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The Effects of Modal Preference in Determining the Meaning of Derived Words at Third and Fifth Grade Levels

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THE EFFECTS OF MODAL PREFERENCE
IN DETERMINING THE MEANING OF DERIVED
WORDS AT THIRD AND FIFTH GRADE LEVELS

THESIS

Submitted to the Graduate Committee of the
Department of Curriculum and Instruction
Faculty of Education
State University College at Brockport
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Education

by
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Abstract
The purpose of this research was to investigate whether or not third or fifth grade children who were clearly successful or unsuccessful in determining the meanings of derived words which exhibited vowel-shift patterns, would demonstrate trends toward either a visual or auditory preference, or toward mixed modalities. The researcher designed vowel-shift test, which consisted of twenty-nine derived words and three pseudowords, presented both visually and auditorily, was administered to forty-three third graders and sixty-nine fifth graders in a suburban western New York school district. The vowel-shift test instrument consisted of derived words which were not ordinarily found in basal reader series at third and fifth grade levels but contained a vowel alternation and retained orthographic similarity to the base word. Those students who scored 2\(\frac{1}{2}\) standard measures of error above or below the mean were further tested with the Visual Auditory Preference Assessment to determine modality preference. The VAPA consisted of three treatments of simultaneously presented visual and auditory stimuli. All three treatments presented a series of five digits visually while at the same time five different digits were presented auditorily. All data were analyzed descriptively. The results of this study indicated that in the third grade high or low groups, or in the fifth grade high group there appeared to be no trends toward a modality preference. It seemed, however, that the third
grade low group was not using visual and phonological clues to a significant degree, whereas both high groups seemed to be using visual and phonological information to access the meanings of the derived words. The low group at the fifth grade level demonstrated an auditory preference which may indicate that these students were not using the visual information to access the meanings of the derived words. Longitudinal studies and studies which incorporated tactile and kinesthetic modalities were recommended.
# Table of Contents

List of Tables ......................................................... iv

Chapter I

Statement of the Problem ........................................... 1
  Purpose .................................................................. 1
  Need for the Study .................................................. 2
  Modality Strengths .................................................. 6
  Derived Words and Modality Strengths ......................... 9
  Research Design ..................................................... 11
  Definition of Terms .................................................. 12
  Limitations of the Study ........................................... 13
  Summary ............................................................... 14

Chapter II

Review of the Literature .............................................. 15
  Purpose .................................................................. 15
  The Relationship of Spoken and Written Language in Terms of the Vowel Shift ...... 15
  Access to Meaning of Printed Words ......................... 22
  The Psycholinguistic Nature of the Reading Process ........ 26
  Learning Modality Theories and Their Relationship to Psychology ................. 32
  The Relationship of Learning Modalities, Reading and Spelling ................. 36
  Summary ............................................................... 41

Chapter III

Design of the Study ..................................................... 43
<table>
<thead>
<tr>
<th>Purpose</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Questions</td>
<td>43</td>
</tr>
<tr>
<td>Preparatory Instruments and Procedures ......</td>
<td>44</td>
</tr>
<tr>
<td>Test Instruments and Procedures</td>
<td>47</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>51</td>
</tr>
<tr>
<td>Summary</td>
<td>51</td>
</tr>
</tbody>
</table>

Chapter IV

- Analysis of Data .................................. 53
- Purpose ........................................... 53
- Analysis of Data .................................. 53
- Summary .......................................... 67

Chapter V

- Conclusions and Implications .................... 69
- Conclusions ....................................... 69
- Observations during testing ..................... 69
- The Vowel-shift Test Data ......................... 71
- VAPA Test Data .................................... 72
- Implications for Research ....................... 74
- Implications for Classroom Practice .......... 75

References .......................................... 79

Appendices

- A. Dictionaries and Thesauri ..................... 89
- B. Vowel-shift Test Instrument ................ 91
- C. Visual/ Auditory Preference Assessment Stimuli 96
List of Tables

Table

1. Distribution of Vowel Shift Test Scores ......... 54
2. Student Responses to the Vowel Shift Test
   Grade 3 ................................................. 57
3. Student Responses to the Vowel Shift Test
   Grade 5 ................................................. 58
4. Student Responses to the VAPA Test ............... 60
   Grade 3
5. Student Responses to the VAPA Test
   Grade 5 ................................................. 62
6. Mean Percentage of Correct Responses in
   Treatments II and III ............................... 65
Chapter I

Statement of the Problem

Purpose

The purpose of this study was to investigate whether or not third or fifth grade children, who were clearly successful or unsuccessful in determining the meanings of derived words which exhibit vowel-shift patterns, would demonstrate trends toward either a visual or auditory preference, or toward mixed modalities.

The following questions were posed to define the research problem:

1. Do students at the third and fifth grade levels, who successfully identify the meanings of derived words on a vowel-shift test which has been presented simultaneously visually and auditorily, demonstrate a modality preference individually or as a group?

2. Do students at the third and fifth grade levels, who cannot successfully identify the meanings of derived words which have been simultaneously presented visually and auditorily on a vowel-shift test, demonstrate a modality preference individually or as a group?
Need for the Study

Language, man's basic form of communication, and its relationship to reading acquisition, has come to the foreground in current educational research (C. Chomsky, 1970, 1972, 1979; Goodman, 1968, 1969(a), 1969(b), 1972; Smith 1973, 1975, 1978). Since language can be represented in both speech and print and since man can recognize and process print and speech with accuracy and remarkable speed, (Meyer, Schvaneveldt & Ruddy, 1974b) much debate and controversy exists concerning its representation and acquisition. Furthermore, the implications for and applications of current reading and spelling research instruction are unlimited and controversial as well.

Before the onset of the printing press, printed material was neither within the economic nor intellectual realm of the common man. Spelling was not standardized and as a result the spellings reflected changes in the language due to phonological changes and the introduction of foreign words from such languages as Latin, French, and Greek. With the development of printing in England at the end of the fifteenth century, spelling and its "regularity," "correctness" or uniformity became the accepted practice so that by the end of the seventeenth century, modern English spellings were fairly well established. As a result of
historical and etymological influences, modern spelling tends to be patterned (Fries, 1962).

Traditionally, the English language has been viewed as an alphabetic system in which there is a highly irregular phoneme-grapheme (sound-symbol) correspondence. As a result, beginning reading and spelling, regardless of the method used, has been taught with an emphasis upon an analysis of letters and sounds. Phonetically accurate spellings have been regarded as regular, and phonetically inaccurate spellings have been taught as irregular. No account has been made for the spelling regularity that exists based upon word relationships (meaning) and the underlying lexical similarities (Chomsky, 1970). Goodman (1972) theorizes that the relationship between oral and written language is not alphabetic but instead is a surface structure that is related to an underlying deep structure. He argues that the alphabetic system is not irregular but a highly complex orthographic system with many rules, subrules, and exceptions. Based upon an extensive analysis of pronunciations and spellings of common English words, Hanna, Hanna, Hodges & Rudolph (1966) and Venezky (1967) concluded that the English orthography is highly regular.

Linguists, N. Chomsky and M. Halle (1968) have proposed that the English orthography is a "near-optimal" system in which the speaker's internalized language system is represented as "lexical representation" rather than an
orthography that merely imitates the phonological system. Thus, the orthography reflects the meaning units as well as the sounds that are produced in speech. Furthermore, they hypothesize that were this not the case, the lexical representation would not respond to the major dialects of the language.

C. Chomsky (1970) expands upon the Chomsky-Halle theory. She states that conventional spelling corresponds more closely to the underlying abstract level than to the surface phonetic form. She points out that if English spellings were phonetic in nature, two spellings would be necessary for word pairs that undergo vowel alternations when suffixes are added. Her examples are "the ey-alternation in nation/national, the iy-alternation in extreme/extremity, the ay-I alternation in wide/width, and the o-a alternation in phone/phonics" (p. 289). She states that even though these word pairs are phonetically different, speakers of the language recognize them as variant forms of the same word. Based upon this she theorizes that the lexical spelling is an abstract representation from which the language user can predict the phonetic realizations and apply them to rules of pronunciation.

The research also tends to support the theory that readers use orthographic information to obtain meaning. There is much controversy, however, as to whether meaning is
accessed directly through a visual strategy (Baron, 1973; Baron & McKillop, 1975), whether a phonemic recoding is necessary (Barron, 1978; Meyer, Schvanevelt & Ruddy, 1974(a), 1974(b); Rubenstein, Lewis & Rubenstein, 1971), or whether both strategies are used (Barron, 1980; Spoehr, 1978). Smith (1973, 1975, 1978), however, contends that language is a process which "must be located entirely within the cognitive structure of the individual" (1975, p.111). Within this model the reader uses visual information which is picked up by the eyes and joined with the nonvisual information which the reader brings to the reading task. The result is comprehension which is the ultimate goal of reading.

Nicholson and Schachter (1979) have proposed that spelling is a process. According to this theory, able spellers employ language knowledge, internalized rules and visual associations when they write words. Because of the interplay of these three knowledge types, the speller may use them separately or in combinations, depending upon the word to be spelled. The ability "to understand English words, to assign meaning to sounds, and to know whether or not words 'sound right'" (Nicholson & Schachter, 1979 p. 805), is that vast amount of language knowledge with which children come to school. This knowledge helps children spell related words, use semantic clues in relation to homonyms and apply prior knowledge to help with word
structures. Children also come to school with what are termed internalized rules (C. Chomsky, 1970, 1972, 1979; Nicholson & Schachter, 1979; Read, 1971, 1975, 1980). These rules, "whether acquired inductively (by example) or deductively (by generalization), enable children to predict and write the most probable spelling for words" (Nicholson & Schachter, 1979, p. 805). Children probably cannot explain what these rules are but they apply them in their speech and writing (C. Chomsky, 1970, 1972, 1979; Read, 1971, 1975, 1980). Finally, categorized word sets, such as light, sight, and right, form part of our "visual dictionaries in our heads of words and their graphic forms" (Nicholson & Schachter, 1979, p. 805). Here the highly irregular orthographic forms and other associated irregular structures are stored.

