasal or sentence form, surrounded by and impinging upon other concepts. Words learned in
isolation, lacking connections, are not likely to result in ideas or in the transfer of ideas" (O'Rourke, 1970, p. 46).

Language development includes both horizontal and vertical or hierarchical structure. Horizontal structure refers to word order. Vertical structure is the deeper, underlying meaning in a sentence or phrase. For example, [(frisky puppies) and kittens] carries a different meaning than [frisky (puppies and kittens)]. Sentences that appear the same on the surface, may carry quite different meaning in their deep structure. For example, "John is unable to eat." is quite different from "John is easy to eat." even though John seems to be the subject of both sentences. Obviously the second sentence conveys a different meaning concerning the noun John and the verb eat.

Students need to practice skills in order to perfect them. This includes word learning. Time is needed for mastery. Time and practice are almost synonymous here; the more time a student has to practice, the better the skill becomes (assuming the correct skill is practiced and practiced correctly. This is why teacher-directed instruction remains an important variable in education). Students who lack
early sensory experiences and the opportunity to name those experiences lack concepts on which to hang labels.... Vocabulary learning is more difficult for them. "The dearth of rich, meaningful experiences result in their inability to develop the conceptual relationships and the generalizations needed for abstract thought. Language inadequacy is traceable to inadequate experiencing. In general, the richer the experience, the richer the language. The converse of this is also true" (O'Rourke, 1970 p. 58). This does not mean that the language disadvantaged cannot overcome their lack of experiences. Quoting Lenneberg (1967), "New words may be acquired throughout life, because the basic skill of naming has been learned at the very beginning of language development." O'Rourke goes on to say that "Using this potential language facility, that is, the basic skill of naming word-object, and word-idea relationship, -- the student can extensively broaden his vocabulary and conceptual structure, by making conceptual relationships in a variety of ways -- through paradigms, categorizations, and discriminations within the syntactic structure of the language" (O'Rourke, 1970, p. 58).
"Acquiring a vocabulary does not consist of acquiring discrete, unrelated symbolic references. There is process and structure in effective vocabulary development in the process of acquiring concepts and the structure of relating them. The internalization of the student's experiences through related concepts is central to his cognitive style. It makes a difference whether he sees words (concepts) as separate entities or as related, classified components of a synergistic whole" (O'Rourke, 1970, p. 60).

Man names concepts to manage the overload that would otherwise result if everything encountered had a new name, a new label. By categorizing, relationships between concepts become visible. Compare this thought to meaning words (nouns, verbs, adjectives, adverbs) and function words (prepositions, conjunctions, articles) in a sentence. The meaning is there once you have the noun and verb in place, but without the function words to tie everything together, it is impossible to extract the correct or complete meaning from the sentence. This analogy is another example of synergism. Students may know all the words in a sentence, be able to say them (word calling), know what the individual words mean, and still not comprehend the author's intent. Why? The sum
of the whole is more than the parts. This is not mathematics. This is language. Language is words and words have more than one meaning, and shades of meaning. The phrase deep structure takes on new importance when thought about in this light. Words have meaning, a surface structure. When words are combined with other words, they take on additional meaning, a deep structure. Surface structure without considering deep structure is easily misinterpreted. The way to become comfortable with interpreting deep structure is to practice. It takes opportunities to practice, and lots of them, to realize a word has various shades of meaning. Would you rather be called a boy or a man? There's a world of difference although a beginning reader or a foreign language learner may learn man as a synonym for boy. And it is, when compared to girl and woman, but not when your choices are boy, man, lad, and adult male.

One way to practice extracting meaning from words is to work with antonyms. Antonymy, the process of dissimilarity, can help a student master the various shades, the nuances, of meaning possessed by words. One teaching tool stressing nuances is sometimes called the theory of opposition. Its purpose is to master the
concept of opposites. While much research using synonyms when teaching vocabulary has been conducted, only one recent researcher, Powell (1986), has used antonyms. O'Rourke says "Words are not unidimensional and static but multidimensional and dynamic. One word leads to another" (O'Rourke, 1970, p. 80). More research needs to be done with antonyms and learning meaningful vocabulary.

O'Rourke's classification concept theory involves (1) an instructional process that proceeds from known to unknown knowledge, (2) the study of vocabulary involving the planned teaching and learning of external and internal context clues, including the systematic teaching of key roots and affixes for maximum transfer of learning, (3) utilization of the twilight zone -- the continuum concept of learning words by degree, and (4) the learning of words by broad classification, through synonymy and antonymy" (O'Rourke, 1970, p. 81).

He further believes that instruction should be individualized, involve active participation, have motivation built-in, be two-way, i.e., plan for and expect interaction between the students and teacher (the collaborative nature of learning), and be reflected in
the students' level of reading sophistication. Borrowing from Dale (1985), O'Rourke lists three levels of reading: (1) duplication (reading the lines), (2) implication (reading between the lines), and (3) application (reading beyond the lines). Current terminology is literal and inferential comprehension and critical reading. Students should be speaking, listening to, writing, reading, visualizing, and observing words. "Creative learner interaction involves the whole sensorium of the student" (O'Rourke, 1970, p. 117).

There are three major aspects of English language structure (O'Rourke, 1970, p. 97). One aspect is phonological, the sounds of the language. This is generally taught in first and second grade through phonics instruction or sound to symbol correspondence. The second aspect is syntactical or semantic. This includes word order and meaning. The third aspect is morphological or word formation in terms of combinations of phonemes in meaningful units and use of generative roots and affixes. O'Rourke stresses the last approach by suggesting a practical word analysis program.

He believes teaching key word elements should be a regular part of the vocabulary program, beginning as
soon as the students are ready for it. Only the most generative and easily transferable word elements should be taught in the beginning. "Knowing the roots of words is both an effective memory device and a short cut to learning thousands of words. A knowledge of key roots is highly transferable knowledge" (O'Rourke, 1970, p. 100).

The challenge has been given: "What is needed is a taxonomy of generative combining forms, hierarchically arranged according to the principle of complexity -- from easy to hard" (O'Rourke, 1970, p. 108).

Stotsky (1976) was interested in the systematic introduction and use of prefixed words in reading and instructional materials to enhance comprehension. She acknowledges that "while it is highly rational in a beginning reading program to teach children to read words which are already in their oral vocabulary and which are among the most frequent words in written material as well, too much reliance on the principle of frequency beyond the decoding stages or on exposure to a richer (and possibly uncontrolled) variety of words in literary selections may not be sound from a long-range point of view if it precludes the possibility for more
systematic development of a reading vocabulary" (Stotsky, 1976, p. 2).

Stotsky used O'Rourke's (1970) idea of a planned program of vocabulary development that focuses around the study and use of generative roots and affixes. She feels working from the known to the unknown would permit the generalization of word knowledge to transfer vocabulary skills across all areas of the curriculum. Her study deals with prefixes and prefixed words. Stotsky suggests that researchers need to think again about which principles and practices should be used to introduce and teach vocabulary in the middle grades.

No matter which word list is used to analyze the words appearing in primary grade reading materials, a fairly common list of 2,000 is found. Vocabulary has been chosen in the past based on (1) sound to symbol regularity, (2) frequency, (3) frequency plus richer (and possibly uncontrolled) exposure, and/or (4) greater exposure to wider reading. "There is no indication that other principles exist or are utilized in constructing or offering reading selections in these [basal] developmental reading programs" (Stotsky, 1976, p. 17). Also, "there is little if any research evidence to suggest if and how teachers help their students to
transfer word analysis skills to vocabulary in other reading materials that contain similar meaning-bearing elements" (Stotsky, 1976, p. 16). The problem appears to be over-reliance on the principle of frequency to the exclusion of structural analysis. Children are taught sight words and phonics but little or no mention is made of meaning-bearing elements (prefixes, roots, suffixes).

Stotsky incorporates the following assumptions from O'Rourke (1970) in her use of the classification-concept approach to vocabulary development: (1) vocabulary size is a critical factor in language development, (2) students need teacher guidance in word study, and (3) students need to see words as "related, classified components of a synergistic whole." You should proceed from the known to the unknown utilizing the principle of transfer in learning. She summarizes by saying "The nucleus of O'Rourke's systematic program of vocabulary study consists of word analysis and synthesis, the study and use of generative roots and affixes. Such a nucleus would enable the learner to transfer vocabulary skills across all areas of the curriculum, one of the major deficiencies in reading achievement at the upper elementary and secondary levels" (Stotsky, 1976, p. 31).
Paul and O'Rourke (1988) have written an article explaining the complications involved in comprehending polysemic words for special education students. Not only is polysemy a problem for readers of any description in special education but, many nonspecial education readers also falter when encountering multimeaning words in their textbooks and pleasure reading. These authors suggest the need for imaginative, direct, vocabulary instruction and include suggestions for broadening and deepening students' knowledge of word meanings. Paul and O'Rourke believe a rich vocabulary is a prime factor in reading comprehension.

Three basic positions, and a fourth derivative, have been postulated to explain the relationship between vocabulary knowledge and reading comprehension (Anderson and Freebody, 1979, 1982, 1985; Mezynski, 1983; White, 1985). The instrumentalist position states that an individual with a large vocabulary to work with will comprehend text easier than a reader with an underdeveloped or limited vocabulary.

The aptitude hypothesis states that verbal ability and large vocabularies are related in that individuals
possessing large vocabularies have a superior verbal ability which in turn leads to reading comprehension.

The knowledge hypothesis is most closely associated with reader-schemata or prior knowledge (Anderson & Freebody, 1985; Mezynski, 1983, Pearson, 1985). Advocates of the knowledge hypothesis view a rich and active vocabulary as a reflection of a reader's schemata. The more schemata available to help readers organize their previous experiences, the better they can access these schemata to help in comprehending the printed word. It is not just knowing thousands of individual words that is important. The entire conceptual framework accessed through individual word knowledge, enables the efficient, fluent reader to become more efficient and effective in his comprehension of text because he already has the categorical classifications in place to assist him when he needs help.

An either/or position concerning these three hypotheses is probably incorrect. It is more likely that advocates of one hypothesis understand and use principles incorporated into two or all three hypotheses. A fourth hypothesis, the access hypothesis, refers to automaticity in word recognition. The less
time you spend on word recognition, the more time you have to devote to comprehending meaning.

Marzano (1984, 1987) hints at the need for combining positions by saying that direct, systematic vocabulary instruction that relates the known to the unknown is probably most effective in developing students' vocabularies. Learning words is not an easy task (Jenkins & Dixon, 1983; Nagy & Herman, 1984; Nagy, Herman, & Anderson, 1985). Perhaps what is needed is an interactive approach to vocabulary instruction similar to the interactive model of reading. It has already been established in the research literature that direct instruction (Baumann, 1986; Beck, Parfetti, & McKeown, 1982; Becker, 1977; McKeown, 1985; McKeown, Beck, Omanson, Pople, 1985; Stahl, 1983; Wixson, 1986), teaching from a conceptual base (O'Rourke, 1970; Johnson & Pearson, 1984; Stahl and Fairbanks, 1986; McKeown, 1985) and providing multi-opportunities to practice and learn a word (Dale & O'Rourke, 1986; Johnson & Pearson, 1984) while accessing prior knowledge (Anderson & Freebody, 1985; Mezynski, 1983; Pearson, 1985) is important in teaching vocabulary. What is needed now is the technique or techniques that best accomplish this multi-faceted goal when teaching vocabulary in the
primary grades where reading instruction begins, but also throughout middle and secondary school whenever new concepts are introduced by content area instruction.

Paul and O'Rourke stress the need for instruction in vocabulary that enhances reading comprehension. Factors thought to be important include proportion of words taught, number of encounters of words in passages, degree of word difficulty, passage length, method of instruction, as well as text-based and reader-based factors.

Effective instruction is direct, systematic, and aimed at problem areas. Teaching strategies should broaden and deepen students' knowledge of words and related concepts. No one approach is a panacea. The skillful teacher uses a variety of activities involving the class in oral discussion, sharing ideas and experiences. This will broaden concepts. "As a result, many students may learn words and related words through the mediation of the teacher suggesting, reminding, correcting, and elaborating" (Paul & O'Rourke, 1988, p. 46). Vocabulary instruction should be part of language development.

