COMPARING THE EFFECTIVENESS OF VISUAL AND AUDITORY TRAINING PROCEDURES IN THE REMEDIATION OF SPELLING ERRORS AMONG PHONIC SPELLERS

by

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B.Ed., University of Calgary, 1973

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ABSTRACT

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The purpose of this study was to determine which mode of instruction, auditory or visual, is more effective in remediating phonically correct misspellings among third grade students who are not skilled spellers.

Local norms for the spelling section of the Wide Range Achievement Test were developed for the third grade level. These norms were used to identify 96 students who were not skilled spellers. These individuals were given a group pretest of a 100-word spelling list. The errors made on this test were classified in terms of phonic plausibil-

ity. Individuals for whom 80% or more of the errors were found to be phonically plausible were designated "phonic spellers". These phonic spellers formed a pool of subjects to be randomly assigned to three groups, stratified by school attended, spelling ability, sex, and teacher.

The first group was designated "Control" and received no instruction. Group II was designated "Visual Training". Subjects were given five twenty-minute sessions of individual instruction, each teaching ten words from the errors made on the pretest. Instructional sessions were followed by tests of immediate and delayed recall. Group III was designated "Auditory Training". Subjects in this group received instruction and testing parallel to that provided Group II, but in this case the instruction was in the auditory mode. Following the final delayed recall tests, a group post-test of the 100-word list was administered.

The final sample consisted of 9 subjects in Group I and 10 in each of Groups II and III. Analysis of Covariance, with pretest scores serving as the covariate, and the Scheffé procedure were used to assess the significance of the differences in post-test scores.

Post-test scores of the Visual Training Group were found to be significantly higher than those of both the Control and Auditory Training Groups. Post-test scores of the Auditory Training Group were not found to be significantly better than those of the Control Group.

Examiners: [redacted]

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DEDICATION

I have a very supportive family. They have provided a great deal of encouragement throughout my graduate studies. Without their cooperation, this project could not have been considered. I wish to dedicate this thesis to my husband, Peter, and to my sons, Paul and Steven.

CHAPTER ONE

INTRODUCTION

Spelling has been defined as the ability to translate oral words into a standard set of symbols (Simon, 1975). As such, it is a basic literary skill.

As a skill, spelling is characterized by factors common to all skills. One such factor is the involvement of a complex pattern of behavior. Simon (1975) illustrated the complexity of spelling by developing an information processing model that depicts the integration of internal, auditory, visual, and motor components in spelling. The internal elements include long and short term memory. The auditory aspects include auditory perception skills, knowledge of phoneme-grapheme correspondences, verbalization of spelling rules, and mnumonic devices. The visual representations include visual perception, and knowledge of word and letter shapes. The motor components include the ability to form letters and whole words, and kinesthetic data.

Peters (1974) illustrated further the complexity of spelling by comparing it to reading:

> (i) Reading skill depends on the individual's ability to tap his various linguistic resources in order to supplement the visual information on the printed page. Spelling is not a polymorphous ability--it is a single skill, which at its ultimate is a motor habit, depending, however, developmentally on visual, kinesthetic and logical (rules) strategies.

> (ii) Reading is dynamic, (and indeed, progressive. It may develop, adapt, progress, change. Spelling is an all or none activity determined by the individual's linguistic experience, his perceptual ability, his imagery, his memory, his attitudes and self-image.
>
> (iii) Reading is a matter of uncertainty reduction, or if one is decoding, it is a matter of successive approximation to the word. In spelling there is no uncertainty reduction nor successive approximation. Once the word is written, it is written (unless it is erased!).
>
> (iv) Reading is flexible. A wide range of performance is possible in reading, but very little, if any, in spelling. Apart from shorthand and the odd cultural mutation, spelling does not vary according to the situation. (p. 56)

The complexity that has been illustrated by Simon and Peters has led some authorities to cite "difficulty" as a characteristic of spelling. Comparisons to reading are again used to illustrate the point. Cronnell (1978) made such a comparison, concluding that spelling is much more difficult than reading:

> In reading the written symbol can be isolated if necessary and studied in detail. Speech sounds are much more difficult to isolate and study and thus as stimuli, they present greater difficulty for spelling. (p. 337)

Cronnell indicated that reading stimuli are much more concrete than spelling stimuli. The variation allowed in reading pronunciation and the total lack of variation allowed in spelling provide further evidence of the difficulty of spelling. In addition, in reading the skill performance involves moving from the many stimuli to fewer

responses-- 70 letters and letter combinations produce 40 speech sounds while in spelling the reverse is true. (In reading it is known that both 'd' and 'dd' are pronounced /d/, but the sound /d/ can be spelled by either 'd' or 'dd'.) Variations in pronunciation due to dialects also cause spelling confusions, states Cronnell. (You can pronounce 'catch' as /kach/ or /kech/, but both /kach/ and /kech/ must be spelled 'catch'.) He also points out that while there are relatively few homographs in reading, there are 1800 words that belong to homophone groups and require contextual information before the correct spelling response can be made.

The complexity of spelling and the difficulty that arises from it may be seen as characteristics of spelling skill.

Another characteristic of spelling, as a skill, is the automatic execution of the complex behavior pattern by skilled spellers. The individual is free to concentrate on the ideas he is expressing and does not have to focus on the spelling of the words that he is using. At times, he functions at the level of automaticity; at others, he must "slow down" and consciously attend to the many clues that are present, in order to spell correctly.

Spelling, like other skills, can be analysed into smaller units called subskills. Hunt, Hadsell, Hannum and Johnson (1963) identified four spelling subskills: a)

the ability to spell words that are phonetic, b) the ability to spell words that involve roots, prefixes and suffixes, c) the ability to look at a word and spell it later, and d) the ability to spell the "demons".

Spelling demons are words, like "their", "surprised", and "lose", that are spelled incorrectly more frequently than most other words. Pollock (1971) found that 6% of the words misspelled at the high school level accounted for over 50% of the spelling errors, confirming the existence of words that are difficult to spell.

Several attempts have been made to isolate the source of spelling difficulties. Petty (1958) was unsuccessful in his attempt to isolate difficult phoneme-grapheme correspondences. Schwartz & Doehring (1977) found that children learn pattern abstraction in the course of spelling acquisition but experience more difficulty with orthographic patterns than with morphological patterns.

Spelling acquisition occurs, in part, as the result of spelling instruction. Numerous studies have been designed to identify a more effective spelling program (Burton, 1953; Cook, 1957; Eisman, 1962; Buzzby & Mann, 1962; Edgerton & Twonbly, 1962; Schoephoester, 1962; Personke, 1962; Schroeder, 1968; Golladay, 1971; Wallace, 1972). Most of these studies have viewed spelling in the global sense rather than focusing on subskills and most

have not considered individual differences. No ideal spelling program has been found.

Perhaps the failure to isolate a "best" spelling program is due, in part, to the failure to allow for individual differences. Spelling ability has been found to vary according to reading achievement (Pepe, 1979) and mental abilities (Nelson & Warrington, 1974). Some individuals have been found to display consistent error patterns (Walker, 1974; Williams, 1974) that suggest strengths in some subskills and weaknesses in others. Consideration of these factors might lead to more effective spelling instruction.

The varying effectiveness of teaching modalities has been investigaged in the field of reading (Mills, 1970). Some individuals have been found to learn more effectively through one perceptual modality than through other modalities. Galton (1907) referred to great variations among individuals in their ability to visualize. His studies indicated that such ability could be developed through practice, or could be subordinated and fall into disuse.

Atkin (cited in Brueckner & Bond, 1955) studied the effectiveness of the study procedures employed by individual students and calculated each subject's "learning index". Individuals were found to vary greatly in their ability to employ effective study procedures, indicating

that some individuals might benefit from specific instruction in study procedures.

Gates and Russell (1940) developed a diagnostic spelling test that included a section intended to determine the type of study procedure most effective for the individual. The auditory, visual, kinesthetic, and combination modes were compared. Peters (1970) supports this attempt to isolate an effective learning mode.

Some writers have indicated that an examination of spelling errors provides valuable information for the identification of desirable teaching practices. Learner (1976) states:

> The analysis of the kinds of spelling errors... might give clues about whether the child is relying on auditory or visual processes to spell the words. The child who is strong in auditory perception and the ability to remember the sounds of words but poor in visual memory and visual learning may misspell words, but the error will follow some kind of phonic generalization. (p. 85)

Spelling skill involves a highly complex behavior pattern that is often associated with difficulty. The skilled speller spells without conscious effort. Four spelling subskills have been identified, one of which is the ability to spell difficult words. Spelling achievement is related to factors of individual differences. Numerous studies have attempted to identify a "most effective" spelling program, but no consensus has been reached. Per-

haps the consideration of individual differences could lead to more effective programs of spelling instruction.

The analysis of spelling errors reveals some elements of individual differences. Individuals who spell phonically might be expected to be skilled in phonic analysis and related auditory skills, but unskilled in visual memory and visual analysis skills. They might, therefore, be expected to obtain limited benefit from further instruction in the auditory mode, but significant benefit from the development of visual skills.

The Purpose of This Study

The purpose of this study is to determine whether auditory or visual instruction is more effective in the remediation of spelling errors made by phonic spellers. An attempt has been made to determine which mode of instruction would result in the greatest development of spelling skill among third grade students who are not skilled spellers and who consistently produce phonically correct misspellings.

Limitations of This Study

This study is limited in that:

Only third grade students who are not skilled spellers and who spell phonically are studied.

Only regular classroom students are studied. No students who are hearing impaired or visually impaired are

included; nor are any who have diagnosed speech defects. None of the subjects has been identified as being below the average range of mental ability.

Motor aspects of the spelling task are not considered; nor are motivational factors.

The focus of this study is on spelling in the dictated-test situation only. The obtained level of achievement may vary significantly from that which is evident in spontaneous writing. Such writing is assumed to involve a level of automaticity not currently considered.

Assumptions of This Study

It is assumed that spelling errors can be reliably categorized as being phonically plausible or implausible.

It is also assumed that most common phonic generalizations have been taught to the subjects, prior to this study.

It is further assumed that a consistent pattern of phonically plausible spelling errors reflects a behavioral set characterized by an over-reliance on phonic analysis skills and a failure to employ visual skills.

Summary

This chapter has presented a theoretical framework for the study, applying the skill development model. The purpose, assumptions, and limitations of the study have

been delineated.

Spelling is a skill that involves a highly complex behavior pattern which is often associated with the concept of difficulty. This skill has been studied from a variety of perspectives, including the analyses of spelling difficulty, correlations with other cognitive abilities, and attempts to develop effective instructional programs.

The complexity of the spelling task precludes a study of spelling instruction in the global sense. In the present study, one limited aspect of spelling instruction is investigated. Spelling instruction is related to one type of individual difference, as revealed by error analysis--the tendency to produce phonically correct misspellings. An attempt is made to determine which mode of instruction--auditory or visual--is more effective in overcoming spelling weakness among phonic spellers.