Modality Strengths

Recent educational research concerning modality strengths, or acquiring information through a preferred auditory, visual, kinesthetic or tactile channel, has been problematic for two reasons. First, tests which establish visual, auditory and kinesthetic-tactile preferences have not established concurring criteria. The traditional cut-off point, the median or one standard deviation above or
below the mean, does not necessarily group subjects correctly according to modality preference for further testing or instructional treatment. Second, modality is not a fixed characteristic. Cooper and Gaeth (1967) and Barbe, Swassing, Milone, and Kampwirth (1981) have established that the auditory modality appears to be preferred at the primary grade levels, whereas the visual modality seems to be preferred in the later elementary grades, and mixed modalities may even be the case. As a result, much controversy exists concerning modality preference and learning.

Wepman (1960, 1971) has suggested that the sensory modalities develop individually and that each pathway progresses sequentially from recognition and imitation, to comprehension, formulation and use of verbal symbols. He theorized that as children grow and mature they show a preferred pathway for acquiring information. Therefore, he proposed, based upon significant results of the standardized Wepman Auditory Discrimination Test, that school age children should be studied to determine whether or not their auditory abilities have reached the level of maturation in order to benefit from phonic based reading instruction or from auditory training in speech. Wepman (1971) further theorized that if students have one preferred pathway of learning, individualized reading instruction can be considered when planning curriculum. Likewise, children
who experience learning difficulty should be tested for modality preference and instructed accordingly.

Many research studies have attempted to match modality preference with a preferred learning style of instruction. In a review of twenty-two such modality-methods studies, Kampwirth and Bates (1980) have concluded that since only two of the twenty-two studies showed "positive" results, there is little justification to continue to rely upon the supposition that teaching according to modality preference will lead to greater reading success.

In a study of primary-grade children, Robinson (1972) found no significant results when a phonics reading approach was matched with auditory learners, nor were significant results found when a sight approach was matched with visual learners. Similarly, Waugh (1973) investigated the relationship between a sensory-modality preference teaching method and a traditional non-preferenced modality teaching method with second graders. He concluded that since reading is a multisensory process, emphasis should not be placed on only one channel during teaching.

However, in a study with average fourth graders, Newcomer and Goodman (1975) reported significantly higher performance results on meaningful and associative learning tasks when students were matched according to learner preference and instructional modality. They proposed that the significant results could have occurred because student
ability and modality preference were controlled for by administering the Illinois Test of Psycholinguistic Abilities and eighteen modality tests.

Research in modality preference has also extended into areas of psychology. Through a variety of methods, Munsterberg (1894), Henmon (1912), Hill & Hecker (1966), and Lilly & Kelleher (1973) have looked for a relationship between mode of presentation and memory. Russell (1928), Williams, Williams & Blumberg (1973) and Jarman (1979) have tried to determine, using various methods and age groups, which type of presentation, visual or auditory, was superior.

Derived Words and Modality Strengths

In a study of children aged five to twelve, Moskowitz (1973) investigated the ability of children to manipulate the vowel-shift patterns of pseudo-words. She found that children could manipulate the vowel-shift patterns of pseudo-words and that this ability is acquired slowly as a result of exposure to the English spelling system.

LaSorte (1980), in a study of third and fifth graders, found that children could utilize graphic information to determine the meanings of derived words. Students were better able to discover the meanings of derived words when
presented visually than when presented auditorily. The findings also suggested that in determining the meanings of derived words, good readers at both levels were better able to utilize lexical information that was conveyed in the orthography.

In a study of forty-four second grade students who were matched to the preferred visual or auditory mode for a spelling learning task, Kobs (1972) found that there seemed to be a trend toward a relationship between a student's auditory or visual immediate memory for letter sequences and his/ her child's preferred mode.

Recent research suggests that when children enter school they have already mastered their native language through the internalization of phonological and syntactical rules (C. Chomsky, 1971, 1972; Read, 1971, 1975, 1980). Wepman (1960, 1971) has argued that differences in children's perceptual levels of learning do exist and furthermore, within each child these learning systems, or modalities, develop sequentially and between systems. Lazerson (1974-75) and Barron (1978) contend that mature and fluent readers can access meaning during the reading process through orthographic information. Therefore, are children successful or unsuccessful in using lexical information contained in derived words which have undergone a shift in vowel pronunciation? Furthermore, are children who are highly successful or highly unsuccessful in determining the
meaning of derived words containing vowel alternations demonstrating a modality preference?

**Research Design**

To examine these questions a researcher-designed test instrument and an unpublished modality preference assessment were used. Each derived word selected had a base word in which the core reading level was between grades two and six (Harris & Jacobson, 1972). Only words which contained vowel alternations (e.g. nation/national) were used. Test items were arranged sequentially from second grade level through sixth grade level with four multiple choice definitions for each item. A representative sample at each grade level was given the multiple-choice test. Based upon standard measures of error above and below the mean, two groups at each grade level were given the modality preference assessment. The test consisted of three treatments in which bimodal stimuli were presented. In the first treatment the subject is asked to write down any numbers that s/he remembers after the presentation of the auditory/visual stimuli. In the second and third treatments the subject is asked to write down any numbers that s/he has heard and seen respectively.
Definition of Terms

Phonics: Phonics is a method of teaching reading through sound-symbol correspondences.

Grapheme: A grapheme is a significant unit of visual shape. The basic graphemic units of English spelling are the twenty-six letters of the Roman alphabet (Hall, 1966).

Phoneme: A phoneme is a significant unit of speech-sound as distinguished from all other sounds (grunts, screams) which do not function as part of the system of human speech (Hall, 1966).

Morpheme: A morpheme is the minimal meaning unit of language. Any simple word in English is a morpheme (example: base); prefixes (such as de- in debase) and suffixes (such as -ment in debasement) are also morphemes (Hall, 1966).

Orthography: English orthography consists of the written symbols (graphemes) which are arranged in a specific order to form words (LaSorte, 1980).

Derived Words: Words that are a result of adding affixes to a root or base word are called derived words. (e.g. photographic is a derivation of photograph) (LaSorte, 1980).
Modality Strength: A modality strength implies superior functioning in one or more perceptual channels and is assessed through a task of some kind (Barbe and Milone, 1981).

Modality preference: Modality preference implies self-reported superior functioning in one or more perceptual channels (Barbe and Milone, 1981).

Limitations of the Study

The subjects in this study were randomly selected from a small suburban school and were limited to third and fifth graders. No attempt was made to control for reading level or IQ. It is possible that other age groups would produce different results.

Since both test instruments were not standardized, it is conceivable that other results would have been obtained with standardized tests. Since the English language is rich in words which contain vowel alternations, other choices could have been included on the test instrument. Even though the subjects saw and heard all of the test items and choices, it is possible that a contextual presentation rather than an isolation presentation and a different test population, in which backgrounds and experiences varied, would have produced different conclusions.
Summary

This study attempted to examine the modal preferences of students who were highly successful or unsuccessful in determining the meanings of derived words which contain a vowel alternation. Data obtained from the vowel-shift test and the modality preference assessment were analyzed in relation to mode of presentation, Chomskian linguistic theories, and psycholinguistic theories of the reading process.
Chapter II

Review of the Literature

Purpose

The purpose of this study was to examine the relationship between students' ability to manipulate the vowel shift and their modality preference.

A review of the literature, the theories and research which form the basis for this study, will be discussed in terms of the following areas:

The Relationship of Spoken and Written Language in Terms of the Vowel Shift

Access to Meaning of Printed Words

The Psycholinguistic Nature of the Reading Process

Learning Modality Theories and Their Relationship to Psychology

The Relationship of Learning Modalities, Reading and Spelling

The Relationship of Spoken and Written Language in Terms of the Vowel Shift

Writing, according to Bloomfield (1942), appears to have stemmed from picturing or picture writing in which pictures were drawn to represent a message. Writing and
picture writing differ because writing is a rather systematic attempt to permanently capture language utterances visually. Linguists, Bloomfield (1942) and Fries (1962) proposed that English utilizes an alphabetic writing system in which each alphabetic character (letter) corresponds to the phonemes (speech-sound units) of the spoken language. They regard the language as containing regular spelling patterns in which patterns of letters are the functioning units of the phonemic representations. Spelling irregularities are thought to deviate from these patterned alphabetic principles. As a result, reading and spelling instruction has been based upon the premise that the English orthography is highly irregular. Venezky (1970) proposed that orthographic "regularity" and "irregularity" instead be labeled "predictable" and "unpredictable." He also asserted that words should be grouped either as: "transfer words," in which the spelling or pronunciation pattern is predictable and can be transferred to other words containing the same patterns; or "association words" in which words are grouped according to frequently occurring unpredictable patterns; or "isolated words" which are taught "as whole words to inhibit transfer of irregular or low-frequency patterns" (p. 42).

Hanna, Hanna, Hodges & Rudolph (1966), and Venezky (1967) refute the theory that English is highly irregular orthographically, based upon their analyses of 10,000
pronunciations and 20,000 spellings of common English words. Both researchers concluded that the orthography is highly regular when the main linguistic features are considered.