Paul and O'Rourke suggest a three-step plan for the teaching of (multimeaning) words: (1) activate and
enrich the students' prior knowledge in terms of words and related concepts, (2) create appropriate activities for students to use these words, thus reinforcing and expanding on what they have already learned, and (3) provide ample opportunities for students to read old and new word-concepts in a wide variety of natural, meaningful contexts.

Anderson and Freebody (1979) were concerned with knowledge of word meanings. They describe three distinct views of vocabulary knowledge. The instrumentalist position says knowing more words enables text comprehension. Direct instruction advocates are probably in the instrumentalist camp. The aptitude position says mental agility and vocabulary knowledge are two aspects of verbal ability. It is verbal ability which mainly determines text comprehension. The third position is called the knowledge hypothesis. This view holds that exposure to culture paves the way for a deeper and broader knowledge of text. Advocates of learning from context fit into this category. "The instrumental position, as we choose to characterize it, stresses individual word meanings. The knowledge view emphasizes conceptual frameworks or 'schemata;' individual word meanings are merely the exposed tip of
the conceptual iceberg" (Anderson & Freebody, 1979, p. 5).

Followers of a strict aptitude hypothesis can be fatalistic. The heredity/environment argument may interfere with teaching strategies if permitted. Some researchers (LaBerge & Samuels, 1974; Perfetti & Lesgold, 1979) believe speed and efficiency in word recognition mean more information can be processed from language input. They believe the amount of reading should be maximized, however no concrete evidence has been demonstrated yet indicating that increased word knowledge leads to better comprehension.

A major distinction of the instrumentalist position is the emphasis on direct vocabulary instruction. Wide reading and varied language experiences are also important. Becker (1977) is a strong proponent of this position.

Proponents of the knowledge hypothesis emphasize concept learning and learning words from context (Nagy & Anderson, 1984; Nagy, Herman, & Anderson, 1985). They believe words are easier to learn if there is familiarity with an area of knowledge (a concept) in which to categorize or classify a word. "If the knowledge perspective was strictly adhered to,
vocabulary instruction would not be thought of as a separate subject in school" (Anderson & Freebody, 1979, p. 15).

The quote above would seem to indicate that there are clear cut distinctions between the three hypotheses. Such is not the case. Pearson and Johnson (1978) seem to be strong adherents of the knowledge hypothesis with their emphasis on conceptual distinction and relations. However, the activities suggested for teaching and reinforcing vocabulary appear to favor the instrumentalist position with emphasis on direct vocabulary instruction. O'Rourke (1970) would probably also bridge the two philosophies since he wants to see systematic direct instruction of vocabulary in all disciplines emphasizing the concepts that words represent.

Jenkins and Dixon (1983) wonder how students learn so many words. Direct instruction of every word is impossible. Incidental learning of words from written sources is not automatic enough to account for the large number of words children learn. How do they learn so many words since vocabulary doubles between third and seventh grade? "Many words are probably not learned the
first time they are encountered, but require multiple exposures" (Jenkins & Dixon, 1983, p. 238).

Word meanings are acquired in one of four ways: (1) explicit reference to a meaning (altercation means argument), (2) through example, i.e., an object (cello) is accompanied by a label, (3) through verbal context, either written or oral, or (4) through morphological analysis of individual words. "More than likely, most word-learning experiences involve a mixture of two or more categories" (Jenkins & Dixon, 1983, p. 240).

These authors mention two important factors to be considered in vocabulary instruction: method of instruction and degree of formal teaching. Another important factor to consider is the notion of automaticity of lexical access. "Automatic access to meanings, compared to slower, more deliberate, conscious processing of words and their meanings, is seen as being particularly advantageous during reading because it allows the person to devote more mental resources to comprehending the overall text, rather than the individual words" (Jenkins & Dixon, 1983, p. 243).

Jenkins and Dixon agree with Beck, McKeown, McKaslin, and Burkes (1969) that vocabulary teaching presently done in schools lacks intensity and scope.
Three of the most elementary principles of teaching and learning are missing: multiple examples, repetition, and review.

Jenkins and Dixon think context plays an important role in vocabulary learning. They point to the work of Steinberg and Powell (1983) on eight classes of context clues and a second major category of mediating variables, the number of occurrences of an unknown word and the variability of the contexts in which an unknown word occurs.

Other important factors from Steinberg and Powell's work (1983) may include: presence of relevant cues, proximity of relevant contextual clues, reader's perception of the importance of the unknown word, density of unknown words, how difficult the meaning of a word is to grasp, and prior knowledge.

To this list, Jenkins and Dixon (1983) add three more factors. The first factor is an extension to the concept of prior knowledge. Four different aspects of prior knowledge need attention: (1) the unknown word has a simpler synonym and the concept is known by the student, (2) the unknown word has a simpler synonym and the concept is unknown, (3) the unknown word does not have a simpler synonym, but the student can recognize
instances of the concept, and (4) the unknown word does not have a simpler synonym and the concept is unknown by the student. Aspect one implies relabeling. Aspect two requires learning a new concept and a label. Aspect three implies labeling a concept already partially understood, while aspect four is the hardest, acquiring a new label and learning a new concept. Different types of learning are involved in each of these instances. Some words and (concepts) are easier to learn than others. Teaching strategies need to be modified to accommodate the learners' needs.

A second factor Jenkins and Dixon (1983) would add to the Steinberg and Powell (1983) list is the proximity of recurrence of the unknown word. A learner's ability to use context clues at deriving an unknown word's meaning will be easier if multiple occurrences of the word happen within the same paragraph or text passage. In this way, a prediction about a word's meaning can be verified quickly, or disruption in thought continuity may force a reevaluation of the word's meaning sooner.

The final factor to be considered is polysemy, or the number of meanings of the unknown word. Even with all of these factors to consider, and they probably are worth teaching as part of a student's arsenal of word
attack skills, "the ability to infer meanings from unfamiliar words ... is not the reader's central chore. ... readers can often get by without figuring out a word's meaning, and thus may not bother to try" (Jenkins & Dixon, 1982, p. 254). There is a difference between competence and performance. Likewise, there is a difference between deriving meanings and learning those meanings permanently. "That is, a reader might successfully compute a word's meaning, utilize that information in comprehending the text, and promptly forget the word's meaning" (Jenkins & Dixon, 1983, p. 254).

Another factor to consider is learning word meanings from instructional sentences written for that purpose and learning them from naturally occurring texts. The latter calls for generalization which must be taught, not assumed (Baer, 1981). Children can learn word meanings from context, but for this to happen, the words must be encountered several times (more than 2, between 6 and 10) and be accompanied by strong contextual clues (Jenkins, Stein, & Wysocki, 1984).

Nagy and Herman (1984) examined the heterogeneity of English vocabulary and ways of adapting instructional methods to different types of words. They ask simply, how do children learn so many words so quickly? And,
why do these strategies - whatever they are - fail to
work for other children? (Nagy & Herman, 1984).

Horn (1984) stated that 2000 words make up 95% of
written text. Four thousand words make up 97.8% of
written text while 10,000 most frequent words make up
98.9% of text.

Three limitations of vocabulary instruction are
discussed by Nagy and Herman (1984, p. 2): (1) the size
of the task, (2) much vocabulary instruction has failed
to increase reading comprehension measurably, and (3)
English is heterogeneous, therefore instruction must be
adapted to teach different types of words. These
authors believe that ways to effectively aid vocabulary
growth must be found and implemented in the schools.
They believe that the average high school senior's
vocabulary is around 40,000 words. That means 3,000
words per year are learned by the average student. By
contrast, a disadvantaged reader is already 50% behind
in the first grade (Graves, Brunetti, & Slater, 1982
cited in Nagy and Herman, 1984, p. 7).

Of the 88,500 distinct word families estimated by
Nagy and Anderson (1984), 90% or more occur less than
once in a million written words. "The point is that a
relatively small core vocabulary accounts for the vast
majority of the words that one will actually encounter in reading" (Nagy & Herman, 1984, p. 13).

Nagy and Herman could not find a published study that resulted in 500 words learned per year. The most intensive study cited in the literature (Beck, Perfetti & McKeown, 1982; McKeown, Beck, Omanson, & Perfetti, 1983) only covers 360 words in a year.

Frequency poses a major problem in deciding which words to teach. Once 3,000 - 4,000 basic words are known, teaching the next thousand results in little overall gain. This might be why teaching vocabulary does not measurably increase general reading comprehension. Perhaps what is needed is to teach independent word learning strategies and critical thinking or reading skills, so an individual will know how to learn a word when it interferes with comprehension. If comprehension is complete, why bother to learn a word right then; it can be learned over time through repeated exposures or learned when needed for comprehension. The important thing is to teach students to know when they need to learn a word's meaning and when they can skip it temporarily. "Instruction on a core vocabulary of important words might be helpful to students with very small vocabularies, but this will by
no means enable them to catch up to, or keep up with, the rate of vocabulary growth by average students" (Nagy & Herman, 1984, p. 16).

The instrumentalist hypothesis says that knowing the meaning of words is necessary and sufficient for understanding text (Anderson & Freebody, 1979). Necessary yes, sufficient no -- studies attempting to increase reading comprehension by teaching word meanings have failed (Pany & Jenkins, 1978; Pany, Jenkins, & Schreck, 1982; Tuinman & Brady, 1974). There is something beyond vocabulary knowledge in reading comprehension (synergism). Perhaps it is background knowledge. This is the position taken by proponents of the knowledge hypothesis. Individual facts (words) do not mean much until they are tied into existing schemata. This is where synergism comes into play -- the sum of the parts is greater than the whole.

"Words must be treated as labels for concepts which are embedded in larger schemata. Instruction must aim at establishing rich ties between new words and prior knowledge and must present new words and concepts in the context of larger domains of knowledge" (Nagy & Herman, 1984, p. 21).
In conclusion, Nagy and Herman reiterate that the bulk of children's vocabulary growth occurs incidentally. Two approaches can increase incidental word learning: helping students become independent word learners and increasing opportunities to learn through reading and language activities. "We are not aware of any published research demonstrating a successful method for making students into better independent word learners" (Nagy & Herman, 1984, p. 25). This is a challenge to be met.

"Learning new words is an integral part of learning new concepts, so there must be some sort of vocabulary instruction in content areas" (Nagy & Herman, 1984, p. 30).

"A primary goal for any vocabulary program must be to foster independent word learning, which necessarily involves a large volume of reading" (Nagy & Herman, 1984, p. 2).

One catalyst for the monumental work completed by Nagy & Anderson (1984) was the discrepancy found in previous studies investigating the absolute size of vocabulary at a given age level (Smith, 1941; Dupuy, 1974). The disparity is probably in the definition of a word. For this study, Nagy and Anderson (1984) have
chosen to define word from the lexicon of printed school
English with the restricted population of students in
grades 3 through 9. They also distinguish 6 levels of
semantic relatedness:

SEM 0 - the semantic relationship between the
target word and immediate ancestor is semantically
transparent.

SEM 1 - the meaning of the target item can be
inferred from the meaning of its immediate ancestor with
minimal help from context.

SEM 2 - the meaning of the target item can be
inferred from the meaning of its immediate ancestor with
reasonable help from the context: "one exposure
learning" would be possible.

SEM 3 - the meaning of the target item includes
semantic features that are not inferable from the
meaning of the immediate ancestor without substantial
help from the context.

SEM 4 - the meaning of the target word is related
to the meaning of its immediate ancestor, but only
distantly.

SEM 5 - there is no discernable semantic con-
nection; the meaning of the immediate answer is of no
use in learning or remembering the meaning of the target
word. Categories labeled SEM 0 -- SEM 2 are semantically transparent while categories labeled SEM 3 -- SEM 5 are semantically opaque.

Nagy & Anderson (1984) found over 200,000 words plus another 100,000 proper nouns. Over 170,000 words are derived by suffixation, an estimated 139,000 of which are semantically derived (SEM 0 to SEM 2) forms (Nagy and Anderson, 1984, p. 314). Of the 139,000 derived words, over half are compounds. That leaves 43,000 basic words. Distinct word family is defined by these authors as a group of morphologically related words such that if a person knows one of the family (divide, divided, dividend, dividers, dividing, divisible, division, divisional, divisor), he can probably figure out a related member when it is encountered in text. If a child can figure out the meaning of "misunderstood" from the context with little or no additional effort, it would be considered a member of the word family "understood" (SEM 0 or SEM 1). Any determination used for counting words is related to some level of morphological knowledge. "The existence of large numbers of such words in school texts makes knowledge of word formation processes an important
factor in dealing with low-frequency words" (Nagy and Anderson, 1984, p. 318).