CHAPTER TWO

REVIEW OF THE LITERATURE

Analysis of Spelling Skill

It has been suggested that spelling skill represents a highly complex pattern of behavior, involving the integration of perceptual modalities, memory access, and motor functions. The ultimate goal of spelling instruction is to achieve a level of automaticity in which the individual is able to produce the symbols which constitute correct spelling without being conscious of any of the numerous aspects of his behavior; the letter shapes, the word forms, or the muscle movements. Prior to attaining this ideal stage, a level of spelling proficiency can be acquired through the perfection of the subskills which can be combined to produce those responses that do not come automatically.

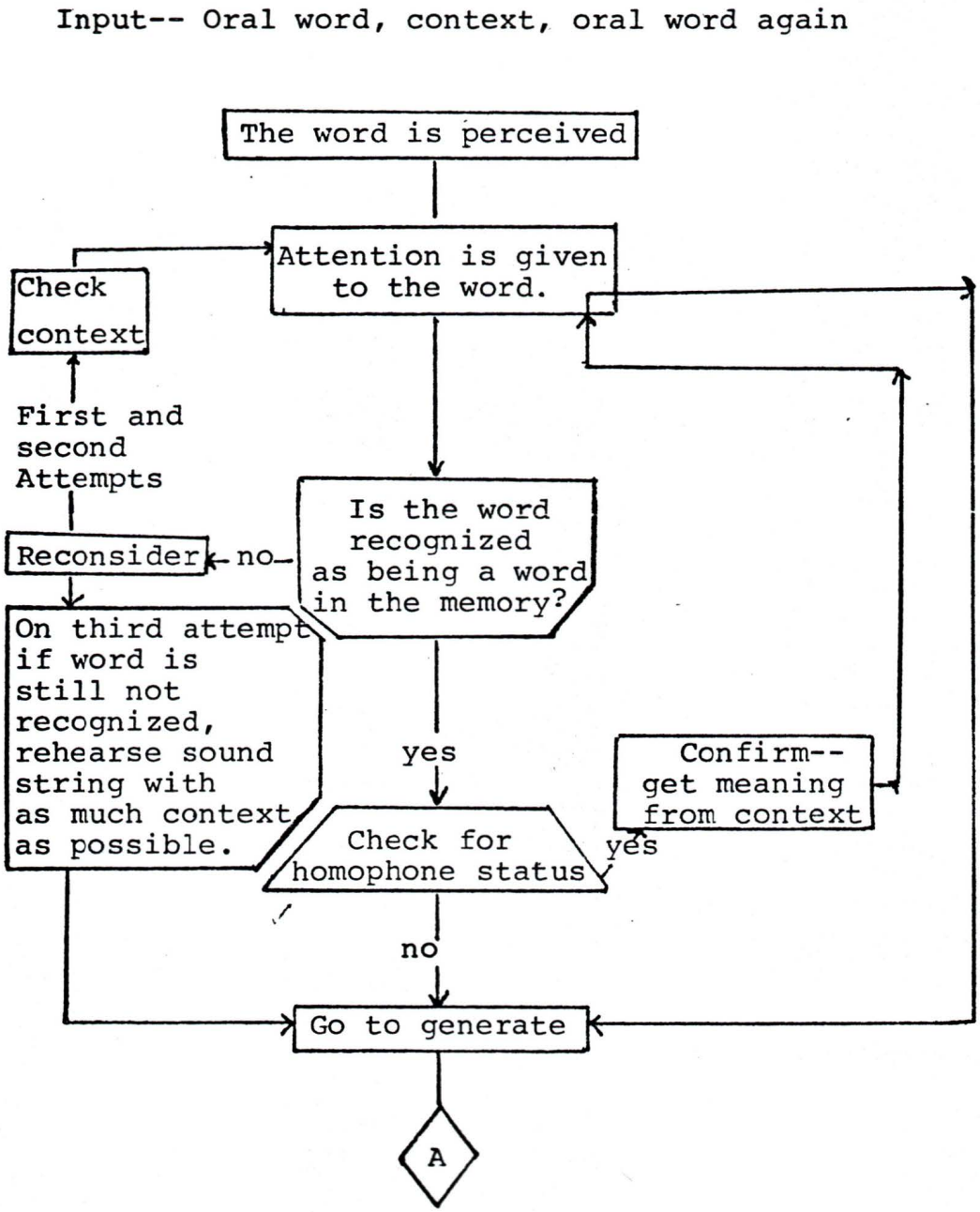
Simon (1975) has developed an information processing model that illustrates what occurs during a dictated spelling test. Information acquired in the process of reading, writing, speaking, and instruction is stored in the memory, available for selective retrieval for the purpose of spelling. Such data includes information relevant to the task environment--the meaning of words and phrases used in the directions; alphabets--the names (auditory data) of letters, visual and motor familiarity

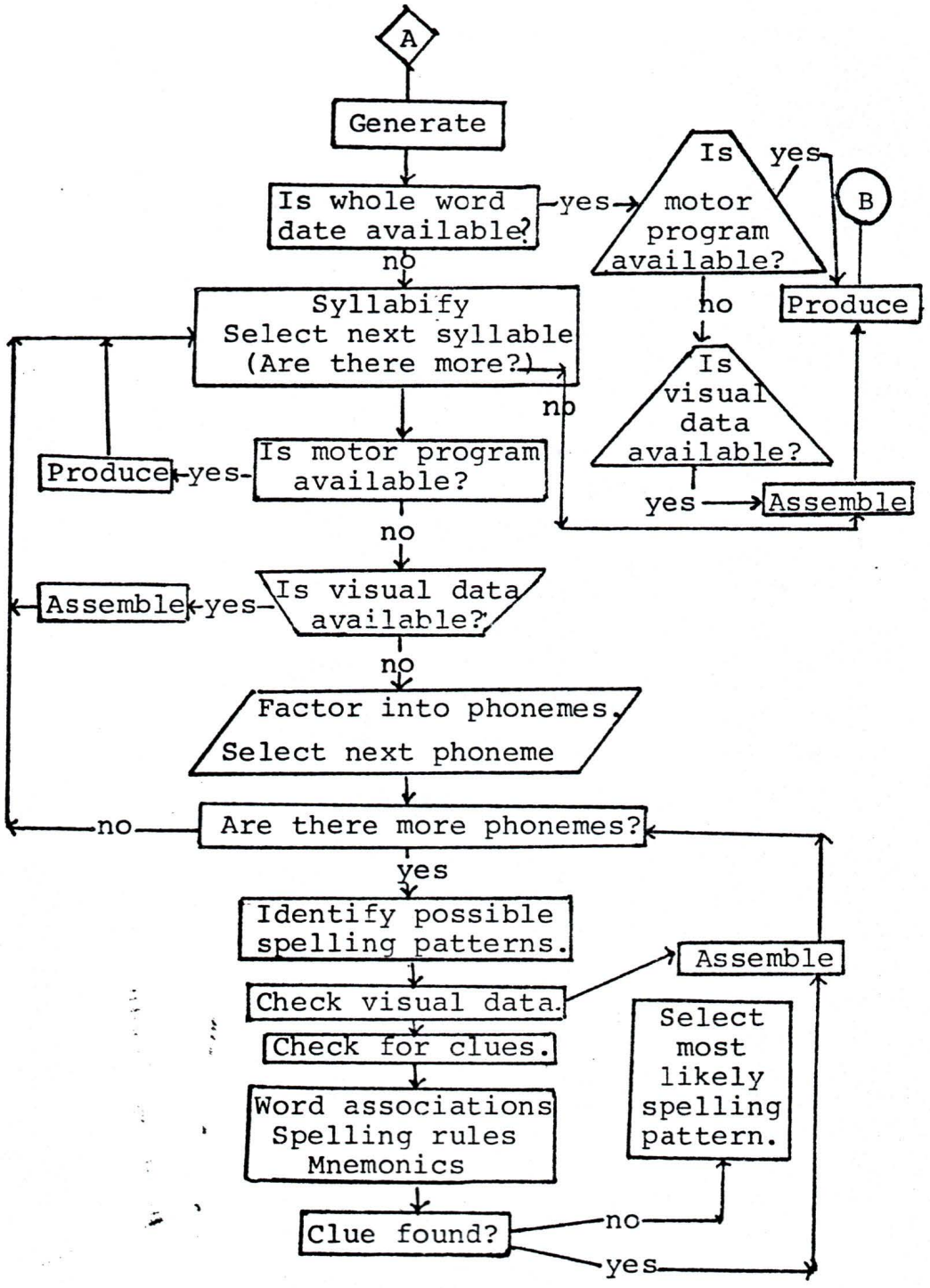
of letter shapes; sets of relationships--phoneme-grapheme correspondences; words--auditory representations (presence in speaking vocabulary), visual representations, meanings (necessary for homophones), pointers to rules and mnemonic devices: spelling rules relating to syntactical endings, pronunciation, orthography, and writing conventions; mnemonic devices; knowledge of external sources of spelling information--where to find them and how to use them. The effective use of the data is dependent upon the mastery of a number of spelling subskills. Figure 2-1 illustrates the processes involved in utilizing the available data to spell a word.

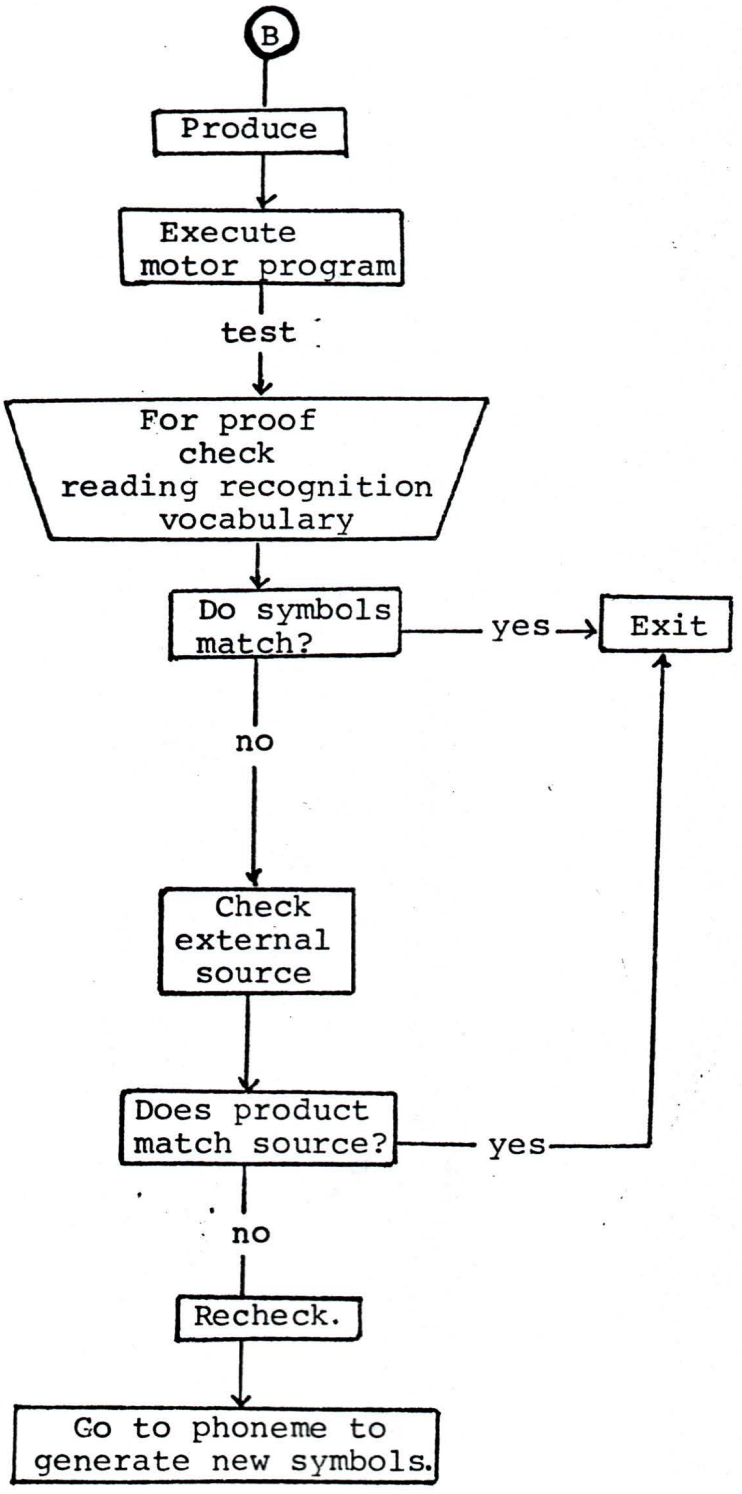
In this model of spelling, the perceived auditory stimulus, a spoken word, dictated in the word/context/word format, initiates the spelling process. The individual attends to the spoken word and attempts to match it to a word stored in his memory. If he is successful, he will proceed to the next stage. If the word is not recognized, he starts again, attending and double checking his memory. If the word is still not recognized, he will repeat the string of sounds to himself and attempt to identify the word according to the context in which it was presented. Once the word has been identified, it will be checked for homophonic status. If a homophone is recognized, the context will be checked for clues to meaning before a decision is made to write.