Linguist N. Chomsky (1957, 1965, 1967) linked spoken and written language with his transformational generative grammar theories. Prior to this theory, many linguists believed that there was a one-to-one correspondence between the surface structure of language and meaning. According to Chomsky, grammar is the bridge between surface structure (the observable sounds of speech or inkmarks of print) and deep structure (the meaning of spoken or written language). Grammar, in his view, consists of a lexicon, or an internal dictionary of words, and syntax, or a set of rules which enables the person to select and order the lexical entries. Thus, using the grammar, a person can generate or understand an unlimited number of sentences which have never been seen or heard before. Chomsky also claims that grammar works without meaning. Linguists have criticized Chomsky's theory on this point (Smith, 1978).

N. Chomsky and Halle (1968) expounded upon the transformational generative theory in The Sound Pattern of English and addressed the "regular," "irregular" orthography supposition. They proposed that the English orthography corresponds to an underlying abstract representational level of the language's sound system rather than the surface or spoken form. Furthermore, Chomsky
(1970) believes that the orthography appears to be a "near-optimal system for representing the spoken language" (p. 4). Finally, the "lexical representation," or the speaker-hearer's internalized rule system, seems to be a direct transcription of the orthography. His evidence to support this belief is the fact that the orthography responds to a wide range of English dialects.

C. Chomsky (1970) argues that a phonemic lexicon, a lexicon which responded exclusively to pronunciation, would not be possible because of a certain group of words which undergo a pronunciation shift when affixes are added. For example, when suffixes such as -al, -ality, or -alistic are added to "nation," the vowel becomes lax. Reduction or alternation occurs in other vowels (convene/ convention, wide/ width, phone/ phonic), or in consonants (critical/ criticize, fact/ factual). Vowel reduction together with shift in stress can also occur (illustrate/ illustrative). C. Chomsky contends that with a phonemic lexicon these word pairs would require two spellings.

Moskowitz (1973) conducted a series of experiments with children ages five through twelve to determine whether children have knowledge of vowel shift, when this knowledge is acquired, what the source of the knowledge is, and what form it takes. Each subject was tested individually and was asked to add the suffix "-ity" to the word or nonsense word which was pronounced by the examiner. Moskowitz concluded
that the acquisition of vowel-shift develops gradually. Read (1971) concurs that vowel-shift acquisition in children's spelling evolves gradually as well. Second, Moskowitz concluded that the spelling system of English provides children's source of vowel shift knowledge. Finally, children are able to manipulate vowel-shift patterns in pseudo-words but they are resistant to other phonetically simpler patterns which involve no shift.

Several researchers have tried to determine more information about the internal lexicon. In a series of lexical decision task experiments, Taft and Forster (1975) concluded that prefixed words are analyzed into their morphemes before lexical access occurs. For example, the words "submit, commit, and admit" would be analyzed into the morpheme, "mit," prior to lexical access. Nonwords that are stems of prefixed words take longer to classify than nonwords which are not stems. Thus, a nonword which consists of a real stem such as "vent" takes longer to classify than a nonword which consists of a pseudo stem such as "pertoire." This research tends to support the theory that morphemes are stored as single lexical items in the lexicon. Holyoak, Glass, & Mah (1976) investigated how morphologically derived words are represented in memory. Their data revealed that derived words need not be decomposed into the basic form to obtain meaning and that both derived forms and basic forms seem to be represented in
the lexicon. Memory and the tip-of-the-tongue phenomenon were used by Rubin (1975) to determine how words are represented in the lexicon. He concluded that word-name memory consists of at least morphemes or morpheme-like clusters rather than inseparable strings of letters.

Steinberg (1973) challenges Chomsky and Halle's underlying phonological representations. He argues that the vowel shift rule is invalid, that the underlying phonological representation is not the only sound representation listed in the lexicon, and that derived forms can appear as whole words in the lexicon. A surface phonemic representation would be more optimal in his opinion. Furthermore, he contends that in a study using pseudo-words with adult subjects to test the vowel shift rule, no attempt was made to alternate the vowel in over 90 percent of the cases. Based on a review of psychological research and his own empirical data, Richardson (1977) also concluded that there is no evidence which would support Chomsky and Halle's theory of lexical derivation. In a series of two experiments, Jarvella and Snodgrass (1974) required subjects to make same-different judgments for word pairs with and without phonetic or orthographic stem alternations in an attempt to determine whether or not the skillful readers could "see" the morphological forms. They concluded that direct recognition of morphemes does not seem to be the case, but the orthography did seem to have an
effect on performance.

Gleitman and Rozin (1977) indicated that learning to read has to do with the cognitive prerequisites of understanding and focusing one's "attention on the phonological substratum of speech" (p.3). Thus, learning to read requires the individual to make and to build upon what one already knows from speech, since children learn to speak first. In addition, Gleitman and Rozin (1977), Reed (1970), Ruddell (1976) and Venezky (1970), account for the nature of the English writing system. They indicate that the morphophoneme is an intermediate unit between the phoneme and the morpheme. Thus, the meaning structure and the sound structure are joined. Gleitman and Rozin (1973) advocate, based upon research in speech perception and the argument that "alphabetic writing is based on a mapping between sound-stream and symbol" (p.447), the use of the syllable as the basic unit in beginning reading. In a study in which deaf students and hearing students were asked to pronounce tachistoscopically presented monosyllables, Gibson, Shurcliff and Yonas (1970) found that since the deaf students were not able to use invariant sound mapping, they must have used orthographic rules. They claim that this finding tends to support the intermediary morphophoneme theory.

Templeton (1979) addressed these questions: 1. Does orthographic awareness precede an awareness of word
pronunciation?, and 2. Is the orthography a more efficient system for eliciting vowel alternation and vowel reduction information? Since most of the subjects were able to spell most of the pseudo-words correctly but were less able to pronounce them, she concluded that orthographic knowledge may be necessary for higher order phonological knowledge. She also concluded that the relationship between orthographic ability and knowledge of vowel alternation and reduction was significant at grade ten but not at grades six and eight. Context was found to improve pronunciation of derived words.

Berko (1961) also used nonsense materials and context to test morphological rule knowledge. Preschool and first grade children were asked to supply inflectional endings orally to words used in context. Berko concluded that children do possess and sequentially acquire morphological and phonological rules, and that boys and girls perform equally well on the test items.

Access to Meaning of Printed Words

The process by which readers gain entry to their internal lexicons during the reading process and thus obtain the meaning of the printed word, continues to be a controversial issue. One school of thought is that readers
are able to go directly from the printed word, using graphic information only, to achieve meaning. A second theory is that readers must convert the graphic information into a corresponding phonemic representation in order to gain lexical access. Yet others believe both strategies work simultaneously in order to achieve meaning from print.

As a result of experiments using various lexical decision tasks, Baron (1973), Barron (1978), Bower (1970), and Kolers (1970) have concluded that a reader can gain enough visual stimulus from print to access meaning directly. Since subjects were better able to name words than individual letters, Kolers (1970) hypothesized that the recognition of words depends to a limited degree upon the individual discrimination of letters. Reading pictures, numbers, maps, abbreviations, and an unfamiliar foreign language all involve direct use of graphic information (Baron 1977). The visual strategy appears to be faster than the phonemic strategy (Baron & McKillop 1975). Phonetic recoding, however, does seem to play a vital role in retaining sentence wording in memory for comprehension (Barron 1978). Therefore, fluent readers possess graphemic and phonetic analysis skills and apply this knowledge efficiently in pursuit of desired information (Barron 1978).

In two lexical-decision task experiments, Meyer, Schvanevelt, and Ruddy (1974a, 1974b) presented subjects with English word/nonword pairs in isolation. Subjects were
required to decide whether semantically associated words (bread/butter), unassociated words (bread/doctor), word-nonwords (wine/plames), nonword-words (nist/lamb), or nonword-nonwords (nart/trief), were English words by pressing yes/no keys. Reaction times were measured. Reactions to semantically associated words were faster than nonassociated words. Reaction time was also affected by the phonemic relation between words. These results suggested that semantic context may influence or excite the neural signals that encode information before lexical memory has been contacted. However, they do believe that a phonological representation does occur. Rubenstein, Richter, and Kay (1975) also presented subjects with English words and nonsense words. They argue that since the homophonic nonsense words (e.g. brane) had longer latencies than nonhomophonic nonsense words, and since homophones (e.g. yolk and yoke) had longer latencies than nonhomophones, the reader must be using phonemic encoding during lexical search. They also concur with Rubenstein, Lewis, and Rubenstein (1971) that latency for English is less than for low pronounceability nonsense (e.g. blast/blasv) except in the case of infrequent or rare words. Clark (1973) questioned the statistics used by Rubenstein, et al. (1971) and the fact that the language materials used almost never generalize beyond the specific sample.
Kleiman (1975) conducted three experiments to determine when recoding to speech occurs: before, during, or after lexical access, or not at all. Subjects were required to make phonemic, graphemic and synonymy decisions about word pairs. A shadowing task of counting out loud was used to disrupt recoding. The results indicated that subjects did not recode to speech while making synonymy and category decisions. Recoding was employed in making acceptability decisions. Kleiman concluded that speech recoding occurs after lexical access in order to facilitate short-term memory for sentence comprehension.

Vocal interference techniques were also used by Barron and Baron (1977) and Levy (1975). Levy (1975) required subjects to count aloud while reading sets of sentences. Barron and Baron required subjects to repeat the word "double" during meaning, sound, and rhyming tasks with picture-word pairs. Both studies concur that vocal interference interfered with phonetic recoding which led to a decrement in reading accuracy and retention.