Nagy & Anderson (1984) have the following to say about word frequency. Many words are in the lower ranges of the frequency distribution. Roughly 50% of words in printed school English, occur once in a billion words of text. Semantically transparent derivatives are also skewed towards the lower frequency ranges to an even greater extent than morphologically basic words and semantically opaque derivatives. "If a child were exposed only to vocabulary controlled carefully by frequency, there would be both relatively little opportunity to learn, and little necessity to make use of, the word-formation processes that relate derived words to their component parts. The relatively few transparently derived words that do occur in the higher frequency ranges are likely to be learned, at least at first, as unanalyzed wholes (Nagy & Anderson, 1984, p. 320).

Word frequency should not be confused with word difficulty. An individual student's vocabulary may vary widely over and above the general frequency distribution. First graders especially, have amazed this experimenter with their ability to master tough
dinosaur names at age six that cause 40-year old adults problems. Motivation and interest are factors that should not be overlooked in vocabulary learning.

How many words are children exposed to in a year? If a less able third or fourth grader reads ten pages or so daily averaging 100 words per page, 100,000 running words of text could be covered in 100 days. A seventh grader might cover 500,000 to 1,000,000 running words. An avid reader might encounter 10,000,000 words. "Rough estimates demonstrate that direct instruction could not cover more than a small fraction of the words that a student will actually encounter in school reading" (Nagy and Anderson, 1984, p. 322).

These authors have settled on the number 88,500 for distinct word families. This number includes morphologically basic words and derivatives at levels SEM 3, SEM 4, and SEM 5. This figure does not take into account the added problems created by polysemy. For the child who can make use of SEM 3 and SEM 4 derivates, for each word learned there are more than 3 derived words with meanings recognizably related to that of the base, and at least 2 of these involve fairly transparent relationships. This demonstrates that the ability to utilize morphological relatedness among words puts a
student at a distinct advantage in dealing with unfamiliar words (Nagy and Anderson, 1984, p. 323).

Since an increasingly greater proportion of vocabulary words are semantically transparent at the lower end of frequency levels, morphology should play an increasingly important role as more content type reading is done. Frequency alone should not be the only criterion for selecting words to teach or learn. "The introduction of new words should be determined by family relationships as well as by frequency" (Nagy and Anderson, 1984, p. 325).

Four advantages of teaching words together as a family are given: (1) building from the most frequent words (known) to less frequent words (unknown), (2) reinforcing learning of basic words when working with derivatives, (3) calling attention to word-formation processes that relate different members of a family, and (4) familiarizing students with the types of changes in meaning that often occur between related words.

Not only does logic force the conclusion that some (many) words are learned from context, it is hard to visualize learning function words (if, or, the, but) any other way. This does not happen with a first encounter, however, but through repeated exposures in different
contexts. "While context often is not sufficient to determine the meaning of an unfamiliar word, it may provide enough information to permit a guess at the appropriate meaning of a word whose semantic context is partially determined by its morphology .... A hypothesis that should be explored in future research is that joint utilization of contextual and morphological information is a strategy employed by children who develop large vocabularies" (Nagy and Anderson, 1984, p. 327).

Two final thoughts from Nagy and Anderson (1984): (1) experience with language is the principal driving force in vocabulary growth, and (2) vocabulary instruction should teach independent word learning strategies.

From the period this experimenter has called The Prolific 80's, have come the following variables or factors to consider in vocabulary instruction: semantic clusters, language activities, concept learning, prior knowledge/experiences, structural analysis, contextual analysis, multifaceted learning, frequent encounters with words, rich encounters with words, instruction extended beyond the classroom, expressive vocabulary, instruction over the entire 12-year span of schooling,
independent learning, desire/motivation/interest, active involvement, using a systematic approach, polysemy/multimeaning words, taking into consideration not just frequency but semantic variation, using classification and categorization, teaching in a context, horizontal and vertical structure, time to practice/mastery, synergism, nuances/shades of meaning, theory of antonymy, working from the known to the unknown, transfer of learning/generalization, individualization, direct instruction, breath and depth of learning, and the need to teach vocabulary as a part of reading comprehension. With all these factors to consider, where does one start to establish a systematic approach to vocabulary study?

This experimenter chose to work with the established variables proven effective for learning from past studies: (1) starting with what the learner presently knows, (2) using language experiences, and (3) building upon prior knowledge. Future goals include: (1) active use of receptive and expressive vocabularies, (2) improved reading comprehension, (3) understanding and using the concept of synergism, (4) taking advantage of generalization, and (5) helping learners become independent (intrinsic) learners.
In order to attempt to accomplish these goals, this experimenter chose to use a systematic, direct instructional approach working from the known to the unknown by actively involving the learner. The concept of breadth and depth of word knowledge (root knowledge) was introduced through programmed instructional packets emphasizing structural analysis (morphological analysis) in a context, not in isolation. Since the materials were individualized, time to practice to achieve mastery was taken into account.
CHAPTER III

METHODS AND PROCEDURES

Introduction

This study was undertaken to investigate the effectiveness of direct vocabulary instruction with post-secondary students. The participants were six students who completed an introductory Spelling and Vocabulary class during Winter Quarter, 1988 on an extension campus of Columbus State Community College.

A method based on systematic instruction utilizing structural analysis combined with contextual analysis using programmed instructional packets was developed to increase students' active participation in building their vocabulary. It was an individualized approach based on pretest data so students worked only on roots whose meanings were unknown to them. Materials were developed by the experimenter.

A pretest-posttest, multiple probe design was used. Visual analysis of the data was conducted.
METHODS

Participants

Six individuals who were students on an extension campus of a two-year community college located in downtown Columbus, Ohio participated in the study. Criteria for student selection included:

2. Students who did not know the meaning of at least twelve selected roots (Appendix A) on a pretest.
3. Students who verbally expressed an interest in participating when the research was explained to them.
4. Students who attended at least fifteen forty-five minute sessions over a ten-week period.
5. Students who signed the subject approval form (Appendix B).

Setting

The study took place in a conference room on the fifteenth floor of a downtown private
Columbus, Ohio industry. Windows covered the wall facing west. Two walls were blank while the east wall had a doorway and a landscape painting on the wall. The room was equipped with an easel and chart paper, conference table, and padded armchairs. Ten people could be comfortably seated at one time. The room was carpeted and had overhead lighting.

**Experimenter**

The experimenter was a Ph.D. candidate in the Department of Educational Services and Research with a curriculum in special education, applied behavior analysis, and clinical and remedial reading. She has a Bachelor of Sciences degree in Russian, a year of study in the Graduate Elementary Teacher Certification program, and a Master's degree in Reading from The Ohio State University. The experimenter has had 11 years of teaching experience at the primary and intermediate public school level. She has also taught for eight years at a two-year community college in developmental studies. Three of those years were concurrent with her public school teaching
experience. For the past two years, the experimenter has taught overseas in a cooperative education program administered by a major midwestern university, teaching reading and study skills. The experimenter has 33 quarter hours in applied behavior analysis, 31 quarter hours of reading and language arts instruction, and 18 quarter hours in research methodology.

**Independent Observer**

The independent observer for accuracy measures on the independent and dependent variables was an adjunct professor at The Ohio State University who has 14 years experience teaching in the public schools and 28 years experience as a lexicographer for World Book, Incorporated.

**Experimental Approval**

Approval for this study conducted on an extension campus of the Columbus State Community College was received from the program director of Developmental Education, the administrator in charge of extension classes for Columbus State Community College in the Business and Industry Division, and the personnel director in charge of coordinating college classes for credit at Ohio
Bell Telephone Company in Columbus, Ohio. After obtaining these approvals, the purpose of this research was explained to students in the Spelling and Vocabulary class held in the Bell Telephone building Winter Quarter, 1988. It was explained that students who participated in this study would have the opportunity to help themselves improve their vocabularies and start to become independent learners of vocabulary. Students who indicated a willingness to participate signed a subject participation approval form (Appendix B). Only participants who signed the approval form participated in this study.

MATERIALS

Instructional materials used in this study include:

Mastery tests. These were written tests covering the roots taught during intervention and roots taught during previous interventions to check for maintenance over time. A root in this study is defined as the central part of any word that is not generally a word in English when standing by itself but is meaning bearing (e.g., "pend" equals "hang"
or "aud" equals "hear"). As many as four roots were included on a mastery test.

**Graphs.** During the study, graphs were kept of baseline and instructional data. Upon finishing a mastery test, the participant had his mastery test corrected by the experimenter. The number of correctly generated words was put on the page beside the root as well as an indication of whether or not he correctly wrote the meaning of the root. This data was then plotted on the participant's graph for visual analysis.

**Pretests.** There were two types of pretests used in this study.

**Pretest A.** The first pretest used in sessions one and two contained 20 roots. Participants were instructed to write the definition or meaning of the root if they knew it and to write as many words as they could containing the root. The root could be located in the initial, medial, or final position in the word. If the participant did not initially know the meaning of the root, he could guess its meaning after generating words.
Pretest B. The second type of pretest used in this study was a shortened version of pretest A. Four to ten roots were probed before instruction each session. This was to insure generalization had not taken place and instruction on a particular root was still necessary.

Programmed instructional packets. These experimenter-made instructional packets were 14 pages long containing 50 frames of exercises in the form of sentence fill-ins or activities which required matching a word containing the root with its meaning, choosing the correct distractor from four choices in a multiple choice format, or choosing the correct word from two choices provided in a modified cloze format. Examples of each activity are available in the sample instructional packet included in Appendix C. The first frame of each packet introduced 10 words containing the root to be studied. Students were instructed to note which 3 or 4 letter combination was in each word. They wrote these letters on blanks provided, then turned the page to check their answers for immediate feedback. Frame two introduced the meaning of the root. Frame three introduced a
word, gave its meaning according to the *World Book Dictionary* (1984), provided the word's etymology, used the word in a sentence, and provided a second sentence where the participant actively used the word and wrote it on the blanks provided. The number of blanks provided matched the number of letters in the word to be filled in by the student. Frames four through twelve repeated this information for nine additional words. Frame thirteen displayed ten additional words containing the same root and instructed the participants to underline the letters comprising the root. A matching activity followed by multiple choice exercises and a modified cloze procedure where the participant chose the correct word from a choice of two made up the bulk of the remaining frames. The last two frames always reviewed the root and its meaning. A sample instructional packet is included in Appendix C.

**Individual folders.** Each subject had a folder with his name on it containing the work for each session. Work within the folders was individualized for each participant based on pretest results.
Posttest. The posttest was identical to the pretest except that fourteen lines were provided for generating words for each root, and additional roots pretested after the initial pretest of twenty roots were included on the posttest. These additional roots were added to the study since twelve roots unknown by each of the participants were not found in the original list of twenty. Directions for the posttest were identical to directions for the pretest.

Review sheets. A review sheet for each root was made by the experimenter. No new information was introduced during a review session. Each review sheet contained the root, its meaning, and the ten words introduced in the instructional packets with their etymologies. Additional words containing the same root were listed. These additional words had been presented in frames 47-48 of each instructional packet but had not been taught. (Appendix F.)

OPERATIONAL DEFINITION OF TERMS

For the purpose of this study, the following operational definitions were used:
1. **morphological**: dealing with morphemes

2. **morpheme**: smallest word part that denotes meaning

3. **affix**: prefix or suffix

4. **prefix**: word part placed before the root to extend or modify its meaning. It may act as either a preposition or an adverb. It may contain one or two syllables.

5. **suffix**: a syllable which contains a central thought to be added to the end of a word or root. It generally reveals the finished word's part of speech.

6. **base**: a word that can stand alone and have meaning or be affixed

7. **root**: the central part of any word that is not generally a word in English when standing by itself, but is meaning bearing; e.g., "pend" equals "hang" or "aud" equals "hear".