To this stage, all that has occurred is a series

Figure 2-1 The Spelling Process
(Adapted from Simon's SPEL2 program to produce written spelling from dictation.)




A
Generate
Is whole word date available?
yes
Is motor program available?
yes
B
no
Produce
Syllabify
Select next syllable
(Are there more?)
no
Is visual data available?
yes
Assemble
Produce
yes
Is motor program available?
no
Assemble
yes
Is visual data available?
no
Factor into phonemes.
Select next phoneme
no
Are there more phonemes?
yes
Identify possible spelling patterns.
Check visual data.
Assemble
Check for clues.
Select most likely spelling pattern.
Word associations
Spelling rules
Mnemonics
Clue found?
no
yes


B
Produce
Execute motor program
test
For proof check reading recognition vocabulary
Do symbols match?
yes
Exit
no
Check external source
Does product match source?
yes
no
Recheck.
Go to phoneme to generate new symbols.

of internal processes. Outwardly, nothing has happened. The individual is now ready to 'generate'. The word may be recognized as one which he has written many times and can now be produced at a level of automaticity, in which case it will be written immediately. If this is not the case, a visual image of the word may exist within the memory. If this is so, the image will develop motor data so the word can be written. In the event the whole word information is not available, the word will be factored into syllables and phonemes. The individual will then draw upon his visual memory of syllables, word associations, spelling rules, and mnemonic devices. The information will be converted into motor data and the word will be written. It is then checked for association with word recognition information. It may be checked with external sources and rewritten.

Clearly the spelling task requires the individual to attend to appropriate cues for action, and to select data carefully from the vast body of information that is available to him.

The task of spelling, as viewed in Simon's model, deals only with one specific aspect of spelling, the spelling test situation. Avakian-Whitaker and Whitaker (1973) indicate that the spelling task varies according to the situation in which it occurs. They cite three distinct spelling circumstances:

1. spelling a word spoken by someone else--
   as in the Simon model, and as will be done
   in the present study
2. spelling a word that is self generated in
   the act of writing
3. identifying words as being correctly or
   incorrectly spelled.

They state that in each of these circumstances, the spelling process involves four stages of performance:

1. identification of the word to be spelled
2. identification of the graphemes involved
3. transfer of the information acquired in
   stage two from the brain to the hand
4. motor performance.

Spelling is also seen as occurring at three levels; letter, syllable, and word.

One can assume from the Simon model that each of the stages described above varies in complexity, according to the word being spelled.

Hunt, Hadsell, Hannum, and Johnson (1963) investigated the spelling of various words to isolate four factors of spelling ability:

1. the ability to spell words that are phonetic
2. the ability to spell words that involve roots,
   prefixes, and suffixes and the rules for combining them

3. the ability to spell a word after looking at it
4. the ability to spell the demons.

They concluded that four distinct types of ability exist within spelling skill. Significant individual differences on test performance revealed independent variations in the abilities, within as well as between individuals.

Hunt et al (1963) employed nonsense words for all but the demon category in this study. It is therefore open to question as to whether or not the words used adequately reflect the structure of the English language. The question becomes particularly salient when one considers the number of words that can fit more than one category. Numerous words involve roots and affixes and are phonetic as well, for example.

Spelling is a very complex skill that involves the integration of a wide variety of functions, abilities and subskills. It has been suggested that the spelling task varies according to the situation in which it occurs and that spelling occurs in stages. Research involving nonsense words and spelling demons suggests that spelling subskills vary independently.

Breakdowns in Spelling Skill

Due to the complex nature of the spelling task, a breakdown can occur at any one of a number of stages. Schonell (1942) studied the causes of spelling disability using the case study approach with 107 children between the ages of 7 and 14 years. He found several general conditions connected with such disability:

1. weakness in visual perception of words for both discrimination and span; two types of backward spellers in this category
2. weakness in auditory analysis and synthesis of verbal material

   There may be a combination of (1) and (2) in some cases.
3. weakness in general intelligence, together with some perceptual deficiency
4. sensory defects, particularly visual defects
5. faulty pronunciation
6. temperamental attitudes, particularly variations in attitudes toward correctness of detail
7. emotional inhibitions
8. environmental conditions, such as absence from school, frequent change of school, bad teaching methods. (p. 325)

The failure to employ consistently objective measures may reduce the reliability of some aspects of

Schonell's study.

Peters (1967) surveyed a large body of spelling research, identifying three main sources of spelling weakness. She categorized the factors in the following manner:

I. Physical and psychological factors
   - A. Motor development
   - B. Sensation
     1. hearing
     2. sight
   - C. Perception
   - D. Imagery

II. Educational Experience
   - A. Opportunity to write creatively
   - B. Early educational experience
   - C. Method used to teach spelling
   - D. The effect of reading instruction

III. Motivation
   - A. A general casual attitude
   - B. Self image

Taschow (1970) also indicates that there are three basic sources of ineffective spelling. In his case they are listed as

1. the individual's attitude toward spelling
2. difficulties inherent in the English language
3. inappropriate teaching methods.

Peters, Schonell, and Taschow have each identified factors that can lead to a breakdown in the acquisition of spelling skill.

Spelling difficulties can occur as the result of weakness in sensory acuity, perception, motor development, unfavorable educational experiences, or motivational factors. The English orthographic system may contribute to spelling difficulties.

The complexity of the spelling task has provided researchers with a variety of perspectives from which to approach the topic of spelling difficulties.

Difficulties Inherent in the English Language

In a study that focused on Avakian-Whitaker and Whitaker's second stage of the spelling process--the identification of the grapheme to be used--Petty (1958) attempted to isolate specific trouble spots in the English orthographic system. He analysed 234 words that were frequently misspelled and an equal number that were rarely spelled incorrectly, isolating nine phonemes that might be related to spelling difficulty. He then administered a test of 100 difficult words to sixth and seventh graders. Correct and incorrect words were analysed and compared. No recognizable pattern of misspelling could be detected, due to the wide variety of misspelling per word. He concluded that the representation of individual sounds does not show a specific relationship to the persistent spelling difficulty of some

words. This led to the belief that each word must be seen as a unique and individual problem.

It is possible that Petty chose the wrong nine phonemes upon which to focus. His criteria for discriminating between the difficult and the easily spelled--correct less than 70% of the time for the former and more than 80% of the time for the latter--may not have resulted in significant differences between the two categories. If we do accept that there are no difficult phonemes, it does not necessarily follow that each word must be seen as an individual problem. To do so would be to overlook the syllable level of spelling.

Warren (1970) studied the spelling errors of fifth graders to develop generalizations to be used to improve spelling achievement. His generalizations proved to be of little use in overcoming spelling difficulties.

Pollock (1971) studied the specific words that have come to be known as demons. In a very comprehensive study at the high school level, he assessed 54,173 spelling errors, finding that although a total of 6,556 words were misspelled, each in a variety of ways by different individuals, 388 or 6% of the words accounted for over 50% of the errors. He concluded that some words are inherently difficult to spell.

Pollock's study does not relate the errors made

to the method by which spelling had been taught. It may be that the method of instruction employed was not appropriate for these words. Perhaps those individuals who could spell the difficult words had been taught differently than those who could not.

Schwartz and Doehring (1977) focused, not on the phoneme-grapheme correspondences of the English language, but on the ability of the children to abstract and encode spelling patterns. Two types of spelling patterns were considered--orthographic patterns, which relate to the writing system, and morphological patterns. They demonstrated that children did, in fact, learn pattern abstraction in the process of spelling acquisition and do not learn each new word as an individual problem, contradicting Pettty's conclusion. They also found that children experience significantly more difficulty with orthographic patterns than with morphological ones. The former could be used to discriminate between good and poor spellers as well.

These studies indicate that difficulties in spelling the English language cannot be attributed to any specific phoneme-grapheme correspondences. Certain words have been shown to be misspelled more frequently than others and have been assumed to be more difficult. It has been found that children learn pattern abstraction in the process

of learning to spell. They experience more difficulty with orthographic patterns than with morphological ones.

The studies reviewed seem to have certain problems with design and control which reduce the confidence with which the results can be used. It can be concluded, however, that some individuals experience difficulty with some aspects of English spelling.

Individual Differences and Spelling Achievement

Schonell (1942) included personality factors in his study of "Causes of Specific Backwardness in Spelling", citing:

1. general disregard for details, a temperamental attitude shown also in disregarding spelling details
2. laziness, inattention and apathy in overcoming spelling disability, often accompanied by lack of persistence in overcoming difficulties
3. emotional inhibitions
   (a) inferiority attitudes
   (b) superiority attitudes

Each factor was found to make a significant contribution to spelling disability. He found that for 30% of the backward spellers, some "abnormal development of the self-regarding sentitment" (p. 321) was an important factor in their disability. Some demonstrated "inferiority complexes", while others had developed a compensatory bluff to mask

their inabilities and refused to realize or admit their weakness.

The measures that Schonell used to assess these factors were neither standardized nor totally objective. He employed a case study approach, analyzing the individual's attitude toward detail in a variety of circumstances--daily work habits, dress, and minor social convention, in addition to handwriting. Emotional inhibitions were assessed in terms of the subject's expressed attitudes and his approach to tasks.