Bower (1970) and Lazerson (1974-75) altered reading texts visually and syntactically but not phonetically. They concluded, based upon silent reading performance, oral reading performance, and measured eye movements, that reading efficiency was decreased by highly variable spelling and deprivation of a familiar syntactic-semantic system. Lazerson (1974-75) argues, based upon these results, that
Barron (1980), Coltheart, Davelaar, Jonasson, and Besner (1977), Gough (1972), and Spoehr (1978) theorize that visual and phonological strategies are used to access meaning from print. Good readers appear to use both strategies in reading and spelling whereas poor readers tend to rely upon a visual-orthographic strategy in reading and a phonological strategy in spelling (Barron, 1980). Coltheart, Davelaar, Jonasson and Besner (1977) think of lexical access as one of cooperation or "summing" between visual and phonological input. Gough (1972) argues that a phonological strategy by itself would be too slow and prefers to assume that readers map characters onto a string of systematic phonemes which are abstract entities related to the sounds of the language. Using a series of three experiments Spoehr (1978) concluded that efficient readers can identify a letter string using many lexical access paths depending upon the experimental conditions imposed upon the reader.

The Psycholinguistic Nature of the Reading Process

"Language as a product is located entirely in the outside world, language as a process, with rules for its production and comprehension, must be located entirely

At the onset of psycholinguistics, researchers first attempted to explain language in terms of neobehaviorism or in a stimulus-response framework (Smith, 1973). However, N. Chomsky's (1957, 1968) "generative transformational" linguistics which stressed the mentalistic framework in which individuals hypothesized and tested an internalized set of rules, influenced psycholinguistics in two ways:

1. Language cannot be understood or learned merely by imitation, rote, or through a formal and systematic teaching of syntactic rules. Instead, language is understood when the surface structure (the sound or print) and the deep structure (meaning) are joined by the syntax or grammar.

2. Language is creative because the rules of grammar allow for an infinite number of sentence generations (Smith, 1973).

Smith (1973) outlined three areas of the psycholinguistic theory as it applies to reading:
1. Reading is not primarily a visual process. The more nonvisual information (what we already know about reading, language, and the world) a person has, the less visual information (the printed page) the reader needs for meaning. (see also Kolers, 1970)

2. There is a limit to the amount of visual information that the visual system can process. Since the letter-sound correspondences are so complex and since the capacity of memory is restricted, comprehension must precede the identification of individual words.

3. Reading is not decoding to sound.

Children have an unconscious knowledge of the English sound system (Read 1971, 1975, 1980). They bring this knowledge with them to their first encounters with reading and writing. Read (1971) contends that "a child must learn to attend to certain phonetic differences and to abstract from others in a specific and systematic way" (p.2). Based on his research with children's spelling, Read (1971, 1975) argues that children categorize the phones of English by articulatory features in order to make phonetic judgments and orthographical decisions. Children use and apply their internalized language knowledge in a systematic, sequential and categorical way as their spelling and writing ability develops (Beers, 1980; Beers & Beers, 1980; Beers and Henderson, 1977; Bissex, 1980; C. Chomsky, 1972; Gentry, 1978; Read, 1980; Templeton, 1980). As a result, much
insight into children's language development can be obtained by analyzing their spelling development (Beers, 1980; Beers & Henderson, 1977; Bissex, 1980; Forster, 1980; Gentry, 1978; Read, 1980; Templeton, 1980). Read (1980) also contends that children have an unconscious knowledge of sentence parts and words. Ehri (1975, 1978) explains that children may have an implicit knowledge of language and that exposure to print may bring about the child's awareness or that lexical awareness is acquired and shaped by experience with print. Templeton (1980) has proposed that explicit word knowledge or conscious word knowledge, as well as implicit knowledge, is used in reading and spelling. Children must arrive at explicit word knowledge prior to reading instruction in order "to think about language as an object that can be studied, and to impose a psychological segmentation on the stream of speech" (p. 455).

In a study of the language acquisition of children ages six through ten, C. Chomsky (1972) tested for knowledge of nine complex syntactic structures. Reading measures, IQ and socio-economic status were correlated with linguistic development. Chomsky concluded that there is a distinct disparity between child and adult grammar, that knowledge of syntax is acquired in developmental stages and that reading exposure (reading or hearing books read) has a strong correlation to a child's linguistic stage of development. IQ was also highly correlated to socio-economic status.
Gillet and Temple (1978) recognize child's word knowledge as an active process in which children categorize words into sound, meaning, and etymological features in an attempt to bring about order. This categorical word knowledge seems to develop along with Piaget's principles of cognitive development. Gillet and Temple (1978) encourage word sort activities to help children explore and make generalizations about words in an effort to increase vocabulary and spelling ability.

Reid (1966) conducted a series of structured interviews with five-year-old children to determine their notions about reading. She concluded that children had very little idea of what reading was going to be like. Linguistically and conceptually the children were unprepared to meet the reading task. In a replication study, Downing (1970) found similar results.

Ehri (1978, 1980) proposes a word identification amalgamation theory. According to this theory, printed language is represented as operating parallel to the phonology. Words are the fundamental and abstract units of the linguistic system. Each word has acoustic, articulatory, morphological, semantic, syntactic, and orthographic identities. This phonological, syntactic, and semantic information combines with the graphic features of words and is stored as one unit in the lexicon. Thus, once beginning readers can recognize a few words in print, they
can use the syntactic and semantic information found in context to expand upon the known words. Ehri claims that once the reader establishes the orthographic images of words as symbols in the lexicon, he no longer needs to use the mediational sound component to identify a word.

Goodman (1969) asserts that the focus in teaching reading should be placed upon comprehension and away from words as separate units. In his view, words should be presented in context rather than isolation so that children will see words as units of larger, meaningful text. Reading also should be viewed as a selective process or a "psycholinguistic guessing game" involving the interaction of thought and language (Goodman, 1976). During this selective process the efficient reader uses the minimum amount of information necessary to predict, test, confirm, and/or correct the graphic input (Goodman, 1972). Readers use internal, external and word cue systems as they interact with print (Goodman, 1965). Goodman (1965) indicates that teachers can gain insight into children's reading ability by analyzing their miscues during oral reading. He cautions teachers against the following: 1. prompting or correcting children during oral reading since the language cues children to self-correct; 2. teaching phonics skills to large groups of children since children vary greatly in their individual reading abilities; and 3. preventing children from regressing during reading.
Learning Modality Theories and Their Relationship to Psychology

Recent advances in split-brain research have led to the conclusion that as children grow and mature, two cognitive systems develop which are characterized by the left and right hemispheres of the brain (Raina, 1979). Traditionally, education has concentrated almost exclusively on the left hemispheric cognitive system in order to develop linguistic and numerical reasoning abilities. Development of the right hemisphere, which controls perceptual, sensory, musical, and intuitive abilities, has been neglected. Raina (1979) argues that a pedagogically sound system would stress development of both hemispheres, thus aiming at neurological symmetry. Research in perception and sensory learning for the last eighty years has aimed at this goal.

From birth, children learn by hearing, seeing, and touching. This ability to learn through sensory pathways, or learning modalities, increases as the child matures. This modality concept of learning incorporates the independent development of each pathway with the progressive development of each pathway in terms of recognition or discrimination, recall, and sequencing (Wepman 1960, 1964, 1971). The final stage of this hierarchy, which is referred
to as intermodal or crossmodal learning, is reached when the child can integrate data that have been acquired from more than one modality (Wepman, 1960, 1964, 1971). Thus, Wepman (1971) theorizes that "perhaps retardation means the inability to process information along any of the common modalities" (p. 56).

Handedness and gender appear to have no relationship to modality preference. Age, however, seems to be a factor. The auditory modality seems to be preferred by primary grade children and the kinesthetic mode seems to be least developed. A shift in modality preference to the visual mode occurs between kindergarten and grade six. Also at this age, kinesthesia seems to overtake audition. A second shift seems to occur between late elementary grades and adulthood in which vision remains as the dominant modality but audition becomes more important than kinesthesia (Barbe and Milone, 1981).

As a result, much research has been conducted to determine the relationship between mode of presentation and retention, and the relationship between various modes of presentation. Unfortunately the data have not revealed any clear cut conclusions.

Hawkins (1897), Henmon (1912), and Munsterberg (1894) tested visual and auditory memory. Using colors, numbers, and a series of presentations, Munsterberg found that visual memory excels auditory memory. When the two senses acted
together, visual memory was found to be weaker. Using lists of nonsense syllables with seventh graders and college students, Hawkins (1897) found that younger students have stronger auditory memory than older students and when the two senses acted together, memory was hindered. Henmon (1912) asked six subjects to write down number, word, and nonsense syllable memories after visual, auditory and visual/auditory presentations. He concluded that auditory presentation was superior in immediate memory of adults.

In the previous studies, no attempt was made to consider the individual's preferred mode. Lilly and Kelleher (1973) tested 57 educationally handicapped students for modality preference and then presented stories visually and orally. The results indicated that memory was superior when the presentation matched the subjects' preferred learning mode.

Douglas (1975) and Hill and Hecker (1966) examined visual and auditory learning in second graders. Using a paired-associate learning task, Hill and Hecker concluded that when task difficulty is equal, learning rate was not affected by modality stimulation. Using visual and auditory presentations to examine the memory encoding process of second graders, Douglas (1975) concluded that the children were able to use a taxonomic category as an encoding device in both modalities.
Various experimental methods have been employed with a wide range of subjects to determine which mode of presentation is superior. Five nonsense syllables were taught to good and poor first graders using visual, auditory, kinesthetic, and combined modality presentations (Cooper, 1970). Cooper concluded that the good readers learned faster but no single mode resulted in superior acquisition or retention. Likewise, using visual and auditory paired-associate learning tasks with 125 fourth graders who were classified as learning disabled, borderline learning disabled, and normal, Estes and Stewart (1975) discovered that no single mode yielded significant results. However, Williams, Williams, and Blumberg (1973) concluded that the visual presentation was superior to the aural presentation of paired-associate noun lists with lower and middle class white children in grades two, four, six, eight, and ten, and lower and middle class black children in grades two, four, and six.