8. **combining form**: an English word which, unchanged, combines with another English word to form a compound, e.g., home + work = homework, or a Greek or Latin stem (or a derivative from one) when it combines
with: a) an English word, e.g., "mono" meaning "one" and syllable = monosyllable or b) another Greek or Latin stem to form a compound, e.g., "tele" meaning "far" and "gram" meaning "something which is written" = telegram.

9. **structural analysis**: a process of analyzing and synthesizing the component parts of a word

10. **contextual analysis**: a process of analyzing and deducing the meaning of a word by taking clues to its meaning from the surrounding text

11. **phonetic analysis**: a process of analyzing and pronouncing a word by sounding out individual letters or groups of letters

12. **stimulus generalization**: "refers to the phenomenon in which a response that has been reinforced only in the presence of a given stimulus occurs with an increased frequency in the presence of different but similar stimuli" (Cooper, Heron, and Heward, 1987, p. 555.)
13. **response generalization**: "describes the situation in which a given stimulus, previously paired with reinforcement for a particular response, evokes similar but different responses" (Cooper, et al, 1987, p. 555.)

14. **maintenance**: the extent to which a learner continues to perform a target behavior after a portion or all intervention has been terminated.

15. **assimilation**: spelling change in Latin prefixes for ease in pronunciation, e.g., "ad" becomes "as" in the word assimilation.

16. **accuracy**: that quality of measurement reflected by the correspondence between measured and true values

17. **invented words**: a made up word containing known roots and affixes but not a word according to *World Book Dictionary* (1984). Definitions were supplied by the participant who made up the word.

18. **inflected form**: spelling change due to irregular noun plurals (man/men), change
in verb tense (swim/swam; run/running),
comparison of adjectives (big/bigger/
biggest), or showing ownership (boy/boy's
dog/dog's).

19. **derivative**: word formed by adding affixes;
if a suffix is added, the word's part of
speech generally changes (nation - noun/
national - adjective).

**DEFINITION AND MEASUREMENT OF THE DEPENDENT VARIABLE**

Determination of roots to be included in the
study was decided by using the software package
"The Sensible Speller" (1983) for the Apple
computer. This package provides the usual spelling
checker for word processors but also has the
capability to list words from the dictionary. The
American Heritage Dictionary is the dictionary
accessed by "The Sensible Speller."

In using this program, it is possible to have
the "checker" search the dictionary for any word or
letter combination for which you are looking. In
this study, the experimenter typed in "pend=" and
was able to list all the words in the dictionary
that began with the 4-letter combination "pend"
followed by any inflectional ending, suffix, or
combination of suffixes and/or endings. It is also possible to type in "??" to represent any 2-letter prefix plus "pend=" to list words such as "depend" or "append." By typing "pend=," "?pend=," "??pend=," etc. to "??????????pend=" it is possible to list any word containing "pend" even if it contains more than one prefix.

The second step was to check the words generated by the computer against the World Book Dictionary (1984) to make sure they were words containing the root "pend" meaning "hang." Once this step was completed, the experimenter looked up the words in Dale and O'Rourke's The Living Word Vocabulary (1981) to check the grade level of the word. This reference book provides the percentage of students at the 4th, 6th, 8th, 10th, 12th, 13th, and 16th grade level who know the meaning of a given word. If a word has more than one common meaning, both or all of the major meanings are listed individually. By using this source, the experimenter was able to choose words at the 4th, 6th, 8th, and occasionally the 10th grade level. This was purposely done to insure that the participants in the study would probably know the
word already and could concentrate on the root and its relationship to the word.

Determination of the twelve roots taught to each participant was completed during pretesting. Participants were given a paper and pencil activity asking them to write the meaning of 20 roots and to generate as many words as they could for each of the 20 roots.

There were two dependent measures in this study. One was the number of words generated from the twelve roots chosen for study with each individual participant. The second was the definition or meaning of the twelve individual roots. Measurement was taken from individual mastery tests consisting of paper and pencil exercises.

The first dependent variable, the number of words generated after instruction, was determined by counting the number of words a participant wrote on a mastery test. After completing an instructional packet, each participant received a mastery test consisting of a paper containing the root taught that session and up to three additional roots taught in previous sessions. Beside each
root was an equals sign and a blank line. Participants were instructed to write the meaning(s) on the lines provided. Under the root were 12 additional lines. Participants were instructed to write as many words containing the root as they could.

Words instructed in the lesson were acceptable as were other words containing the root which had not been instructed. Inflected forms of a word were not counted as separate words. For example, under the root "ject" meaning "throw," a participant may have written "subject," "subjected," "deject," and "dejected." This would have counted as three generated words not four because "subjected" is an inflected form of "subject" whereas "dejected" is a derived form of "deject." An inflected form refers to a spelling change due to irregular plurals, verb tense, or comparison of adjectives. An inflected form retains the same part of speech as the original word. "Subjected" is the past tense of "subject." Both words are verbs. "Subject" can also be a noun but this study did not investigate heteronyms, words that are
spelled the same but pronounced differently and have different meanings.

"Dejected" is an adjective while "deject" is a verb. Since the part of speech has been changed, "dejected" is considered a derivative of "deject" and counts as a separate word.

The second dependent variable, the meaning of each root, was either marked correct or incorrect based on the Appendix in Dale, O'Rourke & Bamman's Techniques of Teaching Vocabulary (1971) entitled "List of Common Roots and Derived Words." On the graphs in Chapter 4, this is designated by a filled circle if the root was known and an open circle if the meaning was not known at the time of the mastery test.

PROCEDURES

After students signed the subject approval form, the diagnostic pretest was administered.

Pretest

The pretest consisted of 20 roots administered once at the end of Winter Quarter, 1988 in the Spelling and Vocabulary class and a second time the first session of Spring Quarter, 1988. A third pretest with 10 roots that the first two pretests
indicated were not known by the participants was administered during the third session. This pretest was individualized based on data obtained from the first two pretests.

Before instruction took place, it was desirable to have the baseline data indicate a need for intervention. Ten roots that the first two pretests indicated might need instruction were chosen for the third pretest based on level, trend, and stability of the baseline data. For example, if a participant had generated zero words for the root "pend" on both of the first two pretests and did not know the meaning of the root, "pend" was included on the third pretest. If two words had been generated on each of the first two pretests and the meaning was still not known, this root was included on the third pretest also. If less words were generated during the second session than during the first session, then this root was also included. If more words were generated the second session than the first session, this root was kept in baseline until stable responding was evident. No roots were instructed if their meanings were known.
The first two pretests (Appendix A) had lines for the date and the participant's name followed by twenty roots with an equal sign (=) after each root and space to write the meaning of the root. Lines were provided under the root for writing five words. For example, "pend" was followed by an equal sign and a blank line with five additional blank lines under the root. After the equal sign, the participant could have written "hang." On the blank lines, the participant could have written "pending," "pendant," "depend," etc. The number of correctly written words was noted as a baseline for predicting future student performance if no intervention had been applied. The other pretests (Appendix A) were the same as the first two except only four to ten roots were probed.

**Baseline**

Data obtained from the above mentioned pretests was graphed to determine which root should have been instructed first. If the meaning of a root was correctly written three times during pretesting, that root was considered known and was not instructed. As long as the root was not
known, the trend of the baseline determined which root was instructed first, second, etc. Since twelve roots were instructed, instruction on the first root began after three baseline data points had been collected, instruction on the second root began after four baseline data points had been collected, whereas instruction on the fifth and following roots began after at least five baseline data points had been graphed. A downward trend or a stable baseline was generally established after five baseline sessions. If not, that root was kept in baseline until it stabilized.

**Programmed Instruction**

Intervention consisted of programmed instructional packets in paper and pencil format (Appendix C). Each lesson provided instruction for one root. Participants worked through the frames of each instructional packet checking their answers as they moved from frame to frame. This provided immediate feedback. Definitions, etymologies, sentences, and sentence completion, matching, multiple choice, and cloze activities were included providing several opportunities to
observe and use the roots. Once all 50 frames had been completed, a mastery test was administered.

Roots which had been tested three times after intervention were probed throughout the remainder of intervention. Roots that did not maintain over time as indicated by less production of words were reviewed if the number of words generated was less than or equal to the expected criterion three times in a row. Criterion was at least five words more than baseline plus the correct meaning for the word part.

Since no previous research could be found that used generation of words as a dependent variable, a criterion of five more words than the number generated during baseline was used to indicate partial mastery of the root. The meaning of the root plus this criterion of five more words signaled total mastery of the root. An original criterion of three more words than the number generated during baseline was used in a pilot study. The three participants in the pilot study were able to generate more than three additional
words after completing the packets so the criterion for this study was raised to five.

**Generalization Measures**

Maintenance and three measures of stimulus generalization were included in the generalization measures.

**Maintenance.** A posttest identical to the pretest (except that it contained more lines for generating additional words) was administered during the last session with each participant. Procedures for administering the posttest were identical to the pretest. A copy of the posttest is included in Appendix E.

**Stimulus generalization.** Three measures of stimulus generalization were included at the close of the study. One measure was a matching test covering the nineteen roots studied by the participants (Appendix E). Only the twelve to fifteen roots studied by the participants were included on their posttests. Words and definitions for this generalization measure came from *The Living Word Vocabulary* (Dale & O'Rourke, 1981). All words were at the 13th or 16th grade level.
A second measure of stimulus generalization was "invented words." Invented words must contain a root studied during intervention affixed by one or more prefixes and suffixes to make up a new word (Appendix E). The participants invented their own words on paper and supplied their own meanings. The words were judged correct if the experimenter and the independent observer both agreed that the word "fits" the definition provided by the originator of the made up word.

A third measure of stimulus generalization was determined by looking at the words generated during intervention sessions. If words generated during the last six sessions contained affixes used during the first six sessions at a greater rate, then some degree of generalization has taken place. This is like mixing and matching prefixes and suffixes even though the participants may not have been able to think of a word outright. They were able to generate the words based on their knowledge of roots and affixes and then determined (or guessed) after writing them that they were words. Some of these "guessed" words were also wrong and
consequently were not counted as correctly generated words.

**Design**

A goal of instructional effectiveness is whether learning of specific knowledge generalizes to untaught examples. All designs using visual analysis must supply enough data to attribute a change in student behavior to the instruction. Prediction, verification of prediction, and replication of effect must be present in order for the design to demonstrate a functional relationship.

Cooper (1981) wrote that "a technology of teaching should be based on continuous scientific verification at the classroom level" (p. xi). Measurement should be continual and provide data from materials actually used in the instruction process. One successful tactic used by classroom teachers for measuring acquisition of academic skills is pre- and posttesting. Reporting an instructional gain from pretest to posttest is even stronger if some other form of continuous measurement, such as a single subject design like the multiple-probe technique, is utilized.
The multiple-probe technique (Horner & Baer, 1978), is a variation of the multiple-baseline design. With the multiple-baseline design, two or more different behaviors of one individual are measured simultaneously before intervention. This becomes the baseline against which future behavior may be predicted. Instruction takes place only on one behavior at a time. Once a change occurs or criterion has been reached, the same instruction is applied to the second behavior. The second behavior serves to verify the prediction made based on data from the first baseline. The third behavior serves to verify the prediction made based on data from both the first and second baselines and serves as a replication of the behavior change demonstrated in the first baseline. Each additional intervention serves to strengthen the functional analysis.

The multiple-probe technique can be substituted for the continuous baseline necessitated by the multiple-baseline design when extended measurement may prove reactive, is impractical, and/or strong A PRIORI assumption of
stability can be made. The latter occurs when measures are PRO FORMA, they represent data points in baseline but actually reveal zero opportunity for behavior to occur.

The multiple-probe technique answers these questions: 1) What is the initial level of performance on each behavior? 2) What happens if opportunities to perform each next behavior are provided before intervention on that step? 3) What happens when training is applied? 4) What happens to performance of the remaining behaviors as criterion is reached in the course of intervention on each prior tier?