Fernald (1943) suggests that the personality factors that interfere with spelling acquisition are created by the school system:

> Spelling failures are due to bad habits forced upon the child by the school in attempt to teach him to spell....Negative emotions are aroused... when the child fails to learn... This emotional reaction serves as a block to prevent him from learning. (p.183)

Peters (1970) found one aspect of personality, carefulness, as evidenced in handwriting, to be an important predictor of spelling achievement. (This study will be discussed in more detail later.)

Personality has been shown to influence spelling achievement.

In addition to considering personality differences, researchers have investigated the relationships between spelling achievement and a wide variety of other individual differences.

Aaron (1952) evaluated the ability of nine visual and auditory perception tests and intelligence to predict spelling ability as it related to words that ranged from purely phonetic to nonphonetic in structure. He found measures of visual analysis, recognition of beginning and ending sounds and the ability to spell phonetic syllables to be good predictors of spelling achievement. Binaural tests were found to be totally nonpredictive. Intelligence was found to be positively correlated to spelling achievement, but did not increase the predictive power of the other three types of tests.

Ahlstrom (1964, 1966) administered a battery of 17 tests, then performed two factor analyses, each of which indicated the existence of five factors of spelling ability, interpreted as

1. the ability to use the conventional linguistic symbols used in formal language instruction
2. phoneme discrimination ability
3. immediate memory for material presented visually
4. inductive intelligence
5. interest in reading

Bannatyne and Wichiarajote (1969) administered a battery of 11 tests to investigate the relationship between written spelling and motor functioning, balance, handedness, visuo-spatial abilities, and various auditory and vocal skills. Written word spelling was found to be significantly correl-

ated with unlearned ambidexterity, sound blending, accurate visuo-motor drawing of memorized unit designs, balancing on feet, and visual memory for complex unit designs. No such correlations were found between auditory closure, auditory memory for letters or digits, visual memory for sequences of designs, auditory discrimination, or visual memory for unit designs when they were not drawn.

In an investigation of the "child variable" that involved 846 children over a two year period, Peters (1970a) used standardized spelling tests; diagnostic spelling tests; tests of visual perception, speed and carefulness of handwriting, and ability to generalize from known word forms; as well as teacher questionaires to assess the following factors in terms of their ability to predict spelling achievement and progress:

1. verbal intelligence
2. visual perception of word form
3. speed of handwriting
4. quality of handwriting
5. fluency
6. rule following approach
7. generalization
8. auditory perception
9. socio-economic status
10. place in family
11. size of family

12. period of year born
13. handedness
14. vision
15. hearing

The relationships were investigated through the use of stepwise regression analysis. Peters concludes

> The overall picture from examining the data related to the child variable reveals a complex of inter-correlations around acquired characteristics associated with spelling attainment, and of these verbal intelligence is the most powerful predictor, followed by visual perception of word forms, then carefulness evinced in quality of handwriting. Other acquired abilities that are slightly predictive are speed of handwriting and rational approach to words. At nine years, socio-economic status... (is) slightly predictive....
>
> (When dealing with less favoured children) family order (is important)....if they have the advantage of being in a favourable family position, viz. singleton or eldest rather than youngest or middle, they can progress. (p. 36)

Groff (1962) investigating the relationship between handedness and spelling achievement, concluded that no such relationship exists. He did find significant sex differences in his population of fourth, fifth, and sixth graders.

Unlike Groff, Peters found no sex differences. "There are no significant differences between the sexes in spelling attainment at nine or eleven years." (1970, p. 29)

Personke and Yee (1971), considered sex differences, along with verbal ability and pretesting effects in a study of phonic instruction and spelling. They concluded, "...in accounting for variance in pupils phonetic spellings, the results indicate that the most potent contributor to variance is pupil's sex." (p. 62) In reference to tests of unrelated words they state, "These highly significant F ratios indicate the superiority of spelling ability of girls over boys," (p. 62) and in general, "The most potent source of variance proved to be sex". (p. 67)

Wallace (1972), Warren (1969), Pollock (1971) and Manolakes (1975), also cite sex differences in spelling achievement, with girls being superior.

Mosely (1974), in his study of cognitive and perceptual correlates of spelling ability among children between the ages of 11 and 14, found no significant sex differences in levels of achievement. He did find, however, that girls who were poor spellers scored high on creativity, while boys who were poor spellers scored low on this factor.

Researchers have not reached a consensus on the relationship between spelling achievement and sex.

Mosely's study, unlike Peters', found little connection between verbal reasoning and spelling achieve-

ment. This may be related to the fact that the two studies involved different levels of spelling. Mosely focused on spelling in spontaneous writing, while Peters' focus was on the test situation.

The relationship between spelling and reading achievement has also been investigated.

Pepe (1979) found that good readers were significantly better spellers than poor readers, with the latter making 2.3 times as many errors on spelling tests of phonic generalizations presented in dictation format. She also found that there was no appreciable overlap in the type of errors made by the two groups.

Nelson and Warrington (1974), investigated levels of IQ and reading achievement, as they related to spelling achievement. They found that individuals who were retarded in both subject areas demonstrated a decrement of verbal IQ, in comparison to the performance IQ. No such deficit was apparent for those who were retarded in spelling only. Differences were also found in the types of errors made by the two groups, with the spelling only group having fewer phonetically inaccurate ($p < .05$), but more phonetically accurate errors than those who were retarded in both reading and spelling.

Holmes and Peper (1977) investigated the types of spelling errors made by good and poor readers. Unlike

Nelson and Warrington, they found that different error types varied in their probability of occurrence for all subjects, regardless of group. This contradiction may be attributable, in part, to differences in samples in the two studies. While the first study compared individuals who were retarded in reading and spelling to those retarded in spelling only, the second compared good and poor readers.

Peters (1970) compared the spelling achievement of matched samples taught to read by phonic and look-and-say methods. The total number of errors for the two groups were found to be very close. Significant differences were found in the kinds of errors made. Children taught phonetically made significantly more errors that were reasonable phonic alternatives and fewer unclassified errors. For the group with high IQ (116+), the differences due to teaching method vanish almost completely, however.

In a second experiment, Peters (1970c) compared the spelling achievement of matched groups whose reading instruction had been in traditional orthography (t.o.) with rigorous look-and-say and phonic schemes, and in the initial teaching alphabet (i.t.a.). Again the total number of errors were found to be essentially equal for the two groups. Analysis of errors revealed a difference at $p < 0.001$ in the single for double letter error, and in the substitution of

reasonable phonic alternatives and in homophones, indicating significantly more errors in i.t.a. than in t.o. In all three categories of error, the mean for i.t.a. was greater, but the variance less than for t.o. The difference between t.o. and i.t.a. in faulty auditory perception, perseveration, and unclassified errors shows significantly more errors in t.o. than in i.t.a., again $p < 0.001$. Differences at the higher IQ level were not found.

As a result of the two experiments, Peters concluded:

> The use of one of two reading methods (look-and-say or phonic) or a new medium (i.t.a.), when rigorously operated, does not seem to affect the level of spelling attainment.
>
> Differences in method or medium seem, however, to lead to differences in perception which show themselves in the type of spelling error made. (p. 66)

Williams (1974), compared the spelling errors of above and below average ability students. He found that the above average group frequently employed plausible phonetic alternatives. They also made twice as many insertions as the below average group, who, in turn, made significantly more omissions.

Researchers have investigated the relationships between spelling achievement and a wide variety of individual differences. Visual memory and phoneme discrimination ability have been found to be predictive of spelling

achievement. Verbal intelligence and reading skill correlate positively with spelling skill. The relationship between verbal and performance IQ is predictive of the type of spelling errors that will occur. The type of reading program employed has been shown to influence the type of spelling errors made, but not the level of achievement. No consensus has been reached regarding sex differences in spelling achievement. None of these studies has used its findings to develop instructional programs that consider individual differences.

Error Analysis

Some of the discrepancy among the findings of studies dealing with the qualitative differences in spelling ability may be partially attributable to differences in methods of error analysis.

The significant differences that were found in the Nelson and Warrington (1974) study were based on the reclassification of six error categories into a simple dichotomy (phonetically accurate or inaccurate), while the Holmes and Peper (1977) study employed a nine category system of error analysis. It is possible that the findings of the two studies may have been compatible if they had employed similar error analysis.

In a study of the relationship between visual and auditory memory and spelling skill, Day and Wedell (1972),

(discussed in detail later) like Nelson and Warrington, employed a double system of error classification. The first system employed 13 categories and the second a dichotomy, again reflecting the phonetic plausibility of the response. The first system revealed significant differences, related to perceptual skill, in the frequency of letter confusions, single letter insertions and unclassified errors. The second system revealed no significant differences.

Suggesting that phonetically correct misspellings were visually based errors, Herring (1973) referred to such errors as visually based errors. Errors that were lacking in phonetic plausibility were referred to as phonetic errors. Herring attempted to correlate his error classification to performance on tests of visual and auditory perception. His results were quite inconclusive. While a weakness may lie in his classification system, it is also likely that changes in other aspects of the study might have produced more definitive results.

While visual errors in the Herring study were defined as being visually inaccurate but phonetically accurate, the phonetic errors were defined on only one dimension, the lack of phonetic similarity. As a result, the phonetic category may have been contaminated with "garble" responses and substitutions. Although this may not have had an effect

on the phoneme level, it may have had a significant effect upon the whole word level of error analysis. The categorizing of both error types with a given word may have confounded the correlations with perceptual scores.

Since correlations in this study were calculated simply on the basis of errors made, without regard for consistency of error pattern, it might be expected that a significant number of subjects did not demonstrate a regular error pattern. It would, therefore, not be expected that such individuals would demonstrate significant differences in visual and auditory skills. It is suggested that significant relationships between error types and perceptual scores would not be expected under such circumstances. It might have been more productive to have identified visual and auditory spellers, according to their error pattern, and to have correlated their perceptual socres and error scores.

A further weakness of this study involves the perceptual tests employed. While the visual tests were memory tests, the auditory test was one of discrimination--one for which no validity or reliability data were available. Parallel assessments of the respective perceptual abilities would have been more desireable. While visual memory tests encompass visual discrimination and may be said to assess the visual component of the spelling task, an auditory discrimination test cannot be said to encompass

all of the auditory skills involved in the spelling process. The test that was used involved a series of same-different discriminations of word pairs. Phonic spelling involves the assessment of the number of phonemes in the stimulus word, the isolation of individual phonemes, attention to the sequence of these phonemes, and the identification of appropriate grapheme-phoneme correspondences.

Herring's classification of spelling errors may have been valid, even though it was not substantiated by his procedures.

Classifying errors as either phonetically plausible or implausible does not present sufficient information to categorize the source of error. It may stem from poor auditory skills, including a poor grasp of phonics. If the word produced bears visual resemblance to the stimulus word, it may reflect an over-reliance on visual skills. Manolakes (1975) reported bizarre spellings, some of which could not be accounted for by dependence upon visual skills. Holmes and Peper (1977) and Avakian-Whitacker and Whitacker (1973) also employ a "garble" category in their analysis of errors. The category includes, in addition to pure garble, words that are semantically related to the stimulus word and others that appear to be "just words that the subject knows how to spell".