Jarman (1979) matched temporal and spatial information with auditory and visual methods of presentation. Based upon his data, Jarman concluded that the auditory and visual modalities do not seem to be specialized for processing temporal and spatial information at ages seven and nine.

In a study of 690, fifth, seventh and ninth grade students, Russell (1928) compared the scores from an essay test and a true-false test which had been administered after
material was presented orally and visually. The results indicated that the fifth graders learned more with an oral presentation, and the ninth graders performed better as a result of the visual presentation. The relative effectiveness of presentations at the seventh grade level was practically equal.

Various combinations of digits and consonants were presented in a dichotomous oral fashion to 112 subjects to examine the mode and accuracy of recall (Gallup and Bookman, 1982). It was determined that subjects tended to recall all the items from one ear followed by those items from the other ear. Accuracy tended to be greatest in the right ear.

The Relationship of Learning Modalities, Reading, and Spelling

Perceptual skills may play an even more important role in the beginning stages of reading achievement than either emotional factors or intelligence (Strang, 1968). Strang believes that perceptual assessments, such as visual and auditory perception, discrimination, memory, and integration tests, should be administered as a diagnostic procedure for children entering kindergarten and first grade. Based upon a study investigating the visual selective attention abilities of children completing a kindergarten program,
Cuccu (1978) has concluded that a child's poor performance on a visual selective attention task may indicate a delay in his/her introduction to a formal reading program. As a result, the planning and organization of educational programs can take into account the individual perceptual differences of its students in order to improve areas in which deficiencies occur (Strang, 1968; Wepman, 1971).

Several researchers have attempted to match reading methods with students who have auditory, visual, or kinesthetic preferences (Bateman, 1968; Budoff and Quinlan, 1964(a), 1964(b); Cooper and Gaeth, 1967; Waugh, 1973). Much controversy exists regarding these studies. It seems that Bateman (1968) and Waugh (1973) used only selected subtests from the *Illinois Test of Psycholinguistic Abilities*. It has been argued that using such narrow measures limits the type of learning sampled thus increasing the possibility of incorrectly assigning students to modality groups (Newcomer and Goodman, 1975). Budoff and Quinlan (1964(a), 1964(b)) required second graders to learn words by reading or listening. Some argue that the superior auditory results could have occurred because the subjects' visual modality strengths were contingent upon being able to read (Dunn and Carbo, 1981). Cooper and Gaeth's study (1967) appears to be problematic in that some of the results were incorrectly reported (Dunn and Carbo, 1981).
Butenica (1969), Donovan (1978), and Robinson (1972) conducted three year studies to determine if there was a relationship between modality preference and the matched reading programs. Butenica (1969) administered auditory and visual perceptual tests to one hundred forty children. After three years of reading instruction using the same reading program, Butenica concluded that reading achievement could be predicted through the third grade. Donovan (1978) identified one hundred seven first graders as having either auditory, visual, or no-preference modality strengths. Students were placed in reading programs which were related to their modality strengths. The results indicated that students who were placed in reading programs which were congruent with modality preference scored significantly higher on all measures of initial reading behavior. Group administered visual perceptual tests and the Wepman Auditory Discrimination Test were administered in Robinson's study (1972) to four hundred forty-eight students. The students were matched either to a sight approach to reading or to the Hay-Wingo approach according to perceptual abilities. It was concluded that neither method was superior but auditory discrimination made a significant contribution to all reading, regardless of the method used.

In a study of twenty disadvantaged and twenty nondisadvantaged seven year olds, Dauzat (1970) taught word recognition skills using visual, auditory, kinesthetic, and
visual/auditory/kinesthetic methods. Dauzat found the kinesthetic method to be the least effective method and the visual method to be significantly more effective than all of the other methods, regardless of race, sex, or socio-economic status. There seemed to be no difference in learning styles between the disadvantaged and the nondisadvantaged students even though the nondisadvantaged children tended to learn more words faster.

Harter (1981) and Lesiak, Lesiak, and Kirchheimer (1979) studied the relationship between modality preference and spelling. Harter (1981) administered the Swassing/Barbe Modality Index to seventeen special education students. Six students were given four weeks of spelling instruction in their preferred mode. It was concluded that even though no statistically significant data were found, each student benefited from instruction through his/her modality strength. The top twenty and the bottom twenty spellers from a group of third and sixth graders were selected by Lesiak, Lesiak, and Kirchheimer (1979) in order to assess differences between good and poor spellers. Seven tasks that measured visual and auditory discrimination, memory, analysis and synthesis skills were administered. It was determined that five tasks (visual discrimination and visual memory of words; auditory discrimination, memory, analysis and synthesis; and auditory-visual integration) discriminated between good and poor spellers at the third
grade level but only two tasks (those requiring auditory discrimination, memory, analysis and synthesis; and auditory-visual integration) discriminated good and poor spellers at the sixth grade level.

Several researchers have assessed the integration of visual and auditory modalities and its relationship to reading achievement (Birch & Belmont, 1965; Katz & Deutsch, 1963; Kavale, 1980). Katz and Deutsch (1963) measured the reaction times of forty-eight black males in grades one, three, and five to stimuli which was preceded by stimulation in the same modality (ipsimodal) and a different modality (cross-modal). They discovered that normal and retarded readers differ in the ease with which attention has been shifted from one modality to another but the poorer readers showed the greatest amount of difficulty. Birch and Belmont (1965) required subjects to match a visual spatial pattern to an auditory temporal pattern. They indicated that in the primary grades the ability to perform this task was significantly correlated with reading achievement. Objections have been raised about their research especially in the areas of the confounding of visual and auditory stimuli in the experimental task, low test ceiling, unrepresentative sampling, failure to control for intelligence, and lack of test reliability data (Kavale, 1980). Kavale (1980) used a meta-analysis procedure to statistically integrate the findings from thirty-one
Chapter 3

Design of the Study

Purpose

Current research studies have indicated that readers, depending upon the task, may use both the graphemic information and the phonological information to gain entry to the internal lexicon in order to derive meanings of words. Wepman (1964) contends that too much emphasis has been placed upon the conceptual domain, which is one of the last stages in learning, and not enough emphasis has been placed upon the primary stages of learning, or the perceptual levels. According to Wepman, children differ greatly in their perceptual levels of learning and as a result, the ability to learn can be affected. Therefore, the purpose of this study was to investigate the modality preferences of children who were clearly successful or unsuccessful in determining the meanings of derived words which contain vowel-shift patterns.
auditory-visual integration studies. He concluded the following: 1. auditory-visual integration was a correlate of reading ability, and 2. auditory-visual integration showed an approximately equal relationship "with general reading ability, word recognition, reading comprehension and oral reading but a negligible relationship with vocabulary" (p. 953), and, intelligence appeared to be a component of auditory-visual integration.

Summary of the Chapter

This chapter has focused upon the research and theories related to the role of language, how meaning is acquired from print, the psycholinguistic nature of reading, learning modalities, and the relationship of learning modalities to reading and spelling. Although interest in learning modalities has existed for approximately eighty years, the research is still as controversial as that concerning the relatively new area of psycholinguistics. However, some tentative conclusions can be drawn based upon the research that has been previously cited.

The current emerging view is that the English orthography does not bear a one-to-one correspondence with the phonological system but instead bears an indirect relationship. The language is seen as having a surface
structure and a deep structure which are tied together by the syntax. Language users are recognized as having an internalized set of rules of the language which are stored in an internal lexicon. How these rules are stored and retrieved, whether by graphic information, phonological recoding, or a combination of information, needs further research.

In view of psycholinguistic research, young readers are seen as possessing well-developed speech ability and implicit awareness of their language which they bring to the reading task in an attempt to access meaning through print.

Learning modality theorists propose that many people use preferred sensory pathways to gain information. Research has been conducted to determine how people retain and process information using preferred learning modes. Many experiments have been conducted to determine the relationship between modality preference, reading programs, reading and spelling achievement, and modality integration. The results are inconclusive due to weaknesses in research designs, the inability to correctly identify modality preferences, incorrect reporting of results, and a lack of longitudinal studies.
Questions

1. Do those students at the third grade level, who score $2\frac{1}{2}$ standard measures of error below the mean on a visually and auditorily presented test of the meanings of vowel-shift derived words, demonstrate a modality preference?

2. Do those students at the third grade level, who score $2\frac{1}{2}$ standard measures of error above the mean on a visually and auditorily presented test of the meanings of vowel-shift derived words, demonstrate a modality preference?

3. Do those students at the fifth grade level, who score $2\frac{1}{2}$ standard measures of error below the mean on a visually and auditorily presented test of the meanings of vowel-shift derived words, demonstrate a modality preference?

4. Do those students at the fifth grade level, who score $2\frac{1}{2}$ standard measures of error above the mean on a visually and auditorily presented test of the meanings of vowel-shift derived words, demonstrate a modality preference?

Preparatory Instruments and Procedures

Development of Test Instrument

Using several children's and student dictionaries, (see Appendix A) the researcher generated a list of derived words which contained vowel alternations but still retained a close spelling relationship to the base word. Test items
were selected using Harris and Jacobson's *Basic Elementary Reading Vocabularies* (1972). This publication contains a "core list" of basal reader textbook words ranging from preprimer through sixth grade. To be included in the "core list" a word had to appear in at least three or more of the fourteen basal series which were evaluated. The words selected for this study had base words that ranged from grade two through grade six, as a result of La Sorte's (1980) research in which words were selected only from grades two through four. Finally selected test items were arranged sequentially from grades two through six. Three pseudo-words were included on the test based upon the research by Moskowitz (1973) in which children were able to manipulate the vowel shift in pseudo-words. The pseudo-words consisted of legal base words which were selected on the same basis as other test items but a suffix not ordinarily combined with the base word was added to it (e.g. telescope/telescopicity). All three pseudo-words had base words at the third grade level.

Simple definitions and three distractors for each derived word were written using children's dictionaries and thesauri (see Appendix A). In order to compose definitions and distractors without using base words in the definitions and to control for the vocabulary levels, Harris and Jacobson (1972) were used as a guide.
The **Visual/Auditory Preference Assessment** (VAPA) consisted of three treatments of bimodally presented stimuli. In treatment one the subject heard five single digit numbers read on a cassette tape and simultaneously saw five single digit numbers printed on a 3" x 12" tagboard card. After each presentation the subject was requested to record on a lined sheet of paper any numbers that s/he remembered. A series of ten presentations was made. In the second and third treatments, the subject was again simultaneously presented with the series of ten aural and visual five single digit numbers, but the subject was asked to record any numbers heard and seen respectively.

**Pilot Study**

A pilot study was conducted in an urban parochial school in January, 1983 in an attempt to refine test procedures and the vowel-shift test.

The subjects consisted of one heterogeneously grouped third grade class (n=30) and one heterogeneously grouped fifth grade class (n=28). Both groups received the same form of the vowel-shift test.

As a result of the pilot study and a computer analysis to determine test validity, three test items were deleted. Test validity (r=0.83) was determined by computing the split half reliability coefficient and applying the Spearman Brown
to correct for test length.

Subjects

This study was conducted in a lower middle-income suburban school district in Western New York state. Parental permission was granted to administer the vowel-shift test to forty-three third grade students and sixty-nine fifth grade students. Each grade was group tested and all students received the same form of the test.

Test Instruments and Procedures

Test Instrument

The final form of the vowel-shift test consisted of twenty-nine derived words which contained vowel alternations and three pseudo-words. All items were arranged sequentially from grades two through six according to the vocabulary level of the base word as indicated by Harris and Jacobson's (1972) "core list." Three pseudo-words were interspersed with the other test items according to the vocabulary level of the base word.

The VAPA was individually administered using the same format as mentioned previously.
Procedure for the vowel-shift test

In February 1983, the vowel-shift test was group administered by the researcher to forty-three third graders and sixty-nine fifth graders.

Prior to the testing, the researcher explained to the students that the testing was part of a scientific experiment to help teachers better understand how children learn words. The researcher also indicated that the test would not be a part of regular grading and that all scores would be confidential. They were asked to do their best.

The children were shown a sample word with four definition choices. Orally, the group decided upon the correct definition choice. The following directions were read to the students:

You are going to see and hear me read some more words. For each word that you see and hear, you are to circle the letter (a,b,c,d) that you think is the best meaning for that word. There may be some words that you don't know. There are some words that you probably haven't learned yet. I want each of you to be a detective and see if you can find the best meaning for each word. Even if you are not sure, circle the letter for the meaning you think is the best. I want to see if you can be good detectives. It is important that you answer each and every question.

After making sure that all students knew what was expected of them, the researcher read aloud each test item and all four definition choices twice in succession. When all test items had been read twice, the researcher repeated any items that students needed to have repeated. Students were then instructed to make sure that all test items had been
answered.

The researcher scored all test items as being either correct or incorrect. Each test was corrected and scored according to the number of correct test items. The mean, the standard deviation, and the standard measure of error were calculated for each grade level. All students who scored two and one half standard measures of error above and below the mean were given the VAPA.

One week following the administration of the vowel-shift test, sixteen third grade students were individually tested with the VAPA for modality preference. The students at each grade level who scored 2½ standard measures of error above the mean comprised the high group and those students who scored 2½ standard measures of error below the mean comprised the low group.

**Procedure for the VAPA test**

The auditory stimulus, consisting of five single digit numbers, was presented on a cassette tape. The visual stimulus, which consisted of five different single digit numbers, was presented on 3" x 12" flash cards. Each subject was provided with answer sheets to record his/her responses. Individually, the researcher gave a trial of two examples to each child to illustrate the procedure. Each subject received three treatments: treatment I, unprompted; treatment II, auditory; treatment III, visual.
After making sure that the student understood the test procedure, the examiner read the following directions:

You will hear five numbers from this tape recorder and at the same time you will see five different numbers on a card. When I say 'now' write down any numbers that you remember. Don't worry about being confused.

The tape recorder was turned on and at the same time a card with the five digits on it was held up. After the recorder was turned off and the card was put down the examiner said "now." At this point the student wrote down his/her response. Students were not allowed to write until the examiner indicated so with the word "now." Ten trials were given for each treatment.

A second answer sheet was given to the student and the following directions were read for treatment II:

Again you will hear five numbers from the tape recorder and at the same time you will see five different numbers on a card. But this time, when I say 'now,' you are to write down the numbers that you hear.

The same procedure was followed as in treatment I.

In treatment III, a third answer sheet was given to the student and these directions were read:

You will hear five numbers from the tape recorder and at the same time you will see five different numbers on a card. When I say 'now' you are to write down the numbers that you see.

Again, the same procedure for presenting stimuli was used as in treatments I and II.
Data Analysis

For each treatment, the students' responses were recorded and divided into the following categories: correct responses, auditory responses, visual responses, mixed responses, and incomplete responses. Correct responses were the percentage or correct recalled numbers in a given treatment. Auditory responses and visual responses were the percentage of recalled numbers from the auditory stimulus and the visual stimulus respectively. Incomplete responses were numbers recalled but not a complete five digit series. Mixed responses were numbers recalled from both the auditory and visual stimulus. A series of eight questions were posed to determine whether or not the students in the third and fifth grade high and low groups demonstrated a modality preference.

Summary

The purpose of this study was to determine whether or not students who were clearly successful or unsuccessful in determining the meanings of derived words containing a vowel-shift exhibited a modality preference. The vowel-shift test, consisting of twenty-nine derived words and three pseudo-words, was administered to forty-three
third graders and sixty-nine fifth graders. The mean, standard deviation and 2½ standard measures of error above and below the mean were calculated for each grade level. At the third grade level, the VAPA was administered to eight students who scored 2½ SME above the mean and seven students who scored 2½ SME below the mean. The VAPA was administered to twelve students who scored 2½ SME above the mean and to thirteen students who scored 2½ SME below the mean. Three treatments, consisting of simultaneously presented visual and auditory stimuli, were administered to each student. The students' responses were analyzed for each treatment as being either correct, auditory, visual, mixed, or incomplete.
Chapter 4

Analysis of Data

Purpose

The purpose of this study was to determine whether students who were clearly successful or unsuccessful at determining the meaning of derived words containing vowel-shift patterns exhibited a modality preference. Third and fifth grade subjects who scored 2.5 standard measures of error above or below the mean on the vowel-shift test were tested for modality preference with the VAPA.

Analysis of Data

In order to determine which students would be tested for modality preference, the vowel-shift test raw score distribution, the mean, the standard deviation, and 2.5 standard measures of error were determined for each grade level as in Table 1.
Table 1
Distribution of Vowel-shift Test Scores
Grade 3

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43 total scores 19.2 mean S.D. = 4.51
### Grade 5

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<td>15</td>
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</tr>
<tr>
<td>11</td>
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</tr>
</tbody>
</table>

| Total scores | Mean 24.6 | S.D. 4.23 |

As per Table 1, eight students (one student moved prior to the VAPA testing) comprised the high group and seven students comprised the low group at the third grade level. The high group and the low group at the fifth grade level were comprised of twelve and thirteen students, respectively.

As a means of comparing the results of the vowel-shift test, the total number of correct responses for each student
was broken down into the correct responses of the root words for all of the test items by grade level. The three pseudowords included on the test each had a base word at the third grade level. Each of these was examined separately as being either correct or incorrect. The mean score for correct responses at each word's grade level and its percentage was calculated for the high and low groups at third and fifth grade levels. The results are listed in Tables 2 and 3.
Table 2
Student Responses to the Vowel-shift Test

Grade 3

<table>
<thead>
<tr>
<th>Subject total</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Pseudowords</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 10</td>
<td>2 11</td>
<td>3 12</td>
<td>4 14</td>
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<td>7 14</td>
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<td>8 24</td>
<td>9 24</td>
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</tr>
<tr>
<td></td>
<td>11 24</td>
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<tr>
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<td>15 29</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1 8</td>
<td>2 3</td>
<td>3 9</td>
<td>4 2 5</td>
<td>5 3</td>
<td>6 2 9</td>
</tr>
<tr>
<td>(Percentage)</td>
<td>18%</td>
<td>23%</td>
<td>39%</td>
<td>45%</td>
<td>23%</td>
<td>9%</td>
</tr>
</tbody>
</table>

Note: C designates correct response

<table>
<thead>
<tr>
<th>Subject total</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Pseudowords</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8 24</td>
<td>9 24</td>
<td>10 24</td>
<td>11 24</td>
<td>12 26</td>
<td></td>
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<tr>
<td></td>
<td>13 26</td>
<td>14 27</td>
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</tr>
<tr>
<td>Mean</td>
<td>3 6.9</td>
<td>6 5</td>
<td>5 1.6</td>
<td>2.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Percentage)</td>
<td>75%</td>
<td>86%</td>
<td>86%</td>
<td>71%</td>
<td>53%</td>
<td>97%</td>
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Table 3
Student Response to the Vowel-shift Test

<table>
<thead>
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<th>Subject</th>
<th>Total Grade corr.</th>
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<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Pseudowords Grade 3 level</th>
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<td>4</td>
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<td>-</td>
<td>C</td>
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<td>18</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>-</td>
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<td>2</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>C</td>
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<td>3</td>
<td>5</td>
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<tr>
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<td>4</td>
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<td>C</td>
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<td>4</td>
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<td>C</td>
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<td>4</td>
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<td>7</td>
<td>6</td>
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<td>8</td>
<td>7</td>
<td>5</td>
<td>2</td>
<td>C</td>
</tr>
</tbody>
</table>

Mean (Percentage) 2.2 (55%) 4.6 (57%) 4.5 (64%) 3.9 (56%) .77 (26%) 2.1 (70%)
As per Table 1, fifteen third graders and twenty-five fifth graders were tested for modality preference through the use of simultaneous presentation of different visual and auditory stimuli. The responses of the third graders are shown in Table 4 and fifth graders' responses are shown in Table 5. Each treatment has been broken down into percent correct, percent auditory, percent visual, percent mixed, and percent incomplete.
Table 4
Student Response to the VAPA Test
Grade 3

<table>
<thead>
<tr>
<th>Subject</th>
<th>I Unprompted</th>
<th>II Auditory</th>
<th>III Visual</th>
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<tbody>
<tr>
<td>1</td>
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<td>100% correct</td>
<td>100% correct</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
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<td>60% correct</td>
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<tr>
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<td>100% auditory</td>
<td>80% correct</td>
<td>90% correct</td>
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<tr>
<td></td>
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<td>20% mixed</td>
<td>10% mix</td>
</tr>
<tr>
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<td>20% auditory</td>
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</tr>
<tr>
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<td>50% mixed</td>
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<td></td>
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<tr>
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<td>50% correct</td>
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</tr>
<tr>
<td>25</td>
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<td>50%</td>
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</tr>
</tbody>
</table>
To determine whether the low and/or high groups at the third and fifth grade levels were demonstrating a modality preference, a series of five corollary questions have been posed to analyze the data.

The first question asked how many and which students scored seventy percent or higher in one pure mode in treatment I? At the third grade level there was one student in the low group, subject 4, (14%) and one student in the high group, subject 11, (12%) who fell into this category. At the fifth grade level there were twelve subjects in this category: subjects 1,2,3,4,5,6,7,9,10 in the low group or 69%, and subjects 14,18,22 in the high group, or 25%.

Out of those subjects mentioned in question one, which students had a difference of thirty percent or more between treatment II and treatment III? Neither of the two subjects at the third grade level had a difference of thirty percent between treatments II and III. At the fifth grade level, four subjects in the low group, 2,3,5,9 or 44%, and one subject, 14, in the high group, or 33%, had a difference of thirty percent or more between treatments II and III.

From the subjects mentioned in question two, which had thirty percent or more in favor of a self selected mode? There were none at the third grade level. At the fifth grade level subjects 5,9, and 14 favored the auditory mode and subject 3 favored the visual mode.
Question four asked what the mean percentage of correct responses was in treatments II and III. See Table 6 below:

Table 6

Mean Percentage of Correct Responses in Treatments II and III

<table>
<thead>
<tr>
<th></th>
<th>Treatment II</th>
<th>Treatment III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>low group</td>
<td>64%</td>
<td>67%</td>
</tr>
<tr>
<td>high group</td>
<td>88%</td>
<td>83%</td>
</tr>
<tr>
<td>Grade 5</td>
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<td></td>
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<tr>
<td>low group</td>
<td>79%</td>
<td>98%</td>
</tr>
<tr>
<td>high group</td>
<td>88%</td>
<td>94%</td>
</tr>
</tbody>
</table>

Question number five asked what percent of the sample was able to score eighty percent or better on both treatments II and III? At the third grade level there were two subjects in the low group, 1 and 4, or 29%, and in the
high group there were five subjects, 8,10,11,12,15, or 63%. In the low group at the fifth grade level there were eight subjects: 1,4,6,8,10,11,12,13, or 62%. In the high group at the fifth grade level there were eleven subjects: 14,15,16,17,18,19,20,21,22,23,24, or 92%.

The following three corollary questions were posed to determine whether or not any of the students individually demonstrated a modality preference.

The first question asked which individuals showed a preference of seventy percent or more which was confirmed by a thirty percent or more difference between treatments II and III? At the third grade level there were no subjects who met these criteria. At the fifth grade level subjects 3,5,9, and 14 met this criteria. Subject 3 showed a visual preference and subjects 5,9, and 14 showed an auditory preference.

The second question asked which individuals showed no preference in treatment I but showed a preference in treatments II and III? To show a preference between treatments a difference of thirty percent or more must occur between correct responses. At the third grade level subject 2 showed a visual preference and subjects 5 and 9 showed an auditory preference. There were no subjects at the fifth grade level who met these criteria.

The last question asked which individuals showed a preference in treatments II or III? At the third grade
level subjects 1 and 10 showed an unconfirmed visual preference and subjects 4 and 11 showed an unconfirmed auditory preference. At the fifth grade level subjects 1,2,4,5,7,10,12,13,14,16,18,22, and 23 showed an unconfirmed auditory preference.

Therefore, it can be interpreted that at the third grade level no modality preference was demonstrated by either the high group or the low group. However, at the fifth grade level, the low group demonstrated an auditory preference whereas the high group demonstrated an ability to use both the auditory and the visual mode. The data indicated that, individually, only four subjects at the fifth grade level demonstrated modality preferences and only three students at the third grade level demonstrated modality preferences. It can be interpreted that students at both grade levels, but especially at the fifth grade level are better able to use one particular modality when they are instructed to do so rather than when they are allowed to self-select a modality.

Summary

Forty-three third grade students and sixty-nine fifth grade students were given a thirty-two question researcher designed vowel-shift test. The students were required to select the definition choice that was the meaning of each
word which contained a vowel alternation.

Fifteen third graders and twenty-five fifth graders, all of whom had either scored at least 2½ standard measures of error above or below the mean were further tested with the VAPA to determine whether or not any individuals or one of the groups demonstrated a modality preference.

The data presented indicated that at the third grade level there was no modality preference demonstrated by the low group or the high group. Three third grade subjects showed an individual modality preference. At the fifth grade level the low group indicated an auditory preference but the high group demonstrated no preference. There were four subjects who demonstrated individual modality preferences at the fifth grade level. The data also revealed four third grade students and thirteen fifth grade students with a modality preference indicated in treatment I which was unconfirmed in treatments II or III.

The data also indicated that students at both grade levels, but especially the fifth grade students, were better able to use one modality when instructed to do so rather than when they were allowed to self-select.
Conclusions and Implications

Conclusions

The conclusions reached and any generalizations drawn in this chapter relate specifically to the third and fifth grade subjects and the test instruments and procedures used in this study. Conclusions will be based upon observations during testing, the vowel-shift test data, and the VAPA data.

Observations During Testing

During the administration of the vowel-shift test to the third grade subjects, the researcher observed body language behaviors. Many students frequently shifted seating positions and two students stood up and leaned upon the table to answer questions during testing. Other students were heard whispering comments such as "I don't know these words." Based upon these behaviors it appears to the researcher that at this grade level many of the students were frustrated during the vowel shift test. However, during the administration of the same test to the fifth
grade subjects, few of the same behaviors were observed. The fifth grade students appeared to be more relaxed and at ease. It is possible that these behaviors were due solely to the increased testing experience of the fifth grade students. After the administration of the vowel-shift test directions, one fifth grade subject asked the researcher the following question, "Is it OK if we don't know how to pronounce these words?" It appears that some students believe that word pronunciation is an important factor in word recognition. It could also be inferred that some or many of these derived words were not in that student's oral expressive vocabulary. LaSorte (1980) observed frequent vocalization and subvocalization of the derived words by many of her third grade subjects. It is possible that these behaviors were not observed in this study because the derived words and their definition choices were simultaneously presented in a visual and auditory fashion.

The VAPA was administered on an individual basis. Most subjects appeared to be at ease with the examiner and many were curious as to the results of the test. Very few students questioned what was expected of them and none of the students hesitated to record his/her responses immediately after the signal was given. After the testing was completed, several students expressed the opinion that treatment II was easier than treatment III. It was also observed that several students were deliberately attempting
to block out the auditory stimulus during treatment III by subvocalizing the visually presented numbers. Based upon these observations it can be inferred that these students were relying upon the auditory mode and found the visual mode more difficult to use.

The Vowel-shift Test Data

Based upon the computation of the mean percentages of correct answers relative to the total number of words in a grade level subclass, as per Tables 2 and 3, the following conclusions have been drawn:

1. The low group at the third grade level was able to correctly access the meaning of 50% of the grade two and grade four derived words. It is interesting to note that this group was able to correctly identify 53% of the pseudo-word meanings (which were based upon grade three base words) but they were only able to correctly identify the meanings of 29% of the grade three derived words. Based upon these data it does not appear that the students were using visual and phonological clues to a significant degree.

2. The high group at the third grade level scored above 70% at all word grade levels except the sixth grade level. It appears that these students could have been using visual and/ or phonological information to access the meanings of the derived words.
3. The low group at the fifth grade level was able to correctly access the meaning of at least 55% of the derived words at all levels except grade six. It seems that this particular group should have scored higher at grade levels two and three since the words and choices were presented both visually and auditorily. It is possible that some of the words at levels two and three still were not part of the students' oral vocabulary. It is interesting to note that this group scored approximately 20% lower at all graded levels than the high group at the third grade level.

4. Based upon the percentages of correct scores in the fifth grade high group, it appears that these students are using both visual and phonological information to access the meanings of derived words. Results of the VAPA, which will be discussed later, tend to confirm this conclusion.

**VAPA Test Data**

In this sample of third grade students, no student self-selected one pure mode and had this mode confirmed in treatments II or III. As a result, neither the low group nor the high group demonstrated a modality preference. It should be noted that in the high group, sixty-three percent of the subjects scored eighty percent or better on both treatments II and III compared to only twenty-nine percent in the low group. This seems to indicate that when the
subjects were given directions as to which mode to attend, they were able to use one mode over the other. The fact that no group modality preference appeared at the third grade level can possibly be explained by Barbe and Milone (1981). They contend that modality strengths in primary children are mostly auditory. A shift in modality preference occurs somewhere between kindergarten and grade six. It is possible that these third graders are in this transition stage.

At the fifth grade level, sixty-nine percent of the low group demonstrated a preference in treatment I and forty-four percent of these students confirmed this preference in treatments II and III. It is interesting to note that ten of the thirteen subjects in the low group had at least sixty percent auditory responses in treatment I. It is possible that since these students tend to choose the auditory mode, they may not be attending to visual information to the extent that they should during reading tasks. Their achievement could be hindered as a result.

The high group at the fifth grade level did not demonstrate a modality preference in treatment I which was confirmed by treatments II and III. Again, when told to which mode to attend, ninety-two percent of the high group scored eighty percent or better on both treatments II and III compared with sixty-two percent by the low group. In relation to the mean percentage scores on the vowel-shift
test, it appears that the high group is using visual and phonological information obtained through the visual and auditory modes to access meaning of derived words.

Implications for Research

This study was limited to third and fifth grade students in a suburban school district. Sample size was small due to the school requirement of parental consent. A more complete investigation of the issues presented could include other grade levels and larger testing populations. Longitudinal studies which would follow the same groups could investigate any developmental changes regarding modality preferences and any relationships to reading achievement.

The tactile and kinesthetic modes were not included in this study. Future studies could incorporate these modes to determine whether or not they do exist to any degree at these age levels.

Holland (1982) cites Dunn, Dunn, and Price's (1977) contention that how a student learns is possibly the single most important factor in determining academic achievement. Holland regards the neurosensory modalities as students' physical needs during learning. He indicates that other factors such as sociological needs, emotional factors,
environment (especially lighting), status, and cognitive styles play a vital role in student learning. Future studies could take one or more of these factors into consideration.

This study was also limited because no standardized test was administered. Future studies could include a standardized reading test or an IQ test.

Implications for Classroom Practice

Current research and the data presented in this study indicate implications for reading, spelling, and modality preference in the classroom.

Possibly the most important implication for teachers is the need for an understanding and reinforcement of the psycholinguistic nature of the reading process. Students bring a vast linguistic competence with them to reading and writing. It is the teacher's duty to guide the student to a greater competence through hypothesis testing, prediction, and confirmation in regard to not only reading and writing but also spelling.

Today's world is a compendium of visual and phonological stimuli, which includes printed material such as books, newspapers, and magazines, and electronic media such as radio, television, and computers. Much of every day life concerns itself with reading. As a result, teachers
will have to focus more than ever upon the visual aspect of language in their classrooms. Clay (1982), Gentry and Henderson (1978), and Zutell (1978) indicate that creative writing must be encouraged. This allows children the opportunity to explore not only their thoughts but also the structure and orthography of their language. Zutell also indicates that children need to be read to and encouraged to read on a wide variety of topics. Optimally, the home and school environment should contain a large variety of written materials which acts as visual stimuli. Finally, he advocates an environment which includes word study activities in which children can consciously explore and manipulate the various structural, syntactic and semantic relationships present in written language. Such activities could include contrasting and categorizing words according to root words or structural patterns, crossword puzzles, scrambled letters, or other commercial word games.

Templeton (1980) suggests that students should be encouraged to categorize words. Through these exercises and aided by the classroom teacher, children can begin to see "the syntactic and semantic structural similarities among words." (p. 795) As a result, children will begin to see logical reasons for elements of the orthography. For example, by grouping sign, muscle, and bomb with signal, muscular, and bombard, students can see the reasons for silent $g$, $c$, and $b$. 
The results of this study also suggest that the orthography can be regarded as a highly regular alphabetic system. C. Chomsky (1970) advocates that this regularity can be taught through word families, attention to root words, affixes, and the vowel and consonant alternations that occur as a result. Word etymologies can also be introduced which show relationships to current spellings.

Hayes and Plaskon (1982) offer two additional classroom applications. First, they recommend that oral language and written language be associated to the maximum extent possible. This association reinforces the connection between talking and writing and also allows children to verbalize and organize their experiences into meaningful and functional situations. As a result children tend to become more at ease in taking risks in an effort to experiment with their language. Second, Hayes and Plaskon recommend a language arts program that is based upon concrete objects and first-hand experiences which provide direct contact with a wide array of stimuli. All aspects of language, the environment, and the students' physical needs need to be considered as the children are engaged in the never-ending process of language development.

Because all children do not learn in the same manner, the classroom teacher needs to be aware of his/her students' learning preferences. Wepman (1960, 1968) has indicated that early recognition of a child's poor visual or auditory
discrimination, remediation in these areas along with appropriate instructional materials and procedures can maximize the student's potential for learning. Ultimately the elementary teacher must not only be able to recognize a child's modality preference but help each child develop his/her other sensory modalities which are not yet fully developed in order to insure intermodal and intramodal development.
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Cooper, J. C., & Gaeth, J. H. Interactions of modality with age and with meaningfulness in verbal learning. *Journal of Educational Psychology*, 1967, 58, 41-44.


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Appendix A

Dictionaries and Thesauri
Dictionaries and Thesauri


Appendix B

Vowel-Shift Test Instrument
Name ____________________

1. telephonic
   a. able to show something
   b. able to pick something
   c. able to look at something
   d. able to hear someone a distance away

2. familial
   a. belonging to parents and their children
   b. belonging to animals
   c. belonging to farmers
   d. belonging to plants

3. cleanse
   a. to make sick
   b. to listen to someone
   c. to make free from dirt
   d. to be kind

4. width
   a. distance across something
   b. distance around something
   c. distance along something
   d. distance under something

5. courageous
   a. brave
   b. sad
   c. quiet
   d. sleepy

6. recognition
   a. waiting for someone
   b. knowing someone
   c. making a promise
   d. learning something

7. metallic
   a. made of iron
   b. made with glue
   c. made with wood
   d. made of lace

8. telescopicity
   a. making far things appear closer
   b. making music
   c. writing large numbers
   d. telling a lie

9. shadow
   a. giant
   b. darkness
   c. wind
   d. rain

10. finality
    a. in the beginning
    b. on the fence
    c. over a bridge
    d. at the end

Grade ____________
11. inflammation
   a. easily set on fire
   b. easily drawn
   c. easily said
   d. easily seen

12. explanation
   a. making plain or clear
   b. making something up
   c. cleaning something
   d. winning a race

13. pianist
   a. a person who makes music on a keyboard
   b. a person who reads
   c. a person who paints
   d. a person who builds

14. cavern
   a. a small farm
   b. a wide street
   c. a tiny path
   d. a large hollow place

15. medicinal
   a. healing
   b. glowing
   c. fighting
   d. looking

16. geographic
   a. to do with food
   b. to do with sleep
   c. to do with golf
   d. to do with the earth

17. national
   a. to do with plants
   b. to do with time
   c. to do with parts
   d. to do with a country

18. description
   a. reading a book
   b. telling in words how something looks
   c. being afraid of someone
   d. being happy

19. natural
   a. not known by man
   b. not made by man
   c. not understood by man
   d. not seen by man

20. angelic
   a. having bad ideas
   b. being good or kind
   c. having much pain
   d. being angry
21. introduction
   a. to make something known to people
   b. to build something
   c. to eat something
   d. to carry something

22. recitation
   a. singing a song
   b. saying something from memory
   c. thinking about something
   d. playing a game

23. composite
   a. made of numbers
   b. made of letters
   c. made of wood
   d. made of parts

24. resident
   a. a person who is sleeping
   b. a person who is measuring something
   c. a person who is living in a place

25. advantageous
   a. awful
   b. helpful
   c. slow
   d. quick

26. theatrical
   a. having to do with school
   b. having to do with crowds
   c. having to do with actors
   d. having to do with weather

27. definition
   a. a way to reach something
   b. a way to act
   c. a way to swim
   d. a way to explain the meaning of something

28. gradual
   a. not enough
   b. the right amount
   c. little by little
   d. too much

29. civilian
   a. a person who is nice
   b. a person who is late
   c. a person who is early
   d. a person who is a citizen

30. mariner
   a. sailor
   b. waiter
   c. actor
   d. tailor
31. remedial
   a. acting
   b. waiting
   c. dancing
   d. curing

32. acquisition
   a. looking at something
   b. getting something
   c. hiding something
   d. wanting something
Appendix C
Visual/ Auditory Preference Assessment
## Visual/ Auditory Preference Assessment Stimuli

<table>
<thead>
<tr>
<th>Treatment I</th>
<th>Treatment II</th>
<th>Treatment III</th>
</tr>
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<tbody>
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<td>1. A) 59750  V) 21285 A) 93108  V) 28271 A) 27856  V) 34870</td>
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<td>2. A) 93703  V) 12752 A) 21841  V) 59809 A) 23208  V) 60635</td>
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