The main features of the multiple-probe technique include: 1) an initial baseline probe session on all behaviors to be measured, 2) an additional probe session conducted on every behavior immediately after criterion is reached on any behavior, and 3) a series of so-called true baseline sessions conducted just before each introduction of the independent variable -- a series that should increase by at least one session as each additional behavior is instructed. Step three is needed in order for a functional
relationship to be attributed to the manipulation of the independent variable. "Without reversals, the reliability of the single changes from baseline, which constitute the multiple-baseline design, is potentiated in that design by allowing each baseline to run for a different number of points before intervening, this potential reliability then is realized if systematic behavior change in fact promptly follows on each intervention into baseline. In that event, it appears that behavior change not only is correlated with the intervention, but in addition it can be seen that on all other baselines, within which interventions are not occurring at the same time, no similar behavior change is evident. Thus, both sides of the correlation between intervention and behavior change are observed; where intervention is applied, change occurs; where it is not, change does not occur" (Horner & Baer, 1978, pp. 189-190).

The basic question is: Does the intervention affect the baseline of behavior? The answer to this question must be convincing enough to attribute change in behavior to the instruction.
The desired effect should be robust -- very noticeable.
CHAPTER IV

RESULTS

Included in this section are accuracy of data and individual results of participants in this research study.

Accuracy of Data

In order to establish accuracy of measurement, a knowledge of the true value of the dimensional quantities being measured is needed for comparison to observational values (Johnstone and Pennypacker, 1980). Since correspondence was established in this study of measurement on vocabulary behavior, the concept of accuracy was used instead of interobserver reliability on the dependent variables. Accuracy is defined as that quality of measurement reflected by the correspondence between measured and true values.

For this study, The World Book Dictionary (1984) was used to establish a true value for vocabulary words correctly written and defined. Techniques of Teaching Vocabulary (1971) was used
to establish a true value for morphological word parts.

The independent observer checked every root on each mastery test and all generated words. In the event of a disagreement, the experimenter and the observer looked up the word or root in question together and agreed as to whether a word was related to the root in question or if the meaning given for the root carried the meaning intended according to *Techniques of Teaching Vocabulary* (1971).

Agreement measures were 100% for meanings of each root (76 out of 76) and 95% (836 out of 884) for the number of words generated for each root by each individual participant. Agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100.

The following examples will help clarify any confusion which might arise concerning disagreements. One participant wrote the word "vista" thinking it was related to STA meaning to stand. It is not; it is related to VIS meaning to see. When the experimenter counted the number of
words generated for STA "vista" was counted as a word. It should not have been counted. Since this was a single subject design with repeated measurements, this identical mistake happened 8 times.

Another problem with STA was the words "understand," "misunderstand," and "understandable." Although the word "stand" is related to STA, "understand," and related derived words, cannot be counted because they come into English via German and not Latin. A technicality really, but a mistake nevertheless since this study dealt with Latin roots. These words were erroneously counted as correctly generated words a total of 5 times.

A second root, POS, accounted for 8 more discrepancies between experimenter and observer. Based on the experimenter's knowledge of POS meaning to put or place, "post" was not counted as a correctly generated word. The observer pointed out that "post" may refer to a station, or a place where someone was "put or placed," such as a soldier is "placed" at his post, his station. Another meaning of "post" is to mail a letter.
This use of "post" would also be correct. A third meaning of "post" as a piece of timber used as a support is not related to POS but to STA meaning to stand. "Post-" also occurs as a prefix meaning after. The latter two meanings would be incorrect, but this study did not include provisions to distinguish this fine difference. Therefore, "post" was considered a correctly generated word since there was no way to know from a written response, what meaning the participant had in mind when he wrote the word.

One other root, TEND, accounted for nine further discrepancies. Four of these concerned the word "bartender" and five concerned the word "tender." The experimenter did not count these as correct whereas the observer did. "Tender" may mean to formally offer (a resignation). With this meaning, "tender" should be counted as a word related to TEND meaning to stretch. If you use the literal meaning of bartender as "a person who stretches across the bar" to serve a customer, then "bartender" counts as a correctly generated word from TEND.
Results by Participants

Carol

Figure 1 shows that during baseline Carol's generation of words containing the root FAC ranged from 4 to 5 words with a mean of 4.7. Following introduction of the programmed instruction on FAC, Carol's generation of words ranged from 10 to 18 with a mean of 12.5.

During baseline, Carol's generation of words containing the root FER was 5 words. After programmed instruction was introduced, Carol's generation of words ranged from 5 to 13 with a mean of 10.0.

The range of words generated during baseline was 4 to 5 with a mean of 4.8 for the root PEND. The range of words generated after introduction of the programmed instruction was 5 to 13 with a mean of 8.8.

Carol wrote 3 to 5 words during baseline for the root JECT with a mean of 4.0. After introduction of programmed instruction, Carol averaged 5 to 12 words with a mean of 9.7.

Before intervention, Carol's generation of words containing the root DUC ranged from 3 to 5
with a mean of 4.6. After intervention, her generation of words ranged from 5 to 14 with a mean of 11.4.

During baseline Carol's generation of words containing the root TRACT was 5 words. Following introduction of programmed instruction, Carol's generation of words ranged from 8 to 14 with a mean of 11.4.

Word generation for the root VOC ranged from 2 to 4 words with a mean of 3.3 during baseline. After programmed instruction was introduced, word generation ranged from 8 to 13 with a mean of 10.8.

Carol ranged from 3 to 5 words for the root STA with a mean of 3.6 before programmed instruction was introduced. After intervention the range was 8 to 10 with a mean of 9.3.

With the root PORT, Carol ranged from 4 to 5 words with a mean of 4.9 during baseline. After introduction of the independent variable, Carol's range was 10 to 13 with a mean of 12.

Carol was able to generate from 3 to 5 words during baseline with a mean of 3.9 for the root POS. After programmed instruction was introduced,
Carol was able to generate from 13 to 14 words with a mean of 13.5.

During baseline, Carol wrote 5 words with a mean of 4.8 for the root TEND. After programmed instruction, Carol wrote from 10 to 13 words with a mean of 11.3.

Before intervention, Carol generated from 3 to 7 words with a mean of 5.0 for the root GRESS. She generated from 14 to 23 words with a mean of 18.5 after programmed instruction was introduced.

Carol learned well from the programmed instructional packets. She was able to generate at least 7 more words after instruction than during baseline. Her baseline responding was stable except for the last root where lack of time forced introduction of the independent variable before stability was reached in the baseline. It would have been better not to have introduced the root GRESS. A definite trend was established in Carol's responding. She generated the greatest number of words on the initial mastery test after intervention. This was followed by a drop in word production and then production picked back up. There was overlap on 4 roots (FER, PEND, JECT, DUC), but
never on the initial measure after intervention.

Carol needed review on only 2 roots (FER, PEND).

In both cases, the review brought her rate of responding back up. Carol knew all 12 meanings of all 12 roots on the posttest.
Figure 1. Carol. Number of words generated on pretests and mastery tests. Open circles indicate root's meaning not known. Solid circles indicate root's meaning correctly given on mastery test. The solid vertical line labeled R represents a review sheet.
Figure 1 (continued)

JECT  Programmed Instruction

Baseline

Number of Words Generated

DUC

TRACT

Sessions

150
Figure 1 (continued)

POS
Baseline

Programmed Instruction

TEND

Number of Words Generated

GRESS

Sessions

152
Helen

Figure 2 shows that during baseline Helen's generation of words containing the root VOC ranged from 2 to 3 words with a mean of 2.3. Following introduction of the programmed instruction on VOC, Helen's generation of words ranged from 5 to 10 with a mean of 7.8.

During baseline, Helen's generation of words containing the root FER ranged from 1 to 4 words with a mean of 2.5. After programmed instruction was introduced, Helen's generation of words ranged from 8 to 11 with a mean of 9.2.

The range of words generated during baseline was 4 to 5 with a mean of 4.3 for the root TRACT. The range of words generated after introduction of the programmed instruction was 9 to 13 with a mean of 11.4.

Helen wrote 2 to 5 words during baseline for the root FAC with a mean of 3.7. After introduction of programmed instruction, Helen averaged 8 to 13 words with a mean of 10.6.

Before intervention, Helen's generation of words containing the root POS ranged from 2 to 5 with a mean of 3.6. After intervention, her
generation of words ranged from 9 to 13 with a mean of 11.3.

Baseline generation of words containing the root PEND ranged from 3 to 5 words with a mean of 3.8. The range following introduction of programmed instruction was 9 to 12 with a mean of 9.8.

Word generation for the root STA ranged from 3 to 5 words with a mean of 3.9 during baseline. After programmed instruction was introduced, word generation ranged from 6 to 11 with a mean of 7.8.

Helen ranged from 2 to 6 words for the root DUC with a mean of 4.6 before programmed instruction was introduced. After intervention the range was 10 to 12 words with a mean of 11.0.

With the root PHON, Helen ranged from 2 to 5 words with a mean of 3.5 during baseline. After introduction of the independent variable, Helen's range was 6 to 12 words with a mean of 8.2.

Helen was able to generate from 2 to 4 words during baseline with a mean of 3.2 for the root TEND. After programmed instruction was introduced, Helen was able to generate from 8 to 15 words with a mean of 10.3.
During baseline, Helen wrote from 1 to 5 words with a mean of 4.0 for the root SPECT. After programmed instruction, Helen wrote from 12 to 15 words with a mean of 13.3.

Before intervention, Helen generated from 2 to 6 words with a mean of 4.0 for the root VERS. She generated from 10 to 14 with a mean of 12.3 after programmed instruction was introduced.

During baseline Helen's generation of words containing the root GRAPH ranged from 1 to 5 words with a mean of 3.8. Following introduction of the programmed instruction on GRAPH, Helen's generation of words ranged from 11 to 14 with a mean of 12.5.

The instructional packets were successful for Helen. She was able to generate at least 5 more words after programmed instruction than during baseline. Her baseline responding showed some variability but always stayed within a range of four. There was no overlap between phases. Helen was fairly consistent in her responding after intervention. She tended to have high initial responding that dropped off for the second, and sometimes third, mastery test after intervention and then leveled off. Only one root needed review
(PHON). Helen knew 12 of 13 meanings over time as indicated by the final probe. She blocked on the meaning of TRACT.
Figure 2. Helen. Number of words generated on pretests and mastery tests. Open circles indicate root's meaning not known. Solid circles indicate root's meaning correctly given on mastery test. The solid vertical line labeled R represents a review sheet.
Figure 2 (continued)

Programmed Instruction

FAC

POS

PEND

Number of Words Generated

Sessions

158
Figure 2 (continued)

STA Baseline

Programmed Instruction

Number of Words Generated

DUC

PHON

Sessions

2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40

159
Figure 2 (continued)

TEND
Baseline
Programmed Instruction

Number of Words Generated

SPECT

VERS

Sessions

160
Eileen

Figure 3 shows that during baseline Eileen's generation of words containing the root PEND ranged from 0 to 4 words with a mean of 2.3. Following introduction of the programmed instruction on PEND, Eileen's generation of words ranged from 6 to 11 with a mean of 8.8.

During baseline, Eileen's generation of words containing the root VERS ranged from 0 to 3 words with a mean of 1.8. After programmed instruction was introduced, Eileen's generation of words ranged from 7 to 10 with a mean of 8.6.

The range of words generated during baseline was 0 to 3 with a mean of 1.6 for the root DUC. The range of words generated after introduction of the programmed instruction was 4 to 10 with a mean of 7.5.

Eileen wrote 1 to 2 words during baseline for the root FER with a mean of 1.5. After introduction of programmed instruction, Eileen averaged 7 to 10 words with a mean of 8.5.

Before intervention, Eileen's generation of words containing the root JECT ranged from 2 to 4 with a mean of 2.5. After intervention, her
generation of words ranged from 5 to 11 with a mean of 8.8.

Baseline generation of words containing the root SPECT ranged from 0 to 3 words with a mean of 2.0. The range following introduction of programmed instruction was 7 to 11 words with a mean of 9.2.

Word generation for the root VOC ranged from 2 to 3 words with a mean of 2.6 during baseline. After programmed instruction was introduced, word generation ranged from 5 to 9 with a mean of 7.1.

Eileen ranged from 2 to 7 words for the root TRACT with a mean of 4.5 before programmed instruction was introduced. After intervention, the range was 7 to 11 words with a mean of 9.0.

With the root STA, Eileen ranged from 0 to 5 words with a mean of 3.9 during baseline. After introduction of the independent variable, Eileen's range was 4 to 10 words with a mean of 6.6.

Eileen was able to generate from 0 to 3 words during baseline with a mean of 2.1 for the root POS. After programmed instruction was introduced, Eileen was able to generate from 6 to 11 words with a mean of 8.8.
During baseline, Eileen wrote from 1 to 6 words with a mean of 4.1 for the root FAC. After programmed instruction, Eileen wrote from 5 to 9 words with a mean of 7.7.

Before intervention, Eileen generated from 3 to 4 words with a mean of 3.7 for the root TEND. She generated from 3 to 9 words with a mean of 5.5 after programmed instruction was introduced.

During baseline Eileen's generation of words containing the root AUD ranged from 2 to 3 words with a mean of 2.2. Following introduction of the programmed instruction on AUD, Eileen's generation of words ranged from 6 to 9 with a mean of 8.0.

The range of words generated during baseline was 2 to 4 with a mean of 3.3 for the root PHON. The range of words generated after introduction of the programmed instruction was 7 to 9 with a mean of 7.7.

Eileen wrote 1 to 4 words during baseline for the root LEG with a mean of 2.2. After introduction of programmed instruction, Eileen averaged 5 to 9 words with a mean of 7.0.

Eileen completed the most packets (15) and started at zero words generated for 8 of the 15
roots for which she completed instructional packets. She was able to generate at least 5 more words after instruction than during baseline. Eileen's baseline responding was stable with a range of 4 words only on the roots TRACT and FAC. Her responding during the intervention phase was consistent over the first eight roots. STA shows variability in responding as do 3 of the 6 roots that follow STA. Eileen used review sheets for DUC, VOC, STA, and FAC. Responding was 1 to 3 words better after the review sessions. She knew all 15 meanings for the 15 roots she studied as measured by the final probe.
Figure 3. Eileen. Number of words generated on pretests and mastery tests. Open circles indicate root's meaning not known. Solid circles indicate root's meaning correctly given on mastery test. The solid vertical line labeled R represents a review sheet.
Figure 3 (continued)

FER
Programmed Instruction

Baseline

JLECT

Number of Words Generated

SPECT

 Sessions

167
Figure 3 (continued)

VOC
Baseline

Programmed Instruction

TRACT

Number of Words Generated

STA

Sessions

168
Figure 3 (continued)

POS  Baseline    Programmed Instruction

FAC

Number of Words Generated

PEND

Sessions

169
Emily

Figure 4 shows that during baseline Emily's generation of words containing the root FER ranged from 1 to 3 words with a mean of 2.0. Following introduction of the programmed instruction on FER, Emily's generation of words ranged from 5 to 9 with a mean of 7.0.

During baseline, Emily's generation of words containing the root VOC ranged from 2 to 3 words with a mean of 2.3. After programmed instruction was introduced, Emily's generation of words ranged from 3 to 6 with a mean of 4.7.

The range of words generated during baseline was 2 to 4 with a mean of 3.0 for the root TRACT. The range of words generated after introduction of the programmed instruction was 5 to 9 with a mean of 7.2.

Emily wrote 2 to 3 words during baseline for the root POS with a mean of 2.5. After introduction of programmed instruction, Emily averaged 4 to 8 words with a mean of 5.8.

Before intervention, Emily's generation of words containing the root PEND ranged from 2 to 5 with a mean of 3.2. After intervention, her
generation of words ranged from 5 to 8 with a mean of 7.2.

Baseline generation of words containing the root STA ranged from 1 to 5 words with a mean of 3.3. The range following introduction of programmed instruction was 4 to 11 words with a mean of 7.8.

Word generation for the root AUD ranged from 2 to 5 words with a mean of 3.5 during baseline. After programmed instruction was introduced, word generation ranged from 6 to 10 with a mean of 7.3.

Emily ranged from 4 to 5 words for the root PHON with a mean of 4.4 before programmed instruction was introduced. After intervention the range was 5 to 9 words with a mean of 6.4.

With the root PORT, Emily ranged from 2 to 4 words with a mean of 2.5 during baseline. After introduction of the independent variable, Emily's range was 7 to 9 words with a mean of 8.

Emily was able to generate from 1 to 5 words during baseline with a mean of 3.3 for the root DICT. After programmed instruction was introduced, Emily was able to generate from 6 to 10 words with a mean of 7.0.
During baseline, Emily wrote from 2 to 9 words with a mean of 6.3 for the root DUC. After programmed instruction, Emily wrote from 8 to 10 words with a mean of 9.0.

Before intervention, Emily generated from 2 to 8 words with a mean of 4.0 for the root TEND. She generated from 6 to 9 words with a mean of 7.5 after programmed instruction was introduced.

Emily averaged 4.7 more words after intervention than during baseline. Her range was stable on 10 of 12 roots. DUC and TEND showed some variability. These were the last two roots studied by Emily. She wrote increasingly more words in baseline as the study progressed. Generalization to untaught roots may have been taking place. There was overlap between phases on five roots (VOC, STA, PHON, DUC, TEND). Emily gained more from the first seven instructional packets than she did from the latter ones. No trend is evident. Review sessions over VOC, POS, and PEND did seem to help. She knew 9 of 12 meanings on the final probe.
Figure 4. Emily. Number of words generated on pretests and mastery tests. Open circles indicate root's meaning not known. Solid circles indicate root's meaning correctly given on mastery test. The solid vertical line labeled R represents a review sheet.
Figure 4 (continued)

DICT

Baseline

Programmed Instruction

Number of Words Generated

Sessions

DUC

TEND

EMILY
Sam

Figure 5 shows that during baseline Sam's generation of words containing the root DUC ranged from 1 to 5 words with a mean of 4.3. Following introduction of the programmed instruction on DUC, Sam's generation of words ranged from 4 to 17 with a mean of 10.4.

During baseline, Sam's generation of words containing the root STA was 5. After programmed instruction was introduced, Sam's generation of words ranged from 5 to 14 with a mean of 8.1.

The range of words generated during baseline was 4 to 5 with a mean of 4.8 for the root PEND. The range of words generated after introduction of the programmed instruction was 5 to 12 with a mean of 7.8.

Sam wrote 4 to 5 words during baseline for the root VOC with a mean of 4.3. After introduction of programmed instruction, Sam averaged 4 to 10 words with a mean of 6.0.

Before intervention, Sam's generation of words containing the root FAC ranged from 4 to 5 with a mean of 4.9. After intervention, his generation of words ranged from 5 to 8 with a mean of 6.5.
Baseline generation of words containing the root POS ranged from 0 to 5 words with a mean of 2.1. The range following introduction of programmed instruction was 1 to 11 words with a mean of 6.3.

Word generation for the root FER ranged from 1 to 5 words with a mean of 4.1 during baseline. After programmed instruction was introduced, word generation ranged from 4 to 11 with a mean of 7.1.

Sam ranged from 4 to 5 words for the root VERS with a mean of 4.9 before programmed instruction was introduced. After intervention the range was 5 to 9 words with a mean of 7.2.

With the root TRACT Sam ranged from 3 to 5 words with a mean of 4.5 during baseline. After introduction of the independent variable, Sam's range was 6 to 10 words with a mean of 8.3.

Sam was able to generate from 3 to 5 words during baseline with a mean of 4.3 for the root PHON. After programmed instruction was introduced, Sam was able to generate from 4 to 10 words with a mean of 6.6.

During baseline, Sam wrote from 3 to 5 words with a mean of 4.7 for the root TEND. After
programmed instruction, Sam wrote from 5 to 10 words with a mean of 6.8.

Before intervention, Sam generated from 0 to 4 words with a mean of 2.4 for the root LEG. He generated from 8 to 13 words with a mean of 10.0 after programmed instruction was introduced.

Sam showed the most variability throughout the study. He ranged from 1 to 13 words written on the initial mastery test after intervention. This was after stable responding on 9 of 12 roots in baseline. There was some baseline variability on POS, FER, and LEG. There was overlap on 10 of 12 roots, although no overlap occurred on the initial mastery test. Sam had a descending trend on the first six interventions and an ascending trend on the final six packets. Two review sessions were successful (PEND, PHON) but only after being reviewed twice. Sam did not write more words for the roots DUC, STA, VOC, FAC, and POS after review sessions. He knew the meaning of 11 of 12 roots on the final measure. POS was unstable in baseline and was never mastered by Sam as evidenced by his variable rate of responding and lack of learning the meaning for POS. Tier number eight on the root
VERS has an additional phase line. After Sam had finished his twelve packets, he stopped by the conference room one day to chat. Not wanting to disturb the others still participating in the study, the experimenter suggested he do another instructional packet. Rather than complete a new packet, Sam chose to repeat the programmed learning on VERS, a root upon which he was moderately successful. The initial mastery test after doing the packet the second time around found Sam generating 20 words containing VERS. This should be followed up in a future study.
Figure 5. Sam. Number of words generated on pretests and mastery tests. Open circles indicate root's meaning not known. Solid circles indicate root's meaning correctly given on mastery test. The solid vertical line labeled R represents a review sheet.
Figure 5 (continued)

PHON
Baseline

Programmed Instruction

TEND

Number of Words Generated

LEG

Sessions

2  4  6  8  10  12  16  18  20  22  24  26  28  30  32  34  36  38  40

2  4  6  8  10  12  14  16  18  20

185
Carolyn

Figure 6 shows that during baseline Carolyn's generation of words containing the root VERS ranged from 2 to 3 words with a mean of 2.3. Following introduction of the programmed instruction on VERS, Carolyn's generation of words ranged from 5 to 6 with a mean of 6.0.

During baseline, Carolyn's generation of words containing the root STA ranged from 3 to 4 words with a mean of 3.3. After programmed instruction was introduced, Carolyn's generation of words ranged from 3 to 7 with a mean of 4.7.

The range of words generated during baseline was 0 to 4 with a mean of 2.2 for the root FER. The range of words generated after introduction of the programmed instruction was 6 to 9 with a mean of 7.8.

Carolyn wrote 1 to 4 words during baseline for the root SPECT with a mean of 3.4. After introduction of programmed instruction, Carolyn averaged 1 to 8 words with a mean of 5.2.

Before intervention, Carolyn's generation of words containing the root PEND ranged from 2 to 6 with a mean of 3.4. After intervention, her
generation of words ranged from 5 to 8 with a mean of 6.4.

Baseline generation of words containing the root JECT ranged from 1 to 5 words with a mean of 3.7. The range following introduction of programmed instruction was 5 to 9 with a mean of 6.7.

Word generation for the root PHON ranged from 4 to 7 words with a mean of 6.0 during baseline. After programmed instruction was introduced, word generation ranged from 4 to 7 with a mean of 6.0.

Carolyn ranged from 2 to 6 words for the root TEND with a mean of 3.7 before programmed instruction was introduced. After intervention the range was 3 to 9 with a mean of 5.0.

With the root AUD, Carolyn ranged from 2 to 5 words with a mean of 2.8 during baseline. After introduction of the independent variable, Carolyn's range was 4 to 7 with a mean of 5.5.

Carolyn was able to generate from 3 to 11 words during baseline with a mean of 5.8 for the root DUC. After programmed instruction was introduced, Carolyn was able to generate from 4 to 6 words with a mean of 5.0.
During baseline, Carolyn wrote from 3 to 6 words with a mean of 3.0 for the root FAC. After programmed instruction, Carolyn wrote from 4 to 6 words with a mean of 3.0.

Before intervention, Carolyn generated from 0 to 5 words with a mean of 2.8 for the root PORT. She generated from 6 to 7 words with a mean of 6.5 after programmed instruction was introduced.

The instructional packets helped Carolyn gain an average of 4 words more after intervention than averaged during baseline. The range was 0 to 6 indicating some roots were easier for her to remember over time. There was overlap on the initial mastery test for the root DUC. This root showed the most variability in baseline (range of 3 to 11 words). She did not master this root. Overlap occurred on 9 of 12 roots (STA, SPECT, PEND, JECT, PHON, TEND, AUD, DUC, FAC). No trend was established during intervention. Review sheets on 7 of 12 roots did not appear to help. Carolyn knew the meaning of 9 of 12 roots on the final master test. Interestingly, Carolyn kept asking for homework so she could practice the roots. She knows she needs more review and practice to master
a root than this study provided for. Even still, programmed learning was beneficial for Carolyn. She knew more roots and their meanings and wrote more words for each root after intervention than before instruction took place. This intervention was just not as robust for Carolyn as for some of the other participants.
Figure 6. Carolyn. Number of words generated on pretests and mastery tests. Open circles indicate root's meaning not known. Solid circles indicate root's meaning correctly given on mastery test. The solid vertical line labeled R represents a review sheet.
Figure 6 (continued)

DUC
Baseline

Programmed Instruction

FAC

PORT

Number of Words Generated

Sessions

193
CHAPTER V

DISCUSSION, IMPLICATIONS, AND SUMMARY

Introduction

Chapter 5 is organized into three sections. The first section is a discussion of the results presented in chapter four. This is followed by a general summary. Finally, implications for future research are considered.

DISCUSSION

Programmed instruction, at least as defined and used in this study, was effective in setting the occasion for participants to master 12 to 15 Latin roots. Structural analysis, the word recognition skill stressed in this study, does appear to be an effective vocabulary strategy for post-secondary learners, at least with the six participants in this study. If these findings are replicated with other individuals, or groups, evidence would continue to accrue to substantiate the findings of this study.

This study was conducted to convince the experimenter and others that structural analysis belongs in the curriculum. O'Rourke (1970) and Stotsky (1976)
both stated that the systematic teaching of combining forms is an economic and generative way to teach vocabulary. O'Rourke suggests teaching prefixes, roots, and suffixes. Stotsky worked with prefixes only in her research. This experimenter chose to work with roots. All three of us believe that structural analysis may be the key to vocabulary learning, especially on an independent level after mastery of initial word recognition skills. Mastery of simple base words, inflectional endings, and compounds come first before structural analysis plus an understanding of word order and the purpose of reading: to extract meaning from the words.

It is possible to develop a theoretically-sound and empirically-based approach to vocabulary learning. This approach does provide more systematic opportunities for strengthening and expanding students' knowledge of words with meaning-bearing elements than many approaches currently used in educational materials. Other approaches could also be used to accomplish this goal. Structural analysis is not the only way to teach vocabulary. It is one of three major approaches to word recognition, the other two being phonetic analysis and contextual analysis. An individual with a large and
active vocabulary is more likely to be a fluent, efficient, and effective reader than someone with a small and passive vocabulary. There have been and still are some societies where the written language is not important for a full and rich life. However, the mark of an educated person by most American standards is word power.

This research had a threefold purpose: (1) to analyze experimentally the effects of programmed instructional material on the acquisition of morphological definitions, (2) to generate words containing the taught morphemes, and (3) to use these definitions for decoding unknown words. In order to accomplish this goal, four research questions were written to guide the experimental design. Each question is discussed separately below.

Research Question Number One

Was there a functional relationship between a structural analysis approach to direct vocabulary instruction and an increase in the number of words written in response to a written root presented as a pencil and paper exercise?

Yes, a functional relationship was demonstrated providing partial proof that structural analysis can be
an effective vocabulary strategy, at least with post-
secondary learners. By scanning the graphs presented
and summarized individually by participant in chapter
four, it can be seen how much each participant
benefited from the instruction. Appendix G contains
tables summarizing results for the six participants.
Six is a small number upon which to base conclusions but
the data definitely points toward a positive gain for
each individual. Some individuals benefited more than
others.

**Research Question Number Two**

Did the use of structural analysis increase the
number of meanings of the roots used during instruction?
Yes, Carol successfully learned the twelve roots she
studied, and remembered all twelve meanings over time as
measured by a posttest. Helen successfully learned and
remembered the meanings of all thirteen roots she
studied, and remembered all thirteen meanings as
measured by a posttest. Eileen successfully learned the
meanings of all fifteen roots she studied. She had
difficulty recalling the exact meaning of the root VOC.
Eileen correctly gave the meaning of VOC on the mastery
test immediately following programmed instruction and
also on the posttest after looking over a review sheet.
She consistently said VOC meant "voice" on the mastery tests given between the initial mastery test and the posttest. While this answer is not completely wrong, the instructional packet stated the meaning of VOC as "call". Voice is a word derived from the root VOC and was counted in the number of words generated.

Emily successfully learned the meanings of all twelve roots she studied. She had difficulty remembering the meaning of two roots, PHON meaning "sound" and PORT meaning "carry". Sam successfully learned the meanings of all twelve roots he studied. However he had difficulty maintaining the meaning of six roots, demonstrated by his inability to recall the meanings of DUC, FAC, POS, PER, VERS, and TRACT, over time. With the aid of review sheets, Sam did know the meaning of eleven of twelve roots on the posttest. The meaning of POS eluded Sam on all occasions except on the initial mastery test given immediately after instruction. Carolyn successfully learned the meanings of all twelve roots she studied. She had difficulty maintaining the meaning of five roots, VERS, PHON, TEND, AUD, and DUC. With the aid of review sheets, Carolyn did know the meaning of ten of twelve roots on the posttest. She had difficulty remembering the meanings
of AUD and DUC, even though she had a review sheet on DUC. Carolyn did not have a review sheet on the root AUD.

**Research Question Number Three**

Did the use of acquired root meanings transfer from taught to unknown words? The answer to this question is yes, for some participants, and yes, partially, for others. Not every participant was able to transfer the meanings of roots from known to unknown words. Carol and Sam experienced more success with this skill than the others. Helen and Eileen were moderately successful while Emily and Carolyn experienced transfer to a lesser degree (see Appendix G).

The test for transfer of root knowledge was very difficult with all words at the thirteenth or sixteenth grade levels. All six participants took the entire test even though they only completed 12, 13, or 15 instructional packets. The test consists of 24 matching items broken into 6 sections with 4 target words and 5 distractors to choose from in each section. The test could be broken into roughly two halves, at least for seven individuals (three who worked with 12 roots during this study and 4 who took the test but were not part of the study). The second half of the test proved easier
than the first half based on the 10 people who took it. Only 6 of these 10 individuals were part of this study but all 10 people were members of a spelling and vocabulary class taught by the experimenter Summer Quarter, 1988.

Looking at the words and analyzing them does not provide many clues at the moment. The first twelve words contain two 4-syllable words, five 3-syllable words, five 2-syllable words, and four 2-syllable words. The second twelve words contain three 4-syllable words, five 3-syllable words, and four 2-syllable words. Eleven of twelve words have the root of interest in the initial position for the first twelve words. Ten of twelve words have the root of interest in the initial position for the second twelve words. The two halves should have been equal, or perhaps even the first half easier. This was not the case. The four people who took the test but did not participate in the study did better on the second half of the test; in fact, considerably so (83%, 83%, 83%, 75%, to 50%, 25%, 42%, 58%). Ten people do not validate a test. More individuals need to take the test to establish reliability. However, the six participants did do better overall than the four non-participants. The
measure may discriminate well overall but not for individual roots. The discriminating variable may be part of speech. The first twelve words had 6 nouns, 1 verb, and 5 adjectives. The second twelve words had 9 nouns, 1 verb, and 2 adjectives. Adjectives tend to be more abstract and have more nuances to their meanings than either nouns or verbs. Future research needs to address this dilemma.

Research Question Number Four

Was the number of words generated from the presentation of the roots retained over time? The answer to this question depends upon how you interpret the data. If you establish a criterion of more words after intervention than averaged during baseline, then 75 out of 76 roots were remembered and used to generate more words after intervention than during baseline. No examples established or tried in previous studies could be located to guide the choice of a criterion. Five more words generated after instruction than averaged during baseline seemed possible since ten words were presented and actively worked with in the instructional packets. Mastery tests were given immediately upon completion of the programmed instruction. At least half of those words would probably be immediately forgotten
after instruction. Presumably five might be retained on an average. Some students were able to remember 9 or 10 of the words plus add others of their own (previously known and associated with the root under study or correctly "coined" due to knowledge gained and transferred through the use of mixing and matching of affixes). Some students could only recall 3 or 4 words. The number of words generated may have bearing upon the difficulty of a root to master. This would make an interesting study for further research.

The programmed instructional packets were successful in providing the opportunity for each participant to master the meaning of the roots they studied. Participants were also able to generate more words after instruction than before instruction.

IMPLICATIONS FOR FUTURE RESEARCH

This study attempted to produce an instructional method for teaching vocabulary to post-secondary learners. Six participants and nineteen roots are small numbers from which to extrapolate findings. This research needs to be replicated with other subjects to confirm the results found here and to extend the number of roots taught. Nineteen is a low number considering there are over 1037 roots to be learned. Some kind of
decision on which roots need to be taught first has to be determined. When studies in structural analysis have been conducted in the past, root selection was based wholly or partially on word frequency. Word meaning might be a better base from which to work. Only further research will confirm this premise.

Roots were chosen for inclusion in this study based upon their consistency in meaning, frequent occurrence in words encountered, and because they are highly visible in the printed word. Roots can vary considerably in spelling, but for this study, an attempt was made to include only those roots which would be easy to see visually and understand literally without making giant leaps from Latin to English that only 4-year Latin students or other highly trained, or motivated, individuals could do. More work needs to be done in this area to ascertain which words to teach first, second, third, or never. Systematic replications of this study will help make decisions of this type.

Prefixes were not taught since very few have only one invariant meaning or one most commonly used meaning. Prefixes were included in the instructional packets but their role in helping students learn roots was not measured in this study.
Suffixes were excluded from study in the present research since they generally add only the part of speech consistently, a valuable piece of knowledge if you know how to use it, but that is a study in and of itself. Some suffixes add meaning, many do not. Suffixes were used and delineated in the instructional packets but not measured in this research.

In what order should roots be taught? Only a partial answer was found and not a very conclusive one. More roots with more subjects must be studied before any decisions can be made considering order. It is possible to state which roots should not be taught first based on which proved most difficult for these six participants to master in this study. In this research, a total of nineteen different roots was studied by each of the participants. Each participant studied twelve to fifteen roots, but no two individuals worked with the same twelve roots. Only five roots were studied by all six participants: PEND, FER, DUC, STA, TEND. Of these five roots, FER seems the most difficult to master based on the number of words generated and retention of its meaning after instruction and over time. More research must be done to decide upon an order in which to most effectively teach roots.
More than simple opportunities to respond must be considered when deciding how many exposures are needed. Partial regression analysis, holding first one factor and then others constant, might help sort out this problem. This study did not partial out the effect of individual variables.

The vocabulary skill of structural analysis transferred to non-taught exemplars for some of the participants but not all and, in varying degrees for those participants for whom it did work. More complete analysis must be done and a different type of study devised to answer this question.

Support was found for Skinner's (1954) approach to programmed learning. It did work for these students. Whether or not subject reactivity was a major factor cannot be determined; perhaps it was. The six participants were all members of a beginning vocabulary spelling class taught by the experimenter during Winter Quarter, 1988. They all indicated a desire to take advanced vocabulary Spring Quarter. The advanced course was not offered Spring Quarter and it was suggested that they participate in this research as one way to continue their word learning. Eight of sixteen class members chose to participate in this study. One person had to
attend school out of town on two different occasions for varying lengths of time concerning her work. She completed five of the instructional packets. Another student only had 30 minutes for lunch so she did her pretests in the conference room, worked through the packet at home, and then took the mastery test another day in the conference room. She completed four packets. Data for these two individuals were not included in the present study.

Three individuals from a vocabulary/spelling class taught Fall Quarter, 1987, worked with the experimenter during Winter Quarter pilot testing instructional packets. Two of these individuals completed twelve packets. It was decided not to include their data since mistakes made in preparation of the materials had been corrected before the six other participants began their involvement. A more homogeneous group was obtained by including only the six people who took the same course at the same time and who had the opportunity to complete the same packets.

SUMMARY

The purpose of this study was to analyze experimentally the effects of programmed instructional materials on the acquisition of roots, their meanings,
generation of words containing these roots, and the use of these roots to decode unknown words. A root in this study was defined as the central part of any word that is not generally a word in English when standing by itself but is meaning-bearing (e.g., "pend" equals "hang" or "aud" equals "hear").

Participants in this study had been members of a vocabulary and spelling class taught by the experimenter. All were high school graduates, none had a college degree although some had taken college courses, mainly through an extension campus of Columbus State Community College at Ohio Bell Telephone Company.

The independent variable was programmed instruction incorporated into packets made by the experimenter covering 19 different roots. Two dependent variables were of interest: first, mastery of the roots' meanings and second, the number of words generated using each root.

Four research questions were asked: (1) Was there a functional relationship between a structural analysis approach to direct vocabulary instruction and an increase in the number of words written? Yes, for every participant and for 75 out of 76 instructed roots. (2) Did the use of structural analysis increase the
number of meanings of the roots used during instruction? Yes for 75 of 76 roots.  
(3) Did the use of acquired roots' meanings transfer from taught to unknown words? Yes, for 49 out of 76 roots. No, for 27 roots. Some of the roots were studied by all six participants, others were studied by only one person. Therefore, yes, for 64% of the opportunities and no, for 36% of the opportunities.  
(4) Was the number of words generated from the presentation of the roots retained over time? Five more words after intervention than the baseline average was the criterion chosen for this study. Using this criterion, 44 of 76 roots were maintained over time as evidenced by the number of words generated.
APPENDIX A

PRETESTS
APPENDIX B

SUBJECT APPROVAL FORM
The research Karen Swisher is conducting has been explained to me. I understand that I may drop out of the experiment at any time. I

(please print)

wish to be a participant in Karen's vocabulary research. I realize that this involves approximately 15 thirty-minute sessions over the next 5 to 10 weeks.

Signed ____________________________

Date ____________________________
APPENDIX C

INSTRUCTIONAL PACKETS
1. Look carefully at the following 10 words. What 4 letters are found in each word? ---

pending
pendant
depend
dependent
undependable

suspenders
pendulum
perpendicular
independence
appendix

15. Look at the root "pend" in each of the following words again. Underline the root in each word and notice how it adds the meaning of "hang" to each word.

pending
pendant
depend
dependent
undependable

suspenders
pendulum
perpendicular
independence
appendix

37. Saclike growth attached to the large intestine:

a. pendant
b. pendulum
c. appendix
d. suspenders
2. The letters "pend" represent a root meaning "hang." All of the words in this lesson have something to do with hanging. What does the root "pend" mean? __ __ __

16. pending suspenders
pendant pendulum
pendant perpendicular
dependent independence
undependable appendix

38. the word part meaning "hang:"
   a. PEND
   b. DUC
   c. POS
   d. DICT
hang 3. The word pending is an adjective meaning "undecided," as in a decision that is pending, literally, "hanging in the balance." [PEND hang + ING]

We will move to South Carolina— the decision of the search committee.

17. depend a. unreliable
18. perpendicular b. need help from others
19. undependable c. upright position

39. Even very young girls enjoy wearing a [pendant, pendulum] around their necks.
pendant

4. An ornament, such as a locket, that "hangs" around your neck, is called a pendant.

[PEND hang + ANT thing which]

You can buy many beautiful ___ ___ ___ s.

17. b
18. c
19. a

___20. pendulum
d. subject to parental authority

___21. independence
e. saclike growth attached to the

___22. dependent
f. free weight influenced by gravity

___23. appendix
g. free from control of others

pendant

40. When I left work yesterday, a major decision about program development was still ___ ___ ___.

(pendant, pending)
5. If you are controlled or influenced by others, then you depend upon them for help or support.
[DE from + PEND hang]

When you are counting on help from your friends, you are ___ ___ ___ ing on them to see you through difficult times.

20. f __24. pending h. belt replacement
21. g ___25. pendant i. "hanging in the balance"
22. d ___26. suspenders j. hang
23. e ___27. "pend" k. neck ornament

pendant 41. "You can ________ on me, (intend, depend)
Jerry; I'll be on time for the meeting," said Larry.
depend 6. We generally consider children under the age of 18 to be dependent, or subject to, their parents' authority. [DE from + PEND hang + ENT state of]

Children from Southeast Asia seem to be ______ upon parental guidance longer than American youth.

24. i 28. undecided; hanging in the balance:
25. k
26. h
27. j a. appendix
   b. pendulum
   c. pending
   d. pendant

depend 42. Very young children are ______ upon their (independent, dependent)
   parents for almost everything.
7. If you fail to meet your responsibilities, you are considered unreliable, untrustworthy, or undependable. [UN not + DE from + PEND hang + ABLE]

An _ _ _ _ _ _ _ _ _ _ worker soon loses the respect of his supervisor and co-workers.

c. 29. ornament which hangs around the neck:

a. appendix  
b. pendulum  
c. pending  
d. pendant

dependent  43. This new employee is _ _ _ _ _ _ _ _ _ _ she has been late for work three times this week alone.
8. Straps worn over the shoulders and attached to the trousers to hold them up are called suspenders. [SUS under + PEND hang + ER thing].

---are quite popular in today's fashion-conscious market for both men and women to replace belts.

30. to count on others for support:

a. intend
b. depend
c. suspend
d. attend

44. My uncle wears (suspenders, pendulums) to keep his trousers around his waist.
9. A weight so hung from a fixed point that it is free to swing to and fro is called a pendulum. The movement of the works of a tall clock is often timed by a pendulum.

[PEND hang]

In the lobby of COSI, hangs a ___ that freely swings from a fixed point high overhead.

31. subject to parental authority:

a. independent
b. interdependent
c. dependent
d. overdependent

45. Lines that form the corners of a rectangle are ___

(parallel, perpendicular)
10. While you are lying face downward, you are lying in a prone position. If you are standing up, we say you are in a perpendicular position. [PER through + PEND hang]

We refer to lines that cross each other at right angles as _______ _______ _______ _______ _______ lines.

32. unreliable; untrustworthy:

   a. undependable
   b. dependable
   c. dependent
   d. independent

46. The grandfather clock in the hall has a _______ _______ that keeps the (pendulum, suspender) mechanism wound tightly and running accurately.
perpendicular

11. Freedom from the control, influence, or, help of others defines independence.
    [IN not + DE from + PEND hang + ENCE]

    Many countries in the Third World are struggling to maintain their
    ____________ from the United States and the Soviet Union.

a

33. shoulder straps from which trousers hang:

    a. pendants
    b. pendulums
    c. appendices
    d. suspenders

pendulum

47. The United States officially celebrates her (independence, dependence)
    from colonial rule on July 4th each year.
12. The small sac-like growth attached to
the large intestine is called the
appendix.
[AP <AD on + PEND hang]

The human __ __ __ __ __ serves as a
storage area for poisons that collect
in the body.

34. a fixed weight that swings to and fro
under the influence of gravity:

a. pendant  b. pendulum  c. appendix  d. suspenders

48. Your ________________ serves a
(venant, appendix)
vital role in keeping your body free
from infection.
13. Look carefully at the following words. Underline the root in each word and notice how the root "pend" adds the meaning of "hang" to each word:

append  dependable
impend   undependable
suspend  dependant
depend   independent
overdependent  interdependent

35. In an upright position at 90 degrees to the horizon:

a. dependent
b. suspended
c. independent
d. perpendicular

49. The word part _________ is needed to make sense of this word: overde_ _ _ ent, meaning "needs too much help and cannot stand alone."
14. append  independent
impend  overdependent
suspend  interdependent
depend  dependable
dependent  undependable

36. free from the influence or control of others:
   a. independent
   b. interdependent
   c. dependent
   d. overdependent
APPENDIX D

RESPONSE GENERALIZATION
PEND - hang

arborpendverse - condition of hanging upside down in a tree
pendton - hang ten clothes
minidemophilapendasubpedors - little kids who love to hang around under foot when you are trying to work

SPECT - look

Tomspect - peeping Tom
demulingerloufactospectors - people who play sick to get out of work and talk about how much work they do to look good to their supervisor

FER - bear, carry

corpusferate - pall bearer
anthroferpan - a person who attempts to carry all his luggage on the plane

JECT - throw

aquajector - water pistol
anthrojectormalapaths - a person who throws things when they are mad

VOC - call

malvocifphonitis - a mental condition for a person who likes to make obscene phone calls
anthrovocaloqumalist - a person who calls others bad names

STA - stand

stanexinhydring - standing out in the rain

FAC - make, do

faccuing - doing well
VERS - turn

arborpendverse - condition of hanging upside down in a tree

circumversing - turning around

TRACT - pull, draw

acrocardtractor - person who draws an ace off the top of deck of cards
tractademacomming - drawing a crowd

DUC - lead

pseudoduct - false lead
ducdemdiversion - causing dissension in the ranks

POS - put, place

demamnesiaposers - people who forget where they put the TV channel selector

AUD - hear

imaudioite - person who won't listen to what you have to say
homoactaudadictor - a friend who pretended not to hear you when you announced that you needed help moving into a new house Saturday

PORT - carry

anthroportan - piggy back ride
demportadiversers - people who get carried away -- my manager

GRAPH - write

demillagraph - a person who can't write

PHON - sound

cornuphonical - a musical with only brass instruments
monomuterdictaphon - a person who just hit the lottery for fifty million dollars who is speechless and cannot utter a sound
DICT - say

duodiction - two interpretations
repedictor - mocker
idiodiction - stupid conversation
antedictadems - people who engage their mouth before putting their brain in gear (speak before they think)

TEND - stretch

almonobasitending - reaction caused by a bad throw to first base forcing the first baseman to stretch
demtendoverities - people who stretch the truth

LEG - law

equilegorism - idea that laws are equal for all men regardless of how much they paid they lawyer
homophobalegs - a person who drives 50 MPH even when they are the only ones on the freeway @ three in the morning

GRESS - move, step

psuedogression - walking in place
pedgressabuggers - little boys who spend their playtime looking for bugs to step on

MAR - sea

subaquateamarty - underwater tea party
homomariner - sailor

SCRIB - write

ascribbber - an eraser
demascribbler - kids who doodle instead of paying attention in class

CUR - run

nycurlonner - runner in pantyhose
ny [cur] lon-ner
homocurcircumscriber - aperson who runs around in circles and never gets anything accomplished
MIT, MISS - send

floralmister - a flower delivery man

VIS - see

visanine - seeing eye dog
APPENDIX E

REVIEW SHEET
vocabulary = VOC call + (abul) + ARY thing which
vocal = VOC call + AL relating to
vocal cords = VOC call + AL relating to + CORDS
vocalize = VOC call + AL relating to + IZE make
vocalist = VOC call + AL relating to + IST person who
vocation = VOC calling + ATION act of
avocation = A away + VOC calling + ATION act of
 invocation = IN on + VOC calling + ATION act of
convocation = CON together + VOC calling + ATION act of
provocative = PRO forth + VOC call + (at) + 
IVE tending to

other VOC words: vocational
nonvocational
equivocal
unequivocal
evocative
equivocate
advocate
advocacy
APPENDIX F

TABLES SUMMARIZING THE DATA
### TABLE 1

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### Table 12

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**average** | **3.3** | **7.0** | **3.7** | **3.0** | **5.3** | **2.3** |
APPENDIX G

TEST OF TRANSFER
Date _______________  Name __________________

__ 1.  portmanteau  a.  a large suitcase
__ 2.  posting       b.  remarkable thing
__ 3.  tractable     c.  part of a climbing plant
__ 4.  tendril       d.  easily led
                  e.  way of riding

---------------------------------------------

__ 5.  digress        f.  personal judgment
__ 6.  subjective     g.  stall bars
__ 7.  vociferous     h.  wander off subject
__ 8.  stanchion      i.  noisy
                  j.  sluggish

---------------------------------------------

__ 9.  factotum       k.  awaiting settlement
__10.  pendency       l.  respectful
__11.  deferential    m.  easily managed
__12.  ductile       n.  a textile fiber
                  o.  handyman
13. graphology  a. diplomatic group  
14. dictum  b. letter  
15. missive  c. positive opinion  
16. legation  d. study of handwriting  
  e. mountainous  

17. spectral  f. rude  
18. cursory  g. hasty  
19. versify  h. ghostlike  
20. auditor  i. to put into rhyme  
  j. one who listens  

21. phonolite  k. room in a monastery set apart for copying manuscripts  
22. mariculture  l. a long view  
23. vista  m. volcanic rock which rings when struck  
24. scriptorium  n. gliding  
  o. the cultivation of sea plants and animals for food and raw materials  


Gibbons, H. (1940). The ability of college freshmen to construct the meaning of a strange word from the context in which it appears. *Journal of Experimental Education*, 9, 29-33.


O'Rourke, J. (1970). *Toward a science of vocabulary development*. Unpublished doctoral dissertation. The Ohio State University, Columbus, OH.