Schonell (1942) classified errors into five main categories, according causal factors:

A. Weak Visualization--Type A

Errors typical of the first group of weak visualizers are:

(i) Confusion of visually similar letters

(ii) Transposition of letters

(iii) Reversals of short words.

These mistakes, he states, would be minimized if the individuals supplemented their faulty visual powers with auditory-articulatory aids.

B. Weak Visualization--Type B

The individual neglects the visual forms of words and hence makes no transpositions, reversals or visual confusions. He relies almost wholly on auditory recall of the word.

C. Weakness in Auditory Analysis and Synthesis of Verbal Material

The individual demonstrates (characterized by) the inability to spell long words and makes auditory substitutions.

D. Sensory Deficits

E. 1. Defective Speech

2. Faulty Pronunciation

F. General Disregard for Details

Dolch (1942) advocated the inspection of spelling papers to aid the teacher in locating possible uses of unsuitable method of spelling:

> If practically all the mistakes are caused by an obvious attempt to spell all words by sound, we can be pretty sure that the child is not using visual images or the "looks of words" as he should, or is not using thought-spelling where thought-spelling is possible. If the letters in words are rather illogically mixed up, the child is usually trying to read the letters of the mental picture and is not seeing the mental picture clearly enough to do so. He is obviously not checking with the sound or the letters would not be so mixed up. And if the letters bear little resemblance to the words he was supposed to be spelling, we can at once be suspicious that the child did not hear the words given him. A check of hearing should be made. (p. 242)

Following a somewhat different approach to that of Schonell and Dolch, Fitzgerald (1951), indicated that spelling errors are commonly related to the following factors:

1. capital letters
2. double letters
3. apostrophes
4. hyphens
5. omissions
6. additions of letters
7. transpositions
8. spelling phonetically non-phonetic words
9. nonsensical word forms

10. homonym errors

Peters (1974) suggests that there are three broad categories of spelling errors:

1. reasonable phonic alternatives, including homophones
2. phonic alternatives not conforming to a spelling precedent
3. random words

Researchers have used a variety of methods of classifying spelling errors. While the dichotomy of phonetically correct/incorrect is useful in isolating errors that appear to result from an over-reliance on phonics and a failure to employ visual skills, the class phonetically incorrect is not sufficiently precise to formulate a diagnotic category. For this reason, the present study will focus only on phonetically plausible errors.

Learning Style and Spelling

Mills (1955) demonstrated in the field of reading recognition that different individuals learn more effectively through different perceptual modalities. His results were supported by Coleman (1962), Dauzat (1962), and Bruinicks and Clark (1970). Other researches were unable to find significant differences between the effectiveness of instruction provided in the preferred mode and

that of a nonpreferred mode (Donovan & Austin, 1978; Williams & Williams, 1972).

Galton (1907) concluded from his collection of case studies and questionnaires that individuals vary greatly in their ability to visualize and that such ability can be developed through practice or could be subordinated and fall into disuse.

Aaron (1954) investigated the correlations between spelling and nine measures of auditory and visual perception, concluding that both visual and phonetic skills are essential to effective spelling.

Kuhn and Schroeder (1971) compared the use of visual and auditory modes with the use of the auditory mode only, in the corrected test approach to spelling instruction. The combination method was found to be more successful on the whole group basis. Individual differences were not investigated.

Fernald (1943), Schonell (1942), and Dolch (1942) each stress that no one mode of spelling instruction is appropriate for all individuals.

Dolch (1950), indicates that there are five different ways of spelling:

1. "lip-spelling"--the mere habit of the speech apparatus (The student will 'rattle' off the letters.)

2. "eye-spelling" or visualization
3. "sound-spelling"--spelling every word by sound (The student may try to spell even everyday words by sound, thus making many mistakes.)
4. "thought-spelling"--figuring out why the word is spelled that way, and how to remember it by association
5. "hand-spelling"--muscle habit (Kinesthetic learning).

Dolch states:

> Usually the poor speller tends to use only one method of spelling, either lip-spelling, eye-spelling, or sound-spelling. Any one of these serves some purposes, but no one serves all purposes. Therefore, he continues to make mistakes and he will go on making mistakes all his life until he learns to use the right method at the right time. (p. 243)

Dolch goes on to explain that the problem of remediation is complicated, in many instances, by weaknesses in one or the other of the two essential underlying abilities, the ability to visualize and the ability to accurately hear the sound of a word and to change that sound into letters. He states that, although these abilities may be weak, they will not be totally absent and can be developed through practice. (In either case, however, if the handicap is great,

Dolch indicates that great change cannot be expected.)

It is suggested that individuals who consistently make phonetically correct misspelling have well developed phonetic skills, but poorly developed visual skills (Schonell, 1942). It would follow that such individuals would improve their level of spelling achievement through the use of visual instruction.

Day and Wedell (1972) compared the types of errors made by individuals whose auditory skills were superior to their visual skills with those made by others whose visual skills were superior. They were unable to confirm a relationship between the perceptual skills and the frequency of phonetically correct misspellings. They did not consider competency in sound-symbol relationships, however.

Boder (1970) has classified dyslexic students according to their spelling and reading errors. The "dysphonic" group demonstrates a deficit in phonics skills. Their spelling errors are nonphonetic and essentially unintelligible. The "dyseidetics" do not employ effective visual skills and over-rely on phonics. Their spelling is phonetic, according to their own pronunciation.

In a study dealing with the ability to spell words that are phonetic, Nelson and Warrington (1974) found that students who obtained lower verbal than performance scores

on the WISC were more likely to make phonic errors in their spelling. Such individuals rely on their visual skills, which are more highly developed. Students who made phonetically correct errors did not tend to underachieve on verbal tests. This suggests that the auditory skills of the latter group are well developed, while the visual skills are not.

Walker (1974), compared good and poor visualizers in their ability to spell words that are subject to misspellings that result from sources other than mispronunciation and inapplicability of phonic generalizations. Good visualizers were found to be superior in this capacity.

These studies suggest that while some individuals need to develop their phonic skills and reduce their reliance on visual skills, others need to develop their visual skills and reduce their reliance on phonics. No method can be assumed to be most effective for all individuals. It is suggested that the analysis of spelling errors will provide clues as to which method is appropriate for a given individual.

Phonics and Spelling Achievement

Although much has been written about the use of phonics instruction to improve spelling achievement (Craigie, 1927; Schonell, 1942; Gillingham and Stillman, 1956; Green, 1959; Blake, 1960; Hall, 1961; Hahn, 1964; Yee, 1966; Hodges, 1966; Cronnell, 1971; Hanna, Hanna and

Hodges, 1967; Durrell, 1976), it remains one of the most controversial issues in the field of spelling instruction. While at one extreme some (e.g. Cronnell, 1971), endorse the almost exclusive teaching of phonics, at the other extreme, others (e.g. Hendrickson, 1967), claim that English is a visual, not a phonetic language.

Aaron (1952), tested 203 fourth graders to determine the relative contributions of nine auditory and visual discrimination measures and intelligence in estimating the results of five spelling measures. The tests consisted of lists of words classified as purely phonetic, almost phonetic, phonetic, partially phonetic and non-phonetic. Of the nine perceptual measures, only three were found to be predictive of spelling achievement:

1. visual analysis
2. recognition of beginning and ending sounds
3. spelling phonetic syllables

Aaron's study, he concluded,

> would not lend support to those who desire to eliminate all dependence upon a phonetic approach in the teaching of spelling. Neither would it support those advocating an almost total dependence upon phonetics... certain phonetic skills contributed significantly to the prediction of spelling, even to the spelling of words of non-phonetic content. (p. 126)

Hunt, Hadsell, et al (1963, discussed earlier) found "the ability to spell words that are phonetic" to be

one of four independent factors determining spelling achievement.

In a study comparing the spelling achievement of Scottish and American children, Personke (1966), concluded that the superior achievement of the Scottish group was at least partially attributable to their use of a structured phonics program. Error analysis of the two programs revealed that the spelling errors of the Scottish children were more frequently phonetically plausible errors. (This study will be discussed in more detail later.)

Warren (1970) attempted to use the analysis of spelling errors to identify highly functional phonics generalizations. Five generalizations so identified were then taught to 95 fifth graders over a six week period. Their spelling achievement was then compared to another group from another school that employed the same reading and spelling programs. He found that the teaching of his generalizations did not improve spelling achievement.

T. D. Horn (1970) concluded that while phonics is an important aspect of spelling instruction, it does not make an effective program on its own; reinforcing the earlier statement of E. Horn:

> a. Teaching the consistencies and inconsistencies of sound to letter relationships should be an integral part of spelling instruction.
>
> b. The teaching of phonics generalizations... should be limited to those which apply

> to a large number of words and have few exceptions...
>
> c. Phonics instruction should be used as an aid to spelling rather than as a substitute for the direct instruction of words. (1960, 1351)

Cronnell (1971) prepared a list of 166 rules to be used in the teaching of spelling in the primary grades. He indicated that more would be necessary for the teaching of words of more than two syllables. (Presumably he would advocate delaying teaching such words as Saturday, grandfather and unhappy, and all other three syllable words until the intermediate grades and then introduce additional rules.)

Davis (1972) studied the applicability of phonics rules to seven spelling programs which are described, by their authors, as being phonetic in their approach, and to a list of words drawn from elementary subject areas. She found that the subject related words often did not follow the rules. In reviewing the spelling programs, she found that of the 45 generalizations considered, only nine were 100% applicable, while another 17 met the 75% criterion. She concluded that phonics generalizations are only moderately useful in spelling instruction.

Lanyon (1974) compared the effectiveness of two approaches to improving phonetic spelling. One group of students was given articulation training, while the other was given auditory discrimination training. No significant

differences between the effectiveness of the two methods were found.

Manolakes (1975) criticized the prominent role of phonics in spelling instruction, citing the high number of phonetically correct misspellings that occur as evidence that spelling weakness is not a product of inadequate knowledge of sound-symbol correspondence. He indicated that visual skill and personality factors are more important.

Groff (1979) presented the case for and against the use of phonics instruction in spelling programs, concluding, like Aaron and Horn before him, that while instruction in phonics does not constitute a total spelling program, it does play an important role.

Research has indicated that phonics instruction is an important element of spelling instruction but it is not the only element. Phonetically correct misspellings have been cited as evidence of adequate skill in phonics. Many phonic generalizations commonly taught in the spelling programs are not applicable to subject area words and are limited in their usefulness in spelling programs. Some phonics skills have been found to contribute to the predication of spelling, even to words that are essentially nonphonetic.

Visual Perception and Spelling

Although some elementary spelling texts (Green,

1959; Dunlop, 1964; Patton and Johnson, 1968) emphasize visual skills in their "Study Steps" in the introductory sections of the books, the programs presented tend to focus on the development of phonic skills and assume the presence of the necessary visual skills. Literature supports the introduction of visual training in spelling programs.

Gates (1926) and Sister Mary of Visitation (1929) each conducted studies of the relationships between visual perception, spelling, and reading. They each found that although visual discrimination is essential to both subjects, the perceptual ability functions differently in the two subjects. Neither researcher found any appreciable relationship between the ability to perceive nonverbal materials and the capacity to spell.

Hartman's (1931) study of college students and the relationship between perceptual abilities and spelling skill revealed that speed and accuracy of visual perception exert greater influence over spelling proficiency than auditory or reading skill.

Schonell (1942) identified two distinct types of weak visualizers. The first type, those individuals whose powers of visual perception were weak but who placed considerable emphasis on the recall of visual patterns, tended to overlook the auditory aspects of the words, making

no apparent use of phonics. The second type of weak visualizer neglected the visual patterns of words, producing phonetically plausible misspellings.

Aaron's (1952) study, discussed earlier, revealed visual analysis skills to be the best predictor of spelling achievement. The predictive strength of such skills was found to apply to all categories of words on his continuum, ranging from purely phonetic to non-phonetic.

A few years later, Mason (1957) investigated the effects of letter group discrimination training on spelling achievement among sixth graders. He found that all children tested--regardless of their level of word discrimination--could benefit from discrimination drills, as evidenced by an increase in spelling ability. The degree of benefit was found to vary directly with the initial level of word discrimination ability.

Radacker (1963) investigated the effects of visual memory training. He employed three groups; the first was a control, the second received two training sessions and the third received six training sessions. Working with third graders, he trained visual memory directly, using words typed on cards. A card was presented to the subjects who were directed to look at it, then close their eyes and visualize it projected in large glossy letters on an outdoor screen. This image was to be held for up to a minute.

Stability of the image was created by suggesting the use of metallic letters with fantasy holes for fantasy nails. Retention was improved by imagining fantasy paste being used to glue the letters and adding a flood light.

Although differences were found between the levels of spelling achievement of the control group and each of the experimental groups, with the latter demonstrating improved spelling skill, no significant difference was found between the two experimental groups. Individual differences were not investigated.

Studying the spelling skill of university freshmen who had failed an English entrance exam, Hunt et al (1963), (discussed earlier) determined that the ability to look at a word and spell it later is one of four types of spelling skills. It was found that among individuals of equivalent overall spelling ability, each of the four spelling subskills varied independently. Hence, the level of visual skill cannot accurately be predicted from the overall level of spelling skill or from any of the other subskills.

Beard (1965) administered a battery of 22 tests to 145 children to investigate a variety of perceptual factors. He found boys to be superior with visual materials, their mean scores on visual perception and non-verbal reasoning being higher than those for girls. (The mean

scores for verbal reasoning was almost equal for the sexes.) Beard identified several factors of perception:

1. reasoning
2. a spatial factor
3. verbal closure
4. speed and strength of closure
5. flexibility of closure
6. perceptual span.

He found "No factor is solely concerned with visual tests or with auditory tests, but the overlap is not so great as to indicate an inevitable choice of perceptual factors transcending modalities." (p. 218)

Although separate factor analysis for boys and girls produced the same factors, correlations between tests were generally greater for boys than for girls, much greater for spatial tests. Girls excelled in verbal intelligence.

Beard's findings suggest possible sex differences in modality functioning that might affect spelling performance.

Schroeder (1968, 1971) gave consideration to such possible differences in a study of visual and auditory perception in spelling. The study was designed to assess the effectiveness of spelling instruction in only one mode (auditory) with instruction in two modes (auditory and

visual). The combined method was found to be superior for both sexes, at all ability levels.

Mosely (1969) investigated the effectiveness of graphic cues as spelling aids. Using worksheets with five different typographical cues (one being black print with no special cues), he found the sheet with 'ar' in scarlet, silent letters in fine type, neutral vowels in italic type, and stressed syllables in bold type to be the most effective.

Significance was to the 0.01 level when compared to the black print with no special cues. This study indicates the significance of a visual component in spelling instruction.

Bannatyne and Wichiarijote (1969) investigated the relationships between spelling ability, motor functioning, balance, handedness, visuo-spatial ability (independent of motor activity) and various auditory and vocal skills. Scores on the Schonell spelling test were found to be significantly correlated with scores on tests of spatial memory and memory for designs tests, suggesting a visual factor in spelling ability. The researchers conclude:

> Spelling as a written test is very much (but not entirely) determined by the efficiency of the motor/kinesthetic/praxic/visuo-spatial output or encoding processes, the sequencing memory in these processes and degree of automatization or habituation which has or has not been achieved in output. After all, it is self-evident that spelling is, in a large part a rote memory (automized) process. (p. 12)

Day and Wedell (1972) used the visual sequencing task from the ITPA and the Strambak auditory memory test to identify subjects for whom skill in visual functioning was superior to their auditory skills, and others for whom auditory skills were superior. Students who did not demonstrate significant differences between auditory and visual functioning served as controls. Spelling ability was assessed using the Schonell Test of Irregular Words, stopping after ten errors. The errors were classified according to Livingstone's method and in terms of phonetic plausibility. No significant differences were found among the levels of spelling achievement of the three groups. The auditory group had significantly fewer syllable confusions and the control group had more letter insertions and fewer unclassified errors. No significant differences were found in the frequency of phonetically plausible errors. The failure of the second error classification system to discriminate among the groups may have resulted from a lack of consideration being given to competency in phonetic analysis skills.

Peters' (1970) regression analysis (discussed in detail earlier) indicated that visual perception of word forms was second only to intelligence as a predictor of spelling achievement.

Walker (1974) in a study designed to investi-

gate the interaction between image ability and types of spelling errors, hypothesized that the superiority of good visualizers over poor visualizers would be most pronounced when the errors were not due to mispronounciation or inapplicability of phonic generalizations. The errors made on 108 spelling demons were classified as P (faulty pronounciation or inapplicable phonic generalization) or V (all others). From the words with only one type of error, 24 of each class of word were selected; matched for difficulty, frequency and length. Thirty-three good visualizers and 30 poor visualizers, identified through the use of Bett's Questionnaire on Mental Imagery, were tested with the 48 word list. The interaction between visual ability and error type was found to be significant to the 0.01 level, the superiority of good visualizers being most evident in V words. Walker concluded that P words are recalled according to phonological rules while V words depend upon visual images. (It might be suggested that students who experience difficulty with words that are not spelled phonetically need to improve their ability to employ visual images.)

Cotterell (1974) reported a case study of a nine year old boy who underachieved in spelling. His verbal ability was in the high average range, but his performance score was below average. His spelling errors [as predicted by the Nelson and Warrington (1974) study] were primarily

plausible phonic alternatives. Successful remediation involved the use of kinesthetic and visual training.

Gates and Chase (1976) compared the spelling ability of hearing and deaf children of similar reading ability. The deaf children excelled in spelling ability and demonstrated excellent word perception, suggesting a greater significance for visual skill than for auditory skill in the development of spelling skill. This study, it should be noted, compares hearing impaired and non-impaired children with reference to reading ability rather than age, so it may be that the deaf children were significantly older than the controls.

Research has shown visual perception to be a vital component of spelling ability. Visual skill is a good predictor of spelling achievement. Visual discrimination training, visual memory training and visual cueing have each been found to improve spelling achievement. Individuals with good visual skills have been found to be superior in the spelling of words that are not phonetic in nature. Visual skill in spelling is independent of other spelling subskills. Possible sex differences in modality functioning may affect spelling.

The development of visual perception skills is a desireable component of spelling programs.

Instructional Programs

Many researchers have studied and assessed programs of instruction, hoping to find a "best method" for teaching spelling. Others have attempted to reveal inappropriate aspects of current practices or to demonstrate the advisability of new practices.

In comparing methods of spelling instruction at the twelfth grade level, working with students with spelling difficulties, Burton (1953), employed the Fitzgerald method, a spelling rules program, and an incidental program in which the students kept track of their own spelling errors from their written work. He was unable to detect any superiority of method, concluding that no one method is best for all students. Maturity level or achievement level may have played a role in the results of this study.

At the sixth grade level, a spelling program utilizing individualized lists generated from spontaneous writing activities was developed by Richmond (1956). He employed a highly structured study program to be followed by all students. He indicated that some students had weaknesses in visual, auditory, speech, kinesthetic, or handwriting skills--yet all were required to employ the same study procedure. He perceived a need for individual word lists, but he did not envision indivual study practices. The "low group" did use a study-test plan while the other groups used a test-study plan, however. Although very favorable results for the program were

reported, no control group was used and the method was not compared to other teaching procedures. The objectivity of the reporting may be open to some question.

Also at the elementary level, grades three through six, Cook (1957) compared a workbook program to a non-workbook program. Both groups studied a basic word list and attempted to gain understanding of word structure through the study of prefixes, syllables, root words, word meanings, and pronunciation. Members of the no workbook group were found to have made superior achievement. It is suggested that the reading of the workbook may have caused difficulties for some students, resulting in attention and energy being directed away from the spelling activities.

Eisman (1962), combined individualized word lists with individualized study methods in a comparison of individualized and group instruction for third grade students. In the former case, students selected their own words for study from the Madden and Carlson lists, choosing as many as they felt they could learn in the week (day one). The following day they were given time to practice their words. A partner pretest was given the next day. The fourth day the student was to practice the words in any way he felt appropriate. The final day a test was given and any unmastered words were carried over to the following week. In the group instruction program, all of the students were

given the same list of words, also selected from the Madden and Carlson lists and followed a state adopted program. The individualized instruction group made significantly greater gains in spelling achievement than the group instruction students. While mean IQ's were reported for both groups, Eisman did not analyse his results according to ability levels. It is possible that low ability students might have benefitted from specific instructions in study procedures that would best suit their individual needs.

Schoephoester (1962) focused on one aspect of the spelling program, variations in the test-study plan. Three varieties were compared, each being employed for a four week period with the same group of students. The first plan consisted of two periods of instruction per week, pronunciation and word meaning exercises and initial corrected test on Monday and a mastery test on Friday. The second plan involved the same activities on Monday and Friday and added a mid-week corrected test. The third plan substituted a mid-week word study period for the second corrected test. Delayed recall tests revealed that the effectiveness of the methods varied according to the ability level of the students. Above average students did equally well on all three methods; average students did equally well on the last two methods; below average students mastered significantly more words on the third plan. This study suggests that no one plan is suitable

for all students, and that the amount and kind of instruction needed varies with the ability of the student.

In addition to focusing on grouping and organizing for instruction, researchers have also investigaged the type of instruction provided in various programs.

Edgerton and Twombly (1962) developed a course of programmed spelling instruction and compared the progress made by children on their program with that of a control group. They reported significantly greater gains by both their pilot group and the experimental group when compared to the control group. They did not report what procedures were employed with the control group or if any effort was made to control for Hawthorne effect.

In another study of programmed instruction, Buzzby and Mann (1962) compared progress made by students using the Mini-Max teaching machine and the TMI Grolier Fundamentals of Spelling Program with that made by those taught through teacher instruction and those in a flash card group. No significant differences could be found. Although three ability groups were included in the study, their results were not reported separately.

Personke (1966) compared the spelling achievement of Scottish and American children. The Scottish children began school a year earlier than the Americans and were taught through a phonics and structural analysis approach while the Americans learned words in "interest" units. He

found the Scots to be superior spellers. Numerous comparisons for age and years of schooling indicated that neither time nor maturation overcomes the advantage of an early start. He concluded that the amount and kind of instruction were more important factors in spelling achievement than the maturity of the student. The possible effects of cultural differences were not considered. Because this study contains two independent variables, it is not possible to ascertain whether one or the other had the major effect. The results do indicate, however, that the Scottish system of spelling instruction contains some elements that make it superior to the American system.

Golladay (1971) conducted a comparative study within one school system. In this case the focus was on

1. the tachistoscope method
2. the cyclo-teacher
3. the lecture discussion method
4. list memorization.

The subjects were low ability students. In addition to objectively assessing the rate of progress made with each method, the researcher also asked the students which method they thought was superior. While 65% of the students achieved at or above the eighty-fifth percentile when taught by the lecture, discussion method, only 36% did so with the tachistoscope, 32% with the cyclo-teacher and 28% with list memoriza-

tion. In response to the questionnaire, "most" of the students indicated that they preferred the third method and disliked the cyclo-teacher and list memorization. Golladay suggests that students with spelling difficulties benefit from direct teacher instruction.

Still another variable that has been considered is the teaching of spelling in context. Wallace (1972) used nonsense words, structured according to regular morphology to assess the effect of context on the recall of word forms. Although the report indicates that the context method is superior (and especially so for boys), the actual test results were comparable for the dictation tests. Content presentation was superior only for unaided recall--possibly a function of recalling the "word" rather than its form or spelling.

The use of graded word lists is another aspect of spelling instruction that has come to be questioned. Manolakes (1975), demonstrated that the use of such lists leads to unnecessary instruction since many children already know how to spell a significant number of words included on the lists. He also analyzed errors and concluded that students have individual needs.

In a rather comprehensive study, Peters (1970), investigated the teaching variable in spelling progress, measuring and analyzing the behaviours and attitudes of 65 teachers who taught 952 third, fourth, and fifth grade children.

Five main variables and their subvariables were intercorrelated and correlated with mean class progress in spelling:

1. Attitudes of teachers to what is important in children's free writing.
2. Teacher's grades of technical skill according to the following indices; consistency of policy, no matter in what direction; regular and systematic testing; active and rational marking practice on the part of the teacher and correction practice on the part of the child.
3. How teachers teach spelling:
    - (a) Whether lists of spelling are taught
    - (b) If taught, the kinds of lists used
        - (i) Printed lists, e.g. Schonell
        - (ii) Words asked for in the course of the children's free writing
        - (iii) Teacher prepared lists
    - (c) The time spent on list learning and on spelling instruction
    - (d) The total time spent on Spelling
    - (e) The total time spent on creative writing
    - (f) Corrections' practice
    - (g) The "trying out" of words
4. Testing practice
    - (a) The time spent on testing
    - (b) The frequency of testing
        - (i) not at all
        - (ii) irregularly
        - (iii) daily
        - (iv) weekly
    - (c) The organization of testing
        - (i) not at all
        - (ii) individually
        - (iii) as a group
        - (iv) as a class
5. The mean socio-economic status of the children in each class assessed on father's occupation considered in relation to progress in spelling and to each of the above variables. (p. 41)

Factor analysis, considering 23 variables, revealed five main factors, the first being a teacher factor in which the main loadings were teacher's grade, total time spent on

spelling, testing practice frequency, time spent on testing, testing practice organization, mean percentage progress, rational corrections practice, time spent on lists, practice of trying out words, and teaching by "asked for" lists.

In her conclusion, Peters states:

> In the third year it was the time spent on instruction that contributed to attainment, and total time spent on spelling that lead to mean percentage progress. This suggests that with the less favored, time spent on all aspects of spelling (i.e. the testing of words and practicing writing words) is important as well as time spent on instruction, i.e. the drawing of attention of children to word structure. Indeed, in the fourth year percentage progress (highlighting the less favoured) is dependent on time spent, particularly on testing.
>
> Teaching of spelling by lists acquired in the course of the children's free writing clearly influences actual progress, while the use of printed lists is seen to be detrimental to percentage progress.
>
> It is quite clear from the evidence that the teacher's role is vital, and that if the teacher is rational and systematic in the teaching of spelling, using, directly or indirectly, words the children ask for in their writing, competence in spelling can be achieved by those less linguistically favoured. (p. 59)

Although many attempts have been made to find a "most effective" program of spelling instruction, no consensus on the matter has been reached. Researchers have concluded that the kind and amount of spelling instruction are significant factors in determining levels of achievement. There is also evidence of individual needs in spelling instruction.

The use of student generated spelling lists has been shown to be desireable. Prepared lists frequently contain a significant number of words the student already knows how to spell.

Workbooks are not necessarily advantageous, nor are teaching machines. Students have been found to prefer and benefit from direct teacher instruction.

The amount of time allocated for spelling instruction and the testing practices employed have been shown to be significant factors in determining the effectiveness of spelling programs.

An ideal program in spelling has not yet been developed.

Assessing Spelling Achievement

Researchers have employed a wide variety of procedures to assess spelling achievement. The complexity of the spelling task requires that such procedures be carefully examined, in terms of the circumstances in which the spelling occurs (as outlined by Avakian-Whitacker and Whitacker, 1973) and the type of spelling ability that is to be assessed (as outlined by Hunt et al, 1963). It is unlikely that any one spelling test would assess the total realm of spelling ability.

Ahlstrom (1964, 1966) included three spelling measures in his factor analysis: spelling of dictated words, multiple choice test of spelling and spontaneous writing of

names of common objects presented in pictures. The factor weightings varied according to the type of spelling test. Factor one, interpreted as the ability to use conventional linguistic symbols taught in formal language instruction, varied from 0.875 in test two, to 0.917 in test three, and 1.018 in test one.

The factor analyses revealed that the dictated test had the highest loading and the multiple choice test the weakest loading in the auditory factor. The overall weakness of the loadings was deemed to offer little valuable proof, however, so multiple correlations were calculated between 13 predictors and the three spelling criteria.

Ahlstrom found that the relative strength of the predictors varied significantly from one test to another.

> It is clear that the result, as far as the auditory discrimination tests are concerned, is exactly as expected. In criterion I, the dictation test, the auditory tests contribute the greatest share of all the predictors. In criterion 3, the spontaneous spelling test, their common share is less than the shares for VI and BF (verbal intelligence and the ability to identify the appropriate auditory representation of a nonsense word presented visually), and in the multiple choice test, criterion 2, only the attitude variable has a lower share in criterion variance. The share of the auditory tests in the share of all the predictors in the criterion variances is 24.6 percent in the dictation test, 16.5 percent in the spontaneous spelling test, and 7.3 in the multiple choice test. In short, the multiple regression analyses have shown that the marked differences are present between the three types of spelling test. (1964, p. 33)

The generalizability of Ahlstrom's study may be re-

duced by the fact that the language studied was Swedish.

Most standardized spelling tests follow one of three popular formats:

Type I - The dictation of words to be written by students. Items are usually presented in a word-context-word format. (example: Jastak Range Achievement Test, 1965)

Type II - A visual presentation of words from which the individual must select the correct spelling of the word pronounced by the examiner. (example: Dunn and Markwardt, Peabody Individual Achievement Test, 1970)

Type III - A visual presentation of a list of words from which the subject must choose the one which is incorrectly spelled or indicate that none are incorrect. (example: King, Canadian Test of Basic Skills, 1968)

Tests of the first type have favourable face validity for assessing the ability to spell words spoken by others. Those of the second type have confounded this assessment by providing a visual stimulant. It is not possible to judge whether the subject is able to correctly spell the word or is merely able to recognize it. The third type of test does not measure this subskill.

The ability to recognize words that are incorrectly spelled is assessed by the second and third types of test. Type III tests may be confounded in this assessment by the requirement of identifying the word to be spelled. The subject may "get caught" in the reading task, in which case the test would not measure his ability to recognize the correctness of spelling. Tests of the first type do not measure this ability. (The individual may know that his response is not correct, but this fact is not recorded.)

None of these testing procedures has face validity for assessing the ability of the individual to spell words that are self-generated in process of writing. Richmond's (1956) procedure, utilizing story writing for spelling assessment, would effectively measure this skill. However, such procedures would be extremely difficult to standardize. In addition, they would not necessarily assess the same factors of spelling ability (as delineated by Hunt et al, 1963) for all subjects. (For example, one might employ only words that are phonetic and avoid those which he finds difficult.)

Weiner (1980), devised the Diagnostic Evaluation of Writing Skills (DEWS) to include a measure of spelling skill in spontaneous writing. It is scored in terms of the number of words written per spelling error. (Reading disabled subjects were found to write about half as much as control subjects in the same time period and to have significantly more errors.)

Standardized tests may, depending on the items, measure all of the factors outlined by Hunt et al. When spelling is accurate, it is not possible to assess the amount of reliance on phonic and visual skills or the degree to which they contribute to spelling success. The analysis of errors provides clues to the weaknesses.

The Spache Spelling Errors Test was designed to assess students tendency to make various common types of spelling errors:

1. Omissions
    a. Single letters
        1) silent
        2) sounded
        3) doubled
    b. Syllable
2. Additions
    a. Single letters
        1) doubling
        2) phonetic
        3) nonphonetic
    b. Syllable
3. Transpositions
    a. Phonetic
    b. Nonphonetic
4. Phonetic substitutions
    a. Vowel
    b. Consonant
    c. Dipthong
    d. Syllable
    e. Entire Word
5. Nonphonetic substitution
    a. Vowel
    b. Consonant
    c. Dipthong
    d. Syllable
    e. Entire Word
6. Homonym
7. Incomplete
8. Unrecognizable

The system allows three errors to be tabulated within each word although no specific error is to be entered more than once.

Instead of using error analysis, Personke (1972), advocates the use of nonsense words to assess the ability to spell phonetically. This method can be employed with achievers or underachievers, alike.

Standardized tests may be highly valid and reliable measures of subskill assessed, but the validity does not apply to other aspects of spelling skill. A child may be able to identify a word that is incorrectly spelled, but that does not imply that he knows how to spell it correctly. Each type of standardized test measures specific subskills and the scores obtained on these tests do not reflect the child's ability to perform other subskills.

Myklebust and Johnson (1964), cite the case of a ten year old who scored grade 4.9 on oral spelling, but only grade 3.5 on written spelling because of his limited ability to visualize. They also state that the differences between the scores on multiple choice spelling tests and dictated spelling tests occur because the first requires only recognition, not full recall of the word.

Gillespie and Shohet (1972), developed a modified spelling section of the Wide Range Achievement Test, converting it to a Type II test. This "diagnostic WRAT" and the WRAT were both administered to a group of high school students. Scores on the visual version of the test were significantly higher, indicating that the tests do not measure the same things.

Spelling inventories generally provide more diagnostic information than highly standardized tests. The Gates-Russell Spelling Diagnostic Test (1940) included a total of nine subsections, one of which involved the comparison of visual, auditory, kinesthetic, and combination study methods. Three words were to be studied by each method. Spache, writing in the Fourth Mental Measurements Yearbook (1953), indicated that even though this section is brief and the words of unequal difficulty, it should give some indication of the pupils own methods and his success with different learning methods.

This test is favorably reviewed by Brueckner and Bond (1955), Lerner (1976), and Wallace and Kauffman (1978). In reference to the Gates-Russell Diagnostic Test, Otto, McMenemy and Smith (1973), state "the final work-up provides a more complete picture of the disabled speller than any other single device known to the authors". (p.265)

Other spelling inventories place emphasis on error analysis. The Mann Suiter Spelling Inventory (1974), places emphasis on the isolation of auditory channel deficits and visual channel deficits. The authors do not offer any empirical evidence to support these procedures, however.

In the present study, the most efficient means of administering pretests, recall and delayed recall tests is through the use of a dictation format. It is, therefore,

desireable to employ a similar format (type I test) in the selection of subjects. Since the focus of this study is upon the spelling performance of students who are not skilled spellers, an objective measure is needed to isolate such students. Standardized tests of the type II and type III variety could not be presumed to be valid measures for the skills to be employed in this study.

The spelling section of the Wide Range Achievement Test meets the necessary criteria of being both a type I test and standardized. This test is reviewed by Mervin and Thorndike in the Seventh Mental Measurement Yearbook (1972). Both reviewers question the high correlation coefficients reported in the manual. No specific criticisms of the spelling section are offered by either reviewer. Thorndike indicates that while the overall test has weaknesses, it has value in a clinical or research setting in which one is testing individuals of diverse ability and what is needed is a quick estimate of the person's general level of ability and background. Salvia and Ysseldyke (1974), state "teachers of regular or special classes can use the W.R.A.T. to obtain a global picture of spelling achievement". (p. 161)

Such is the present use.

In assessing spelling achievement, it is important to analyze the test and assess its validity according to the skills one is seeking to assess.

Spelling tests are available in a variety of formats. Standardized tests have three popular forms: (1) the dictation of words in the word-context-word pattern, (2) the visual presentation of word forms from which the subject must select the correct spelling of the word pronounced by the examiner, and (3) the visual presentation of word lists from which the subject must select misspelled words. Diagnostic spelling tests may follow an inventory format or analyse errors that occur in spontaneous writing. Studies of Swedish spelling have shown that the skills measured by spelling tests vary according to the format of the test. Studies that are less detailed indicate that the same is true for tests of English spelling.

Scores obtained on one type of spelling test cannot be assumed to be predictive of scores on other types of tests.

The present study is focused upon spelling in the dictated-test setting. The tests that are employed have been selected to meet the criteria of such assessment.

Summary

This chapter has reviewed literature related to the present study.

An analysis of the spelling task, depicting its complexity and revealing its component elements has been presented. Visual, auditory, motor, and internal factors are involved in the spelling process. Spelling skill encompasses four independent subskills: the ability to spell words that are phonetic, the ability to spell words that involve roots, prefixes, and suffixes and the rules for combining them; the ability to look at a word and spell it later; the ability to spell the demons.

The complex nature of the spelling task can result in spelling breakdown at any one of several stages. Spelling disability has been associated with a variety of factors, including physical and psychological factors, educational experience, and temperamental factors.

Difficulties inherent in the English language have been investigated. Some words have been found to be more difficult to spell than others. No specific phoneme-grapheme correspondences have been identified to account for such difficulty. It has been found that children learn pattern abstraction in the process of spelling acquisition.

A variety of individual differences have been shown to influence spelling achievement, including person-

ality, skill in auditory perception, skill in visual perception, intelligence, and reading ability.

The method by which a child is instructed in reading, and the relationship between verbal and performance IQ are predictive of the type of spelling errors the child will make.

Researchers have not reached a consensus on the topic of sex differences in spelling achievement.

In some instances where the comparison of studies involving error analysis reveal conflicting results, the studies have used different methods of error analysis. Many systems of errors analysis have been developed. Some employ numerous categories, others use a dichotomy reflecting phonetic plausibility, and still others use a combination of the two. Several researchers have recommended the analysis of spelling errors as a diagnostic tool for program development. None of the studies have included empirical evidence to support the use of clues acquired in error analysis by relating them to instructional programs.

Research has shown learning modes to vary in their effectiveness, both on a group and on an individual basis. Attempt to relate phonetic/nonphonetic errors to auditory and visual memory skills have not been successful. Individuals who have verbal scores significantly lower than their performance scores are likely to make phonic errors

while individuals with the inverse relationship between their verbal and performance IQ scores tend to make phonetically correct misspellings.

The teaching of phonics in spelling programs is a controversial issue. It has been concluded that phonics is an essential part of spelling instruction, but not a total program.

Visual perception training has been shown to result in improved spelling achievement. Good visualizers have been shown to be superior in the spelling of nonphonetic words. Visual analysis skills are a predictor of spelling skill, applying across the range of spelling words, from purely phonetic, to nonphonetic.

Spelling programs vary greatly in their effectiveness. While no concensus has been reached with regard to an ideal spelling program, the following factors have been found to be influential: a) the time spent on all aspects of spelling, b) testing patterns, c) the use of child-generated lists.

Spelling tests vary in what they measure.

The complex nature of the spelling task has provided researchers with a wide variety of perspectives from which to approach the topic of spelling.

CHAPTER THREE

EXPERIMENTAL DESIGN

Definitions

For the purpose of this study, the following definitions were employed:

Auditory perception is the identification, organization, and interpretation of sensory data received aurally.

A grapheme is a written symbol that represents an element of the oral code.

A phoneme is the smallest unit of sound of a language.

Phonics is the study of a portion of phonetics, as it relates to the teaching of phoneme-grapheme correspondences.

A phonic speller is an individual who consistently makes phonically correct misspellings, one for whom 80% of the errors on the pretest are classified as being phonically plausible.

A phonically plausible spelling error is a word that bears phonic similarity to the stimulus word. Phonic plausibility is assessed by asking the question: "Is there a word in grade three Dolch spelling list in which the spelling of the phoneme under consideration is represented by the grapheme employed by the student in his response?"

A student who is not a skilled speller is an in-

dividual whose level of spelling achievement is below average, as measured by locally developed norms for the spelling section of the Wide Range Achievement Test. For the present study, the 45th percentile was employed as a cut-off point because it identified approximately 100 subjects for further consideration.

Visual perception is the identification, organization and interpretation of sensory data received visually.

Materials

The following materials were employed in this study:

1. A list of 100 spelling words, randomly selected, using a table of random numbers, from fourth grade spelling textbooks (Thomas, Dent's Speller 4, 1959; Patton and Johnson, Language Mastery Speller, 1968; Hanna, Hanna, and Hodges, Power to Spell 4, 1967; Monroe, Aaron and Schiller, Spelling our Language, 1973; Kusta, Webster, et al, Spelling in Language Arts, 1976).
2. One hundred three-by-five inch cards with individual words from the above list typed on them.
3. Card file for the above cards.
4. Forty three-by-five color patch cards, prepared by gluing a rectangular patch of colored Bristol Board in the center of each card.

5. Pretest response sheets, numbered from 1 to 100.
6. Immediate and delayed recall response sheets numbered from one to ten. (Ten per subject in Groups II and III.)
7. Post-test response sheets, numbered from 1 to 100.
8. One 12 by 15 inch chalkboard, chalk and eraser.
9. Pencils and eraser.
10. Stopwatch.

Selection of Subjects

This study was conducted in British Columbia School District #62 (Sooke). The 17 elementary schools in the district range from rural to suburban in their setting and include a school for the children of military personnel stationed at C.F.B. Esquimalt. Two of the schools, Metchosin and Hans Helgeson, serve one attendance area and, as such, were treated as one for the purpose of this study.

Socio-economic levels in the district vary from working class to the lower end of the upper-middle class range. Some of the schools have very mixed populations with disproportionate representation--more at each end and less in the middle--than a normal distribution. Similar distributions occur in S.C.A.T. scores. (The S.E.S. data is based on a subjective assessment by the Director of Special Education.)

In April of 1980, five schools were randomly selected, using a table of random numbers, to be included

in the study: Ruth King Elementary, Saseenos Elementary, Colwood Elementary, John Stubbs Memorial Elementary, and Metchosin and Hans Helgeson Elementaries.

The spelling section of the Wide Range Achievement Test was to be used as a criterion measure. Because the W.R.A.T. does not have local norms, it was suspected that the norms provided would not be appropriate. The applicability of the provided norms was investigated in June, 1980, by administering the test to third graders attending a school that had not been selected for study. Following the norms provided with the test, none of the students achieved below grade level and several members of the "low group" achieved significantly above grade level. It was concluded that the norms were not appropriate. Local norms would be necessary.

Following the investigation of the W.R.A.T. norms, a pilot study was conducted to assess the procedure for error analysis and to test the workability of the training procedures. (See Appendix One.)

Prior to beginning the study, a sixth school, Happy Valley Elementary was randomly selected to serve as "alternate" in case one of the originally selected schools chose not to participate.

During the second week of September, 1980, the principals and third grade teachers in the selected schools

were contacted and the proposal for study presented. Consent was obtained from all individuals involved. The following week, after initial screening had begun, one teacher from Metchosin-Hans Helgeson contacted the researcher to report her preference not to be involved in the study. She cited the introduction of several new programs in her classroom and significant disabilities of individual students as being cause for concern. Since it would not have been appropriate to include one class from the school without the other, Happy Valley Elementary was substituted for Metchosin-Hans Helgeson.

Local norms for the spelling section of the W.R.A.T. were obtained by administering the test, between September 17 and 25, 1980, to 223 third grade students attending the schools to be included in the study. Percentile ranks were calculated. The results are presented in table 3-1.

The W.R.A.T. spelling scores provided the basis for the identification of students who were not skilled spellers. Individuals who scored at or below the forty-fifth percentile were designated "not skilled spellers". (This group included no individuals who had been identified by the school district as being visually impaired, hearing impaired, speech handicapped.) Four of the individuals, who were in the group of "not skilled spellers" had been

identified, by school district personnel, as being slow learners. These individuals were eliminated from the sample. The remaining 96 students were given a group pretest of the 100-word spelling list.

Table 3-1

Percentile Ranks for the September Administration of the W.R.A.T. Spelling Section (School District #62)

number correct	percentile rank
29	99
29	99
27	99
26	98
25	96
24	94
23	91
22	85
21	80
20	70
19	62
18	51
17	43
16	38
15	29
14	19
13	11
12	07
11	04
10	02
09	00.04

Errors on the pretest were analysed, by the researcher, in terms of phonic plausibility. Individuals whose errors were found to be 80% or more phonically plausible were designated "phonic spellers". The incidence of phonic spellers among those who were not skilled spellers varied somