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Training of Self-Study Spelling Strategies and their Effectiveness on Fourth Grade Students

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TRAINING OF SELF-STUDY SPELLING STRATEGIES AND THEIR
EFFECTIVENESS ON FOURTH GRADE STUDENTS

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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Dedicated to my loving parents, and to David,
who have supported me so wholeheartedly in this project.

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Abstract

The purpose of this study was to determine the effects of specific study strategy training as a method of improving self-study spelling strategies of average fourth graders.

Forty-four fourth graders comprised the treatment and control groups. Two fifteen word banks were constructed to serve as pre and posttests. With no directions as to which study strategies to employ, students in both groups were asked to study word lists for 15 minutes. Following the allotted time, the groups were pretested. Group A then received ten minute treatments for five weeks. These treatments included activities which emphasized visual memory and the development of self-study spelling strategies. Following the treatment the groups were posttested in the same manner as pretested.

A t test of dependent means revealed a significant gain for both treatment and control groups. Further calculations, however, showed a greater gain was achieved by the treatment group.

From the results it can be concluded that a program of training self-study spelling strategies can make a difference on the spelling study skills of fourth grade children.

Chapter I

Statement of the Problem

The controversy over spelling methodology has existed for over a century. Millions of dollars have gone into the production of spelling texts. Enormous amounts of classroom time and energy have been fused into spelling improvement. Yet, high percentages of children are unable to accurately spell high frequency words. The need to spell correctly is of paramount importance. Writing, which is directly influenced by spelling, is a vital medium of communication. The ability to write and spell accurately can very well determine a child's academic achievement level as well as economic rewards or disappointments in future endeavors.

Although a tremendous amount of research has been conducted in the area of spelling, few scientific findings have been applied to the classroom. Instructional practices continue to be influenced far more by habit than by research (Petty, 1969). The major problem seems to be insufficient knowledge of research findings. Too little of those findings is possessed by the teachers and too little has been reflected in commercial spelling materials. Spelling texts currently published are primarily language arts skills books. Exercises in handwriting, grammar, word origins, antonyms, and synonyms may be beneficial to the child but do not directly contribute to his spelling ability (Hinrich, 1975).

Research demonstrates that learning to spell without a given instruction as to how to learn leads to haphazard techniques. Field research studies (Fitzgerald, 1951, 1953; E. Horn, 1944, 1960; T. Horn, 1969b) have all shown that a systematic approach, whereby children learn to study each word, is of crucial importance.

Although no one instructional method has been found to be best for all students, the best spellers have developed a systematic method of approaching new words. Their eye movements are quite regular and they perceive the parts of a word in relationship to the whole (Furness, 1973). Poor spellers, he concluded, commonly approach the task of studying in a hit or miss fashion. Gates (1931) also ascertained that the inability to make analytical attack upon unfamiliar words is typical of poor spellers.

The teaching of systematic strategies appears to be a logical and beneficial objective. Providing learners with strategies can effectively increase learning (Ackinson & Rough, 1974). Brown and Campione (1977) have also concluded that training strategies lead to increased learning, as well as the ability to overcome memory deficiencies. Young children fail to realize a need to memorize or build strategic methods of study, thus instruction in effective procedures for studying will benefit most children (Brown & Campione, 1977; Flavell & Wellman, 1977).

Children need an opportunity to systematically examine, generate, test, and evaluate spelling strategies (Zutell, 1978). Spelling techniques should include a variety of word study activities which allow students to explore and manipulate the various syntactic,

structural, and semantic relationships in the written language. Tasks should emphasize comparing, contrasting, and categorizing spelling words according to a variety of features such as root words and structural patterns.

Spelling is a skill which requires children to encode sounds into an alphabetic/orthographic code, which has degrees of predictability. The majority of spelling errors are not due to errors in phonetics but rather in a person's inability to select the correct grapho-phonemic equivalent. The task of selecting the correct grapheme, of which there may be several for a given phoneme, is the major area of spelling difficulty. Poor spellers, tend to rely too heavily on phonetic translations, and fail to develop better strategies of visual memory. Imagery training studies have been shown to be effective for improving memory of abstract designs, objects, and word forms (Radaker, 1963). Children need to build more effective strategies of word observation and visual study techniques. Studies on visualization--the process of visual comparison, visual recall, and visual imagery are very limited (Hendrickson, 1967). Many other researchers advocate the need for future research in visualization, visual imagery, and memory training as they relate to spelling (Bieger, 1975; Hendrickson, 1967; Radaker, 1963; Simon & Simon, 1973).

In an attempt to explore the feasibility and effectiveness of training visual self-study spelling strategies, the following study was developed.

Purpose

The purpose of this study was to investigate the effects of teacher trained study strategies on the study habits of average fourth grade students.

This study sought to determine if fourth graders, exposed to a particular study method which emphasized visual memory strategies, would significantly improve their ability to study and spell words.

Limitations of the Study

The results of this investigation on the effectiveness of training self study skills and strategies are limited to a fourth grade class in a middle to lower class rural area. The limitations can also be directly related to the small number of subjects, as well as to the fact that they may not be totally representative of a fourth grade group.

The data determining the results were based on a word bank constructed for the design. Those words chosen may not adequately reflect the total needs or abilities of fourth graders.

Summary

Spelling is a skill of vital importance and is one which is largely an individual matter. It is known that all children learn at different rates and that the older a child becomes the greater the range of differences within a group becomes. Recent knowledge, therefore, indicates that considerable emphasis be placed upon research and experimentation which develops systematic individualized approaches

to the study of spelling. Thus, the purpose of this study was to investigate the effects of training self-study strategies as a means of improving fourth graders' ability to study spelling words.

Chapter II

Review of the Literature

Purpose

The purpose of this study was to investigate the feasibility and utility of developing independent study strategies with fourth grade students. The investigation dealt with two areas of research and thus the literature survey is divided into two categories: Overview of Traditional Spelling procedures, and Visual Memory Processes.

Traditional Spelling Procedures

Methodologies of teaching spelling date back to the 13th century (Hodges, 1964). Some of the most comprehensive research have dealt with spelling. Despite the concerted effort of researchers the question of "How to best teach spelling" still remains. Spelling continues to be an area where an overwhelming number of children meet failure. In general, a quarter of the children in any grade spell as well as the average student in the grade above and one-half spell no better than the average student in the grade below (E. Horn, 1963).

Spelling difficulties are caused primarily by inconsistencies in the English orthography and by the fact that a majority of the English language is comprised of non-Anglo Saxon words (Peters, 1967).

Many researchers point out that the English alphabet is inadequate for the consistent spelling of necessary speech sounds. Venezky (1967), Chomsky (1970), and Hanna, Hanna, Hodges, and Rudolph (1966) take exception to this belief. Through studies, researchers have concluded that the English language is not the least irregular. They have analyzed 17,000 words and shown correct spelling patterns can be predicted for a phoneme 90% of the time when the main facets of position in syllables, stress, and internal constraints are considered. They conclude writing serves only as a mirror for speech and derivations from a perfect letter sound relationship are irregularities. A great deal of controversy over these two theories is reflected in much of the research which follows.

Word Selection and Presentation

The spelling needs of children have been historically determined by tabulating samples of children's writings. Criteria for graded lists are based on frequency of occurrence, difficulty, geographic spread, permanency of value, social acceptability, and cruciality (E. Horn, 1960). Those words chosen for a spelling program should reflect the needs of the students. Word lists should also have immediate and permanent value for children learning them. In most schools 3,000 to 4,000 words comprise a school's list.

E. Horn (1960) called attention to the fact that little was gained by teaching a large number of words. Each child should learn to spell the words he needs in his writing. The consensus among researchers is that spelling ability is best developed and maintained

through careful attention to the writing of a particular group of children (Hollingsworth, 1965; E. Horn, 1960; T. Horn, 1969b).

Investigations into linguistic principles have also influenced the selection of word lists. Linguists contend that an emphasis on pattern generalization and strategy formation will provide a stable program. These researchers also indicate more attention should be given to high frequency words with demonstrated difficulties and that easier words will most likely be learned incidentally.

Presenting words in a list format is the most effective method of study (Edwards, 1951; E. Horn, 1963; Strickland, 1951). E. Horn (1963) stated that "Research has consistently shown that it is more effective to study words in a list form rather than in context. Words studied in lists are learned more quickly, remembered longer and transferred more readily to new contexts" (p. 16).

Time Allotments

Research indicates that there is a need for direct systematic spelling instruction; especially for pupils of below average spelling ability. Larson's (1945) study dealing with efficiency of spelling instruction and time allotted to spelling, demonstrated that 100 minutes weekly had no more positive results than 60 minute weekly lessons. There appears to be agreement by authorities that time devoted to spelling instruction need not exceed 15 to 20 minutes daily. The remainder of the daily program should, however, provide time for children to use spelling in meaningful situations (E. Horn, 1960; T. Horn, 1947; Larson, 1945).

Study and Testing Procedures

Poor spelling achievement can be a product of poor study habits (Fitzgerald, 1953; E. Horn, 1967; Russell, 1937). Research has revealed that the best spellers have a systematic method of approaching new words. Research in methodologies of spelling has shown that the child's attention should be directed to a word as a total. Little gain occurs by breaking the word into syllables (T. Horn, 1969b). Horn stated that learning to spell a word should involve the child's forming a correct visual image of the whole word.

Review of the literature indicated indecision as to whether the spelling of a word should follow the synthetic or analytic approach. The advocates of the synthesis approach have concluded more accurate spelling occurs when students concentrate on the total word as a specific individual problem. Research seems to favor the synthetic approach. The analytical technique attempts to emphasize the letters which make up words. These researchers seek to improve spelling by increasing the child's awareness of the likenesses and differences of individual letters within a word.

Current researchers avidly concur on the test-study-test procedure (Fitzgerald, 1953; Hibler, 1957; E. Horn, 1960; Montgomery, 1957). The first step in the procedure is to administer a pretest, preferably at the beginning of a week so students can determine which words they know and which require study. Pupil's learning can therefore be directed towards those words with which they had trouble. There is no justification of the study method, whereby a child knows 15 out of 20 words prior to testing (Hughes, 1966). Pretests allow

students to apply study skills to unknown words only, and place an emphasis on gains in spelling ability.

A record of individual progress and the number of words learned will, or should, motivate spelling achievement and the ability to study words (Eisman, 1963).

As to the question, "Who should correct pretest," the researchers agree on a self-corrected test procedure. Self-correction is an important aspect of pretesting. It is important that each child locates and corrects his errors. It has been determined that 85% of the learning which takes place in spelling occurs during self-correction (Christine & Hollingsworth, 1966).

E. Horn (1963) suggests that the following factors will help make the corrected test a vital experience:

- 1) Each student should understand that the tests show him which words he needs to study.
- 2) A pupil should be convinced to work carefully as he corrects his test. He can learn many new words in the process of correction.
- 3) The pupil should correct his spelling as the teacher reads it aloud. This focuses the attention on each word he has misspelled, as well as on the correct spelling of the word.
- 4) Study time for words missed should follow immediately after correction.
- 5) The teacher should give immediate assistance to individuals who need help.
- 6) Results on the final test should be compared with those on the pretest to show study progress. (p. 18)

Once a student has determined which words he needs to study, an effective method of study must be employed:

Just as wars are conducted on the basis of strategies and broad general principles, while battles are fought by tactics, specific plans and techniques, so must the war on misspelling be based on strategies that precede and dictate day to day classroom tactics. (Schell, 1975, p. 239)

The understanding of how study skills are developed is becoming increasingly more important. Processes for studying and learning new words have been discussed for a quarter of a century but very few reliable studies have been concluded. Those available have been extremely sketchy or the methodologies have not been provided. Blake (1965) developed self-study lists which asked children to develop questions about a word's phonetic structure, its meaning, and its usage. Forty-two questions comprised the list. A child, during the fifteen week study, learned to know which questions contributed to his spelling growth. Reports showed marked achievement in students' spelling and written work.

Dupree (1937) compared children utilizing a given study technique with those who had none. The teacher diagnosed individual cases and helped children work to capacity. The results indicated those using a self-study method learned a larger number of words than those with no technique. Ahrens's (1958) study yielded similar results with individual word lists and a self-study program. A yearly growth of 2.2 years was recorded in comparison to a .8 growth for the previous year.

Brothers and Hosclaw (1975) pointed out a need to cross and integrate the visual, auditory, and kinesthetic modalities before spelling of a word becomes a subconscious automatic process. They felt that no one channel was correct for spelling a particular word

each time it was met. They emphasized copying, proofreading, rewriting, and writing from memory.

The Fernald Keller (1943) method was developed for the severely handicapped speller and reader. The method incorporates all senses in a continual writing, tracing, saying, and retracing method. The process, although very time consuming, was 85%-90% effective for even the most severely handicapped spellers.

Simon's and Simon's (1973) research led them to conclude that a speller chooses a particular spelling because he has stored a differentiated set of spellings associated with the phoneme. A set of rules then allows him to select one or another alternative spelling as a result of context; i.e.

$$\begin{array}{l} \text{phoneme} \longrightarrow \text{sp}_1, \text{sp}_2, \text{sp}_3 \\ \text{phoneme} + \text{phonemic context} \longrightarrow \text{spelling} \end{array}$$

They propose a spelling procedure where students generate alternative spellings by trial and error, then test them by recognition.

Study methods which required repeated writings of misspelled words were found useless, unless intervening recall of the word were employed (Green & Petty, 1968). The writing of words in the air also proved to be of no benefit since it didn't allow the child to form a realistic image of the word as does writing it on paper (Green & Petty, 1968).

Some spelling series have attempted to improve spelling by drawing attention to hard spots. Most research studies have shown this technique to be of little value since they have concluded that children learn words as whole units and not individual parts

(Mendenhall, 1930; Rosemeier, 1965). Other researchers do, however, contend that children--through a pretest--can locate their own hard spots and use appropriate strategies to learn words (Fitzgerald, 1951; E. Horn, 1967).

It is interesting to note that in an examination of 5,000 college compositions, Alper (1944) found over 1,000 different words misspelled, usually in one particular hard spot. The majority of errors made sense phonetically and were not avoidable on the basis of conventional sound to spelling rules. They involved confusion over ambiguous vowel sounds as well as on completely phonetic substitutions. A 1973 study by Simon and Simon also concluded the same types of errors. A major source of confusion resulted from the schwa sound. It occurs in one-half of the 10,000 most common multisyllabic words. It is also spelled thirty ways with almost any vowel or vowel digraph.

Study methods of linguistic researchers emphasized sound-letter associations and the grouping of words into phonemic families (Hanna & Moore, 1953). This approach stresses those words which exhibit accurate phoneme-grapheme relationships. Chomsky's (1970) research has shown unknown spellings of words can also be resolved by referring to related words.

Fries and Hockett (1964) pointed out that English spelling was not as irregular as it is frequently claimed to be. They concluded that individual letters did not have consistent acoustic interpretations but, certain constellations of letters in particular positions in words definitely did. They stressed that to search for the i sound in win,

wine, or action is to search in vain, but each of these represent a familiar spelling pattern a speller can pronounce: /in/, /ine/, /tion/. The study went on to conclude that most spelling patterns occur only in certain positions and are only patterns if they always stand for a specific pronunciation.

Gibson, Pick, Osser, and Hammand's (1962) research demonstrated children's superior spelling performance for nonwords of regular spelling patterns, such as "sprilk" and "blords." Their work demonstrated that the effect of orthographic regularity is not due merely to the presence of spelling patterns but to their occurrence in appropriate positions. Hull (1957) showed that this increased perceptibility with higher order spelling patterns of pseudo words was especially marked in good spellers. The ability to perceive and store orthographic chunks therefore appears to aid in the spelling process.

Gibson, Shurcliff, and Yonas (1970) showed congenitally deaf students extracted spelling patterns of pseudo words despite never having heard them. This illustrates that spelling rules can function independent of pronunciation. It should be noted, however, that hearing subjects spelled more words correctly. It is, therefore, likely that redundant sound correspondence can facilitate spelling when available to the learner.

In a 1926 study Gates compared deaf children's spelling with that of hearing children. He concluded that deaf children of equal reading ability were better spellers. The deaf children, he reported, owed their remarkable spelling ability to an effective type of perceiving and reacting to the visual form of words. Hearing children

did not seem to acquire or develop this precise, accurate form of word observation. He contended they relied mainly on the less productive device of phonetic translation and thus did not develop such keen visual abilities. Templin (1948) found deaf children made fewer errors on spelling tests than hearing children. It is probable the deaf subjects relied almost exclusively on visual patterns of word structure rather than auditory patterns. Research (Hendrickson, 1967; Mackworth & Mackworth, 1974) have revealed a high correlation between spelling ability and visual recognition skills. Spelling maturity, therefore, appears to correspond with more flexible word recognition strategies and increased dependence on larger units of analysis.

An analysis of fifth graders' spelling errors (Wolfe, 1959) indicated that 36.3% were phonetic mistakes such as vowel substitutions, vowel omissions, schwa sounds, and doubling or nondoubling of consonants. Masters' (1968) analysis of two hundred students, eighth grade through college level, showed similar results on 268 high frequency words. A 1965 study by Petty of first and second graders, all of whom had been taught phonics as their approach to reading, spelled circus 148 ways and the word tease 44 ways. Phonetic errors seem to indicate a need for an increased emphasis on visual imagery. The role of visual factors in spelling has, however, been a relatively neglected topic of research.

A definite method to facilitate the development of accurate, permanent visual images of spelling words appears to be needed. Too frequently students merely copy spelling words and never learn to

thoroughly analyze them. Children need to focus their visual attention on the word as it is pronounced, noting the structure of the word, the sequence of the letters, patterns within the word, and the letter representations given to the sounds. This should be done as the word is pronounced several times. It is not this researcher's purpose to disparage the use of phonetics in spelling, but to encourage the visualization of words in combination with definite verbal encoding and a practice of intervening recall. After pronunciation, students should employ the formation of accurate mental images of the whole word. Writing, followed by accurate checking of letter by letter sequences should allow for permanent visual-auditory memory bonds.

Visual Memory

The next major focus of the literature review concentrates on the physiology and cognitive processes of visual memory and its relationship to letters and words, as they further relate to spelling.

In his book Cognitive Psychology, Neisser (1968) proposed a major division between visual and auditory cognitive processes. He used the term "visual cognition" to refer to those processes which occur in the human brain when visual events are recognized, categorized, and interpreted. Visual memory, a subdivision of visual cognition, is the capability of a subject to store and subsequently reinstate knowledge of past visual events or stimuli. This is also often referred to as episodic memory (Tulving, 1972).

Eye Movement Theory

The physiological process of vision and the characteristics of eye movements during inspection of printed symbols has been under study for many years. The eyes make rapid shifts known as saccades, interspersed by longer fixations pauses which average 200-250 msec. in duration. It is considered that intake of visual information occurs during these pauses. A brief examination of eye movement in reading may serve as a model of visual processing in spelling. Gibson and Levin (1975) reported that the number of items which could be identified in a single fixation depended on the skill of the reader and the characteristics of the material. Normal readers can span 7-10 letters per fixation but unskilled readers appear to read fewer letters or require more frequent and longer fixation periods. Spache (1940) also observed that poor spellers had small memory spans for visually presented materials. Nodine and Steverle (1973) found that kindergarten children needed more time and more cross comparisons than either first or third graders to determine whether 2-4 nonsense letter strings were the same or different. Tinker's (1946) study of developmental changes in eye movements, led him to note that fixation frequency, duration, and number of recessive eye movements decreased markedly as children increased in age. Older subjects are also able to process letters and report them back at a faster rate than younger subjects (Spitz & Thor, 1968). These eye movement studies all seem to indicate that perceptual efficiency and effective visual search patterns increase with age and are influenced by graphemic familiarity.

Eye movements, as they relate to spelling, have shown that the best spellers do not scan words letter by letter but see the whole word, then analyze it, or large parts of it, to detect difficult or unusual spots. Then with rhythmic sweeps of the eye from left to right they quickly fuse the several parts into a unified whole (Gilbert, 1932). Furness (1973) concluded that the eye movements of better spellers were quite regular and that they perceived parts of the word in relation to the whole. Poor spellers, however, scan words in a hit-miss fashion or letter by letter. Spache (1940) has also collected evidence which indicates that poorer spellers had a limited visual field and visual span. This he pointed out accounted for their tendency to perceive in smaller, disorganized units. Studies on photographic records of eye movements made by Gilbert and Gilbert (1942) showed good spellers tend to discover and give special attention to the difficult parts of a word.

Visual Encoding

Sperling (1963) has developed several models to explain visual memory. His experiments have established the existence of two temporary storage registers which must function properly for the visual trace to be encoded into long term memory.

The first register is called the iconic storage. The icon, a brief persisting memory of the visual field, is produced at the onset of each fixation. The image lasts, at best, a second or two and disappears long before a subject can finish naming 4 or 5 bits. These visual traces have been theorized as having the same duration

in all subjects but that encoding efficiency allows older subjects to provide a more stable storage and better retention of the trace (Morrison, 1974).

The icon register then quickly channels the information into a graphemic register which forms internal descriptions of printed materials. An inspection process then controls trajectories of the eyes, marking out relative position and sequence of symbols. A scan rehearsal process then chooses those bits it deems to have priority and they are channeled into higher levels of visual cognition. Due primarily to these two functions, serial position of symbolic learning generally shows evidence of higher recall for symbols on the left of a given array over those on the right (Averbach & Corielli, 1961; Sperling, 1963). It should also be noted in relationship to Sperling's research that left ends of letter rows and words are more accurately reported than right ones. The visual memory for the letters on the right in a sequence are also reported more accurately than the visual memory for the middle letters (Croovitz & Schiffman, 1965).

During Sperling's (1960) studies he heard subjects mouthing out letters as they wrote them. This observation led him to hypothesize that the visual information subjects received was covertly transformed into audio-storage. He concluded that subjects formulated and remembered a verbal description of what had been seen and activated an inner or subvocal speech between exposure and report. This transfer to audio-storage not only allowed the subject a few more seconds to

process the information, since auditory memory decay is not as short as the visual, but the information could be maintained by rehearsal. The audio image can be reactivated to a high level of strength just by hearing it again.

Spoehr's and Smith's (1975) model suggest that when a letter string is presented, each individual letter is analyzed or identified by some pattern recognition process. After this visual feature analysis, the information passes into a stage which pairs the string into vocalic center groups. These units are assigned acoustic codes which can later be translated back into letter strings.

Levy (1975) reported that very little verbal coding was needed to retain picture images but simply retaining the shape of words did not permit retention.

Some researchers, such as Health (1970), concluded that young children have inferior strategies for encoding the short term memory. He indicated that they were deficient in their ability to verbally label and hence had to rely exclusively on their visual memory instead of effectively using the dual coding as adults do.

Sperling (1963) also proposed a model to explain rehearsal and retrieval of information. His studies indicated the existence of a recognition buffer. This buffer processes and converts images into programs of motor instruction, stores them, sets up programs and pathways for rehearsal, and when needed activates retrieval. His model including this process and others is as follows (Sperling, 1963, p. 27).

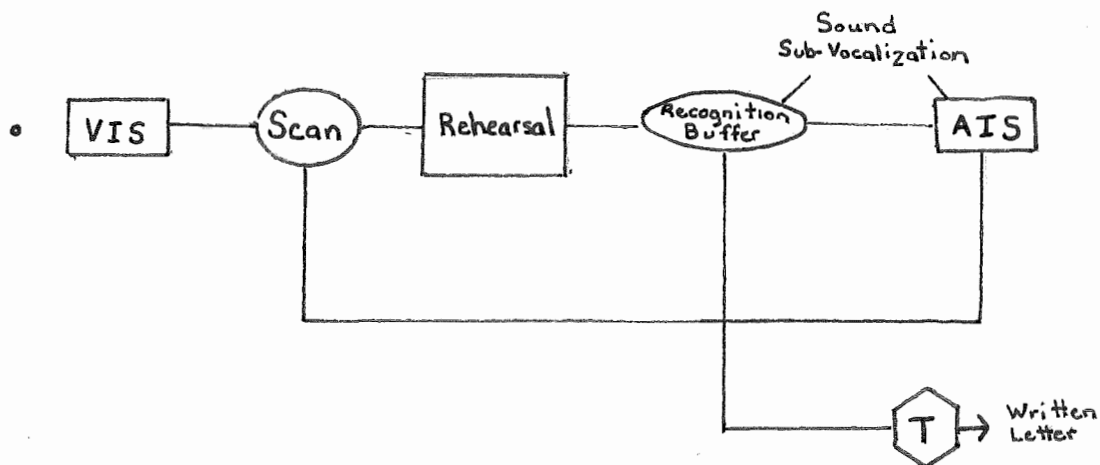


Figure 1. Sperling's Visual Memory Model.

The basic hardware of visual memory, Morrison (1974) concluded, seems to exist at all age levels. However, the ability to organize strategies or programs for encoding and rehearsal improve with age. Older subjects see the same visual stimulus as younger ones but because of familiarization with graphemes, advanced strategies of encoding traces, and the operation of systematic retrieval operations they are able to retain more visual information (Baer & Wright, 1975; Huttenlocker & Burke, 1976). Training students to construct effective memory strategies for learning and retrieval of information would, therefore, appear to increase learning at all levels.

Visual Imagery

Visual imagery or the formation of mental images is often thought of as the entire memory. In actuality, they are revived copies of earlier visual stimulation. Early researchers were extremely skeptical of the very existence of imagery. Galton (1883), however,

continued his research with imagery as it related to word association tests. These unidentifiable and unmeasurable inner seeings received sporadic attention but not until 1960 did imagery, as it relates to symbolic learning, become of interest.

A major emphasis of imagery research dealt with objects, pictures, photographs, and abstract symbols, but very little research has been conducted with imagery as it relates to letters and words (Yakes, 1966). The process of imagery is believed to affect memory through dual coding, that of visual as well as subvocal auditory systems (Paivio, 1971). Imaginal memory is apparently independent of the verbal memory and therefore material is encoded through two channels. Thus two possible ways to gain access to materials are available when retention is tested. Imagery provides an effective framework for organizing and utilizing materials to be remembered by representing items as interconnected or associated (Kohler, 1929). A visual imagery study for learning twenty words in serial order was conducted by Bugelski in 1979. Subjects were asked to form images which would interconnect the words sequentially, whereas a control group was told to learn the words. A time limit of 5 seconds per word was given. The imagery group learned the larger number of words as well as more accurate sequences. Further studies on what types of images yield the best retention revealed that active or extremely vivid images produced the highest retention (Delvin, 1969).

Imagery ability increases with age and varies with individuals (Bugelski, Kidd, & Segman, 1968). Several studies done by Bugelski

have shown children need more exposure time to the original stimuli and often do not produce suitable images for pairs after 30 seconds. On the other hand, some imagery may occur quickly and not be recalled later on. Strickland (1951) also concluded that adults' and children's degrees of sensory awareness as well as the ability to store images of words differed.

Visual imagery is one of the most important contributions to good spelling, Ruel (1977) stated after a review of spelling research. The topic, however, has received little attention and those imagery studies conducted have produced inconsistent findings.

Radaker (1963) trained for visual imagery as a means of improving spelling ability. He directed subjects' attention to visual characteristics of a word. Children received training in creation of visual images of spelling words. Subjects were asked to imagine they could see a particular word on a huge screen with floodlights on the letters. In addition, they were asked to use fantasy paste and glue the letters of words on large boards. These exercises were designed to permit subjects to obtain sharply defined images which they could store in memory and which would later serve as a model in assessing similar representations. The vividness of the imagery was suggested to have divorced figure from ground. His results yielded significant spelling achievement over a long period of time. Many researchers, however, questioned if the creative methods or the exposure of extra spelling classes (the control group was allowed to play during training) were the real causes of spelling improvement.

Hartman (1931) exposed words on a tachistoscope and discovered more words were recalled by students who exercised visual imagery. Having perceived the word pattern, they could hold on to this, examine it, and observe particular characteristics of the word form.

Caban's and Conway's (1978) research with Imagetics and the use of a magic slate concluded that eighth graders learned and retained spelling words better by using mental image practices than by using other spelling methods.

The popular belief that good spellers "see" word spellings in their heads has been disputed by Tenney (1980). Her results showed other factors were more important. Rote learning and linguistic sophistication proved to be more crucial factors in spelling ability. Some researchers suggest spelling is aided by imagery but that rote learning is also required. They concluded neither rote learning nor imagery were strong enough to produce long term memory for words, but that they supplement each other to enhance memory (McClelland, 1976).

Summary

Research conducted in spelling and visual processes appear to indicate that an effective procedure by which a student learns to spell and process information is of crucial importance.

A self-correction method of pretest words, followed by a systematic approach to study, will allow the child to direct his attention to parts of words causing him difficulty and build self-confidence and pride in his ability to spell new words. Programs developed to build independent study skills permit individual word

lists and free the teacher to concentrate on diagnosing and remedying more severe spelling difficulties. Understanding of how independent study skills can be developed has become of increased importance. Unfortunately few reliable studies have been done to indicate how individual techniques should be employed.

Reliance upon rules in spelling has also proved to create confusion, hence it is this researcher's contention that more of an emphasis should be placed on building correct mental images and stronger visual-auditory bonds. Children need to visualize, learn to look and observe, to see more in less time, and recognize and retain the particular grapheme for given phonemes within a word.

The design to follow, therefore, will provide an individualized study procedure which emphasizes a child's ability to visualize, identify hard spots, hear it clearly, compare what one sees with what one hears, and write the word, constantly retaining the visual-auditory correspondence he has made with a particular word.

Chapter III

Design of the Study

This study investigated the effects of training self-study strategies as a method for improving the spelling study skills of fourth grade students.

Hypothesis

There will be no significant difference between the mean posttest scores for the treatment and control groups.

Methodology

Subjects

Forty-four average achieving fourth graders ages nine and ten were chosen for the study. Both the treatment and control groups were comprised of rural children from upper-lower to middle class families. The twenty-two students in each group were homogeneously grouped for reading. Class A, from district A, served as the treatment group and Class B from another school district served as the control group.

Instrument

A thirty-word bank was developed for the purpose of the study. Words comprising the bank were those words which 100% of the children could not spell prior to treatment. The American Heritage Word

Frequency Book, by John Carroll, identified the words at a fourth to sixth grade ability level. Word length and number of syllables were taken into consideration in compiling the lists and in allocating study time. The word bank was divided into Test I and Test II which served as pre and posttests.

Procedure

Students were divided into groups A_1 , A_2 , B_1 , B_2 . To increase the reliability of the word bank, A_1 and B_1 received Test I as a pretest and Test II as a posttest. Groups A_2 and B_2 received Test II as a pretest and Test I as a posttest.

Prior to testing, children received the test words in list form. The words were then pronounced with the children and all meanings were discussed. The students were then allotted 15 minutes in which to study the words. Smith's (1969) theory of informational storage (i.e., that 5 seconds per bit are required for long term memory storage) was utilized to predetermine the time allotted. No directions as to study strategies were given to either group. Following the designated study time, the subjects were asked to spell the words (in written form) after they were pronounced, used in a sentence, and pronounced again.

Group A then received ten minute daily treatments for a period of five weeks. The treatment consisted of activities which taught self-study spelling strategies of organization and analysis. An emphasis was placed on skills which would develop visual memory of words.

Following the five week treatment, Group A received a mastery test to determine each subject's ability to employ those strategies trained.

Groups A and B were posttested in the same manner as pretested. Each group received fifteen minutes to study the word list and then were tested.

Statistical Analysis

A t test of dependent means was used to determine whether there was a significant difference in spelling study skills between the two groups.

Summary

To investigate the effects of training self-study spelling strategies a sample of forty-four fourth graders was chosen. Subjects were divided into two groups of similar reading achievement. Group A served as the treatment group and B served as the control group.

On a pretest students of both groups were asked to study fifteen words for fifteen minutes, and were then tested. The students in Group A then were trained to employ self-study skills of words. The study consisted of 10 minute daily treatments for five weeks. Following the five week treatment, both groups were posttested. The students received the alternate list of words, studied them fifteen minutes, and were tested.

Data were compiled and analyzed utilizing a correlated t test.

Chapter IV

Statistical Analysis

Purpose

The effects of specific study strategy training as a method of improving self-study spelling strategies of fourth graders were investigated in this study.

Findings

To determine whether there was a significant gain in study strategy ability after five weeks of instruction, a correlated t test of dependent means was used. Learning was measured in terms of the number of correct spellings given on pre and posttests.

The correlated t value between the pretest and posttest of Group A was calculated at 10.285. The correlated t value for Group B was 2.5. For a two-tailed test at the .05 level of significance, the critical value, with 21 degrees of freedom, is 2.086. The results are summarized on Tables 1 and 2.

Table 1
Comparison of Group A's Pre- and Posttest

Spelling Scores		
S_s	Spelling Pretest Raw Scores (x)	Spelling Posttest Raw Scores (y)
1	6	7
2	0	7
3	5	5
4	5	10
5	1	1
6	4	6
7	1	4
8	4	10
9	3	8
10	0	10
11	5	4
12	0	4
13	1	5
14	4	10
15	2	4
16	2	1
17	6	12
18	0	3
19	3	6
20	6	8
21	3	7
22	2	12

$t_{crit} (df = 21) = 2.086$

$t_{obtained} = 10.285$

$\alpha = .05$

Table 2
 Comparison of Group B's Pre and Posttest

Spelling Scores

S_s	Spelling Pretest Raw Scores (x)	Spelling Posttest Raw Scores (y)
1	2	4
2	6	6
3	3	2
4	8	9
5	2	4
6	6	5
7	3	3
8	4	5
9	3	5
10	3	3
11	3	1
12	3	1
13	4	2
14	1	3
15	9	9
16	0	3
17	5	6
18	3	2
19	3	3
20	5	5
21	5	5
22	3	3

$t_{crit} (df = 21) = 2.086$

$t_{obtained} = 2.5$

$\alpha = .05$

The data revealed a significant gain by both training Group A and Control Group B. Further correlations between posttests of Group A and B, however, exhibited a greater gain in the ability to study words by Group A. The t was calculated at 8.642. Table 3 summarized these results.

The null hypothesis that there would be no significant difference between the mean posttest scores for the treatment and control groups was rejected. It was concluded that there was a significant gain by both training and control groups over the five week time allotment. There was, however, a greater gain calculated for the training group. This indicates that overall, students who received self-study strategy training scored higher than those who did not.

Table 3
Comparison of Group A's and Group B's

Posttests

S_s	Raw Scores of Group A (x)	Raw Scores of Group B (y)
1	7	4
2	7	6
3	5	2
4	10	9
5	1	4
6	6	5
7	4	3
8	10	5
9	8	5
10	10	3
11	4	1
12	4	1
13	5	2
14	10	3
15	4	9
16	1	3
17	12	6
18	3	2
19	6	3
20	8	5
21	7	5
22	12	3

$t_{crit} (df = 21) = 2.086$

$t_{obtained} = 8.642$

$\alpha = .05$

Summary

The results of this analysis indicate there was a significant gain in study strategies by both the training group and the control group after the five week period of time. Calculated posttest scores of the two groups, however, showed a greater gain was made by the treatment group. It therefore appears that instruction in self-study spelling strategies was very effective.

Chapter V

Conclusions and Implications

Purpose

The purpose of this investigation was to determine the effects of training self-study spelling strategies on fourth graders.

Conclusions

The null hypothesis tested in this study was that there would be no significant difference between the mean posttest score of the group receiving instruction in self-study spelling techniques and the mean score of the control group. This hypothesis was rejected.

The results of a t test analysis revealed there was a significant gain obtained by the treatment group. This suggests that instruction in study strategies, focusing on visual memory activities, improved fourth graders' ability to study spelling. These results concur with Brown and Campione's (1971) research which stated that children need explicit training before they acquire efficient strategies of study.

Students in the treatment group learned to follow specific steps of study and to utilize their study time effectively and efficiently. They learned to focus their attention on the visual aspects of the word, build stronger visual-auditory memory bonds, and identify parts of words which needed special attention. This method has appeared to positively affect the study habits of average fourth graders.

Limitation of the Study

A major limitation of the study was the absence of a standardized testing instrument. The randomly chosen words may not have reflected the needs or abilities of average fourth graders.

Several other components of the design have to be recognized when analyzing the results of the study. The use of a small, homogeneously grouped population of average fourth graders limited the results, as did the short duration of the study. Similar studies with various age levels and abilities may further extend the results obtained.

Limitations within the treatment group were also apparent. The treatment group, consisting of several overactive children, had some difficulty attending to tasks. Due to scheduling problems, training sessions had to be held just prior to lunch which also inhibited the training. Perhaps implementation of this technique at the beginning of the year by the regular classroom teacher would result in even higher success.

An observation in posttest study allotment was that children did not have time to finish studying the words and stated that they would like some more time. Pretest time allotment revealed students studying in haphazard ways and, for the most part, not utilizing the entire fifteen minutes allowed. It appeared, however, that once given study strategies, children were able to independently initiate study and thereby improve study ability. A more positive result may have been obtained if students were allowed individualized study sessions, and tested when they felt they were ready.

Study strategies and visual memory techniques were also designed for this study. Those techniques may not be as effective as further developed strategies and activities.

Implications for Future Research

The implications for further research are numerous. The study might be extended for a longer period of time to effectively determine the impact of training. A longitudinal study would also reveal whether spelling achievement was affected.

It would be worthwhile to determine, in future studies, each child's phonic abilities and modality preferences. Cross variances of matched groupings could determine which children achieved more significantly with the strategies employed.

A valuable extension of the design would be to use groups who had pre-established study plans for spelling. The experiment could then determine if visual techniques used were effective, and which specific skill activities proved to be more beneficial for the studying of words.

A corresponding study might determine children's ability to decode prior to training. The results might lead to some postulations as to whether training encoding strategies inversely affected decoding abilities.

Spache (1940) observed a limited memory for visual materials in poor spellers. Limitations in visual field affected the visual span. Perhaps a study developing techniques to specifically increase visual memory span may increase a child's ability to perceive longer units for storage.

Present research in the area of visual imagery for words is scanty. The degree to which people have visual images or whether they are able to see word images at all, is not known. Presently there are no testing instruments to determine the imagery experienced by each individual. Perhaps exploration and development of an imagery test would aid progress in this area. Future research along these lines might also determine a subject's dominant imagery (visual-auditory-kinesthetic) for spelling, and help to develop techniques to improve spelling through the subject's strongest imagery modality.

Implications for Classroom Practice

The results of this study and the literature reviewed suggest that training of self-study strategies will enhance the study of spelling. The teacher must therefore guide individuals in the development of appropriate programs of study. Programs that incorporate the latest research findings into their spelling curriculums will tremendously aid the student. Campanale (1962), Fitzgerald (1951), and E. Horn (1960) profess that the major problem in spelling is that most knowledge of research findings are never applied to the classroom. Campanale (1962) stated, "If instruction in spelling were planned in a more definite fashion, utilizing pertinent research findings, it could be made more meaningful" (p. 446). E. Horn reported that:

The evidence is sufficiently complete and convincing to enable schools to teach spelling with substantial professional efficiency. Shortcomings in the teaching of spelling are therefore, due not so much to the absence of satisfactory

evidence, as to the lack of knowledge of existing evidence and the failure to apply it intelligently, or to erroneous interpretations. (p. 6)

The teacher and the curriculum must adapt to fit the individual needs and abilities of children. There is clearly a need to develop some method of word analysis and a program of study which the child can initially follow. This program may not be a satisfactory technique for all children, but from there the teacher can assist the individual in developing one which will totally suit his needs.

Bibliography

Bibliography

- Ackinson, W., & Rough, T. The observing response in discrimination learning. Journal of Experimental Psychology, 1974, 62, 253-262.
- Ahrens, M. Improved spelling through action research. Instructor, 1958, 6, 77-78.
- Alper, T. A diagnostic spelling scale for college use. The Journal of Educational Psychology, 1944, 33, 273-290.
- Averbach, E., & Corielli, A. Short-term memory in vision. Bell Systems Technical Journal, 1961, 40, 309-328.
- Ayer, F. C. Gateways to correct spelling. Austin, Texas: Steck Co., 1960.
- Baer, R., & Wright, T. Concerning imagery. Psychological Review, 1975, 75, 466-477.
- Barron, R. W. Visual and phonological studies in reading and spelling. Canada: University of Guelph Press, 1966.
- Blake, H. Study spelling independently. Elementary English, 1965, 38, 29-32.
- Bieger, E. Effectiveness of visual training of letters and words on reading skills of non-readers. Journal of Educational Research, 1975, 71, 157-161.
- Braddely, S. Sequential discrepancies among letters and learning of nonsense syllables. Paper presented at the Meeting of the Experimental Psychological Society, England, 1964.
- Brothers, A., & Hosclaw, C. Fusing behaviors into spelling. Elementary English, 1975, 46, 25-28.
- Brown, A. L., & Campione, J. C. Memory strategies in learning and training children to study strategically. Illinois: University of Illinois Technical Report 22, March, 1977. (ERIC Document Reproduction Service No. ED 136 234)
- Brown, C. Teaching spelling with a tachistoscope. English Journal, 1951, 40, 104-105.
- Bugelski, B. R., Kidd, E., & Segman, J. Images as mediators in one trial paired associate learning. Journal of Experimental Psychology, 1968, 76, 69-77.

- Bugelski, B. R. Principles of learning and memory. New York: Praeger Publishers, 1979.
- Caban, J., & Conway, M. Mental imagery as an approach to spelling instruction. Journal of Experimental Education, 1978, 46, 15-21.
- Campanale, E. A. Survey of methods in the teaching of spelling. Elementary English, 1962, 39, 446-455.
- Carroll, J. B., Davies, P., & Richman, B. The American heritage word frequency book. Boston: Houghton Mifflin, 1971.
- Cermack, L. Human memory research and theory. New York: Ronald Press, 1972.
- Chomsky, C. Reading, writing, and phonology. Harvard Educational Review, 1970, 40, 287-309.
- Christine, P. O., & Hollingsworth, P. M. An experiment in spelling. Education, 1966, 86, 143-147.
- Crovitz, H., & Schiffman, H. Visual field and letter span. Journal of Experimental Psychology, 1975, 70, 218-223.
- Delvin, J. Visual recall ability and eye movements. Psychophysiology, 1969, 4, 300-306.
- Dolch, E. The modern teaching of spelling. Illinois: Garrand Press, 1950.
- Dupree, C. W. A comparative experiment of pupil self-study methods and modern systematic methods of teaching spelling. Journal of Experimental Education, 1937, 6, 1-6.
- Durrall, D. Phonics and spelling. California: IRA Publications, 1976.
- Edwards, C. A comparative study of two techniques of spelling. Unpublished master's thesis, University of Iowa, 1951.
- Eisman, E. Individualizing spelling. Language Arts, 1963, 40, 529-530.
- Farnam-Diggory, S., & Simon H. Retention of visually presented information on children's spelling. Memory and Cognition, 1975, 3, 599-608.
- Fernald, G. Remedial techniques in basic school subjects. New York: McGraw Hill, 1943.

- Fitzgerald, J. The vocabulary spelling errors and situation of fourth, fifth, and sixth grade children's letters written in life outside school. Unpublished doctoral dissertation University of Iowa, 1931.
- Fitzgerald, J. The teaching of spelling. New York: Bruce Company, 1951.
- Fitzgerald, J. The teaching of Spelling. Elementary English, 1953, 30, 378-385.
- Fitzsimmons, R. J., & Loomer, B. Spelling, learning, and instruction research and practice. Iowa: Iowa State Department of Public Instruction Press, 1978.
- Flavell, J., & Wellman, H. Metamemory. In R. Kail and J. Hagan (Eds.), Perspectives on the development of memory and cognition. Hillsdale, New Jersey: Erlbaum Assoc., 1977.
- Fries, C., & Hockett, J. Linguistics and the teaching of reading. Reading Teacher, 1964, 17, 594-598.
- Frith, U. Cognitive processes in spelling. New York: Academic Press, 1980.
- Galton, T. Supplementary notes on prehension in idiots. Mind, 1883, 12, 79-82.
- Gates, A. Contribution to education: The psychology of reading and spelling. New York: A.M.S. Press, 1922a.
- Gates, A. The psychology of reading and spelling with special reference to disability. New York: Columbia University Press, 1922b.
- Gates, A. Methods and theories of learning to spell tested by studies of deaf children. The Journal of Educational Psychology, 1926, 17, 289-300.
- Gates, A. An experimental comparison of the study-test and test-study methods in spelling. Journal of Educational Psychology, 1931, 22, 471-479.
- Geedy, P. What research tells us about spelling. Elementary English, 1976, 53, 233-236.
- Gibson, E. Principles of perceptual learning and development. New York: Meredith Corp., 1969.

- Gibson, E., Shurcliff, A., & Yonas, A. Utilization of spelling patterns by deaf and hearing subjects. In H. Levin & J. Williams (Eds.), Basic Studies on Reading. New York: Basic Books, 1970.
- Gibson, E., & Levin, H. The psychology of reading. Cambridge, Mass.: MIT Press, 1975.
- Gibson, E., Pick, A., Osser, H., & Hammand, M. The role of grapheme-phoneme correspondence in the perception of words. American Journal of Psychology, 1962, 75, 554-570.
- Gilbert, L. C. An experimental investigation of eye movement in learning to spell words. Psychological Monographs, 1932, 43, 81-151.
- Gilbert, L. C., & Gilbert, D. W. Training for speed and accuracy of visual perception in learning to spell. California: University of California Press, 1942.
- Gilstrap, J. The development of individual spelling skills in the intermediate grades. Elementary English, 1963, 39, 481-483.
- Green, H., & Petty, W. Developing language skills in the elementary school. Boston: Allyn and Bacon, 1968.
- Hanna, P. R., & Moore, J. Spelling from spoken word to written symbol. Elementary School Journal, 1953, 53, 116-124.
- Hanna, P. R., Hanna, J., Hodges, R., & Rudolf, E. Linguistic clues for spelling improvements. Report to U.S. Office of Education Project 1991, 1966. (ERIC Document Reproduction Service No. ED 128 835)
- Harris, C. Encyclopedia of educational research. (3rd ed.) New York: MacMillan Co., 1960.
- Hartman, W. The relative influence of visual and auditory factors in spelling ability. Journal of Educational Psychology, 1931, 9, 691-699.
- Health, S. Facilitation of perception by spelling constraints. Canadian Journal of Psychology, 1970, 28, 37-50.
- Henderson, T. Correct spelling: An inquiry. The Reading Teacher, 1974, 46, 176-179.

- Hendrickson, H. Spelling: A visual skill. A discussion of visual imagery and the manipulation of visual symbols as basic skills in ability to spell. Academic Therapy Quarterly, 1967, 3, 39-42. (ERIC Document Reproduction Service No. ED 055 070)
- Hibler, G., & Montgomery, M. The test-study versus the study-test method of teaching spelling in grade two. Unpublished master's thesis. The University of Texas, Austin, 1957.
- Hillerich, R. L. Let's teach spelling--not phonetic misspelling. Language Arts, 1977, 54, 301-307.
- Hinrich, R. W. An old but valid procedure. Language Arts, 1975, 52, 249-253.
- Hodges, R. The psychological basis of spelling. Elementary English, 1964, 41, 629-635.
- Hollingsworth, P. M. Spelling lists--outdated? Elementary English, 1965, 42, 295-299.
- Horn, E. A basic vocabulary of 10,000 words most commonly used in writing. Iowa City: University of Iowa Press, 1926.
- Horn, E. Research in spelling. The Elementary English Review, 1944, 21, 31-45.
- Horn, E. Phonetics and spelling. Elementary School Journal, 1957, 57, 46-53.
- Horn, E. Spelling. In C. Harris (Ed.), Encyclopedia of Educational Research, 3rd ed. Macmillan, 1960.
- Horn, E. Teaching spelling: What research says to the teacher. Department of Classroom teachers, American Educational Research Association of National Education, November, 1963.
- Horn, E. Teaching spelling: What research says to the teacher. Department of Classroom Teachers, AERA Publishers, 1967.
- Horn, T. The effects of the corrected test on learning to spell. Unpublished master's thesis, University of Iowa, Iowa City, 1946.
- Horn, T. The effects of the corrected test on learning to spell. Elementary School Journal, 1947, 47, 277-285.
- Horn, T. Spelling. In C. Harris (Ed.), Encyclopedia of Educational Research, 4th ed. New York: Macmillan Publishers, 1969a.

- Horn, T. Research critiques. Elementary English, 1969b, 46, 1246-1298.
- Hughes, J. The myth of the spelling list. National Elementary Principal, 1966, 46, 53-54.
- Hull, C. Principles of behavior. New York: D. Appleton-Century, 1957.
- Huttenlocker, J., & Burke, R. The origins of language comprehension. In R. Solso (Ed.), Theories of Cognitive Psychology. Washington, D.C.: Winston, 1976.
- Kail, R. Perspectives on the development of memory and cognition. New York: John Wiley and Sons, 1977.
- Kohler, W. Figural after-effects. An investigation of visual processes. American Philosophical Society, 1929, 88, 269-357.
- Larson, I. Time Allotments in teaching spelling. Unpublished master's thesis, University of Iowa, Iowa City, 1945.
- Lee, W. R. Spelling irregularity and reading difficulty in English. London: NFER Publishing Co., 1971.
- Levy, B. A. Vocalization and suppression effects in sentence memory. Journal of Verbal Learning and Verbal Behavior, 1975, 14, 304-316.
- Mackworth, J. The duration of the visual image. Canadian Journal of Psychology, 1963, 17, 62-81.
- Mackworth, J., & Mackworth, N. Spelling recognition and coding by poor readers. Bulletin Psychonomic Society, 1974, 3, 59-60.
- Masters, H. A study of spelling errors. Iowa City: University of Iowa Press, 1968, 4, 138-145.
- McClelland, J. L. Preliminary letter ID in the perception of words and non words. Journal of Experimental Psychology--Human Perception and Performance, 1976, 2, 80-91.
- McKee, P. Language in the elementary school. Chicago: Houghton Mifflin, 1939.
- Meeker, M. Teaching memory skills. California: Educational Corp., 1973.
- Mendenhall, J. An analysis of spelling errors. New York: Teachers College, Columbia University Press, 1930.
- Montgomery, M. The test-study versus the study-test method of teaching spelling in grade two. Unpublished master's thesis, The University of Texas, Austin, 1957.

- Morrison, F., Holmes, D., & Haith, L. A developmental study of the effects of familiarity on short term memory. Journal of Experimental Child Psychology, 1974, 18, 412-425.
- Neisser, U. Cognitive psychology. New York: Appleton-Century Crofts, 1967.
- Neisser, U. The process of vision. Scientific American, 1968, 219, 204-214.
- Nodine, C. F., & Steverle, N. Development of perceptual and cognitive strategies for differentiating graphemes. Journal of Experimental Psychology, 1973, 97, #2, 158-166.
- Paivio, A. Mental images in associative learning and memory. Psychological Review, 1969, 76, 241-263.
- Paivio, A. Imagery and verbal processes. New York: Holt Rinehart and Winston, 1971.
- Peters, M. Spelling caught or taught. London: Routledge Kegan Paul L.T.D., 1967.
- Petty, W. Research critiques-II. Elementary English, 1965, 42, 584-587.
- Petty, W. The teaching of spelling. Bulletin of School Education. Indiana University, Bloomington, 45, #6, 1969.
- Radaker, L. D. The effects of visual imagery upon spelling performance. Journal of Educational Research, 1963, 56, 370-371.
- Rinsland, H. A basic vocabulary of elementary school children. New York: Macmillan Co., 1945.
- Rosemeier, R. Effectiveness of forewarning about errors in response. Journal of Educational Psychology, 1965, 56, 113-339.
- Ruel, A. Spelling: The application of research findings. National Education Association, 1977. (ERIC Document Reproduction Service No. ED 135 003)
- Russell, D. Characteristics of good and poor spellers. New York: Columbia University Press, 1937.
- Russell, D. A second study of characteristics of good and poor spellers. Journal of Educational Research, 1955, 46, 129-141
- Schell, L. B+ in composition C- in spelling. Elementary English, 1975, 52, 239-242.

- Simon, D. F., & Simon, H. A. Alternative uses of phonemic information in spelling. Review of Educational Research, 1973, 43, 115-137.
- Slobda, J. Visual imagery and individual differences. In U. Frith (Ed.), Cognitive Processes in Spelling. New York: Academic Press, 1980.
- Smith, F. Understanding reading. New York: Holt, Rinehart, and Winston, 1969.
- Spache, G. Characteristic errors of good and poor spellers. Journal of Educational Research, 1940, 34, 182-189.
- Sperling, G. The information available in brief visual presentations. Psychological Monographs, 1960, 74, #11.
- Sperling, G. A model for visual memory tasks. Human Factors, 1963, 5, 19-31.
- Spitz, H., & Thor, D. The effects of two types of redundancy on visual digit span performance of retardates and varying normals. Developmental Psychology, 1968, 6, 92-103.
- Spoehr, K., & Smith, E. The role of orthographic and phonotactic rules in perceiving letter patterns. Journal of Experimental Psychology, 1948, 39, 337-346.
- Strickland, R. The language arts in elementary school. Boston: D. C. Heath Co., 1951.
- Templin, S. A comparison of spelling achievement of normal and defective hearing subjects. Journal of Educational Psychology, 1948, 39, 337-346.
- Tenney, Y. Visual factors in spelling. In U. Frith (Ed.), Cognitive Processes in Spelling. New York: Academic Press, 1980.
- Tinker, M. The study of eyemovements in reading. Psychological Bulletin, 1946, 43, 93-120.
- Tinker, M. Recent studies of eyemovements in reading. Psychological Bulletin, 1958, 55, 215-231.
- Tulving, E. Organization of memory. New York: Academic Press, 1972.
- Venezky, R. English orthography: Its graphical structure and its relation to sound. Reading Research Quarterly, 1967, 2, 75-106.
- Vurpillot, E. The development of scanning strategies and their relation to visual differentiation. Journal of Experimental Child Psychology, 1968, 6, 632-650.

- Wenzel, E. Research summary of basic skills in handwriting and spelling. IRA Conference #22, Miami, Florida, 1977. (ERIC Document Reproduction Service No. ED 140 271)
- Wolfe, J. B. Step by step spelling. Elementary English, 1959, 36, 555-559.
- Yakes, H. The generalization controversy on spelling. Elementary English, 1966, 48, 154-161.
- Zutell, J. Some psycholinguistic perspectives on children's spelling. Language Arts, 1978, 55, 844-851.

Reference Notes

Estep, J. Personal Communication, April 15, 1980.

Gibson, E. Personal Communication, February 20, 1980.

Hendrickson, H. Personal Communication, February 5, 1980.

Appendix A
Test Instrument

Test I

1. appreciated
2. anxious
3. boulder
4. junction
5. rhythm
6. sufficient
7. rehearsal
8. scholarship
9. depression
10. collision
11. embarrass
12. mechanic
13. extremely
14. irregular
15. necessary

Test II

1. opportunity
2. immense
3. approach
4. fledgling
5. fatigue
6. commercial
7. various
8. crocodile
9. scenery
10. enemies
11. vinegar
12. quantities
13. picnicking
14. experience
15. vaccinated

Appendix B
Visual Memory Exercises
and
Study Strategies

Match to Standard Visual Memory Exercises

1. Given a letter, syllable, or word the child will trace it, turn over his paper, write the sample from memory, and check his reproduction with the original.
2. Given 15 to 20 seconds to memorize a flashed word, the child will write a word and check it upon completion.
Variation: Team Flash, Given common phonograms or words, groups of two will flash words to each other, write the words, and check them.
3. Word Down: Given a deck of numbered spelling words, the child will study, say, flip the card, write and check a word. A correct spelling will allow the child to move forward towards a goal on his gameboard. An incorrect answer will mean a loss of gameboard yardage.
4. Given a sheet, containing words vertically and horizontally scrambled, a student will visually locate and circle words flashed to him.
5. Outer Space Language: Given a sheet containing nonsense word groupings, the student will study a given sample for 5 seconds. When the sample is removed the child will locate and circle the correct nonsense word seen.

6. License Find: Given paper and pencil, the child will study license plate numbers and letters containing phonogram patterns. When the model is removed the child will write the license plate from memory.
7. Visual Detectives: Given a sheet of paper containing lists of words with one correct spelling and two foils, the child will visually determine the correct spelling.
8. Given a series of words flashed on an overhead, the child will study the words. When the words are removed, the child will visually recall them and write the words.
9. Missing Words: Given a number of words to view on the overhead for 30 to 60 seconds, the student will orally or in written form, spell the word the teacher removed prior to the second showing.
10. Missing Parts: Given a word broken up into syllables on an overhead, the student will provide orally or in written form, the syllable missing.
11. Trace: Given paper and pencil, the student will trace a word while saying it and looking at it, he will then continue to look at it but write it beside the original.
12. Visualize: Given paper and pencil, children will study words written on the board, close their eyes, visualize the word, and tell, for example, the third letter they can visualize or the last one.

Study Strategy Activities

1. Students will follow the given procedure for studying words.
 1. Say the word
 2. Study the word
 3. Trace the word
 4. Close their eyes and visualize the word
 5. Check the original with what they visualized
 6. Spell it out as they see and say the word
 7. Cover and write the word
 8. Check the word
2. Study Packs: Given the following materials, the child will compose a spelling study packet: 12 x 9 inch envelope, pencil, paper, several copies of the study procedures, a red and a green crayon, a chalkboard, and red and green chalk.

Study procedures will also be written on the outside of the envelope by the students.
3. Visual Comparison: Given three words on a flashed screen, the child will say, or write similarities of spelling words (e.g., all begin with "c," all end in "ly," all have an "ance" in them).
4. Distinguishing Features: The child, when flashed a word, will tell how many letters in a given word, number of syllables, and any distinguishing features of the word.
5. Given a spelling word, the child will match sound to written symbols, check for silent letters, observe double letters, write base words, and study one word at a time.
6. Having studied a given word, the child will complete missing parts of a word by holding up cards to show the missing letter or syllable (e.g., imposs_ble).

7. Detective Trace: Students will trace a word in crayon, detect where they believe a hard spot exists, and scrape the crayon off these letters.
8. Chalkboard Writing: Students will trace spelling words with green and red chalk. They will trace all letters they are sure of in green and all questionable ones in red. They will then write the word and check it.
9. Double T-Scope: Given a T-Scope with a window on both sides, pairs of children will predict hard spots. The correct ones will be written in red so children can check each other once predictions have been made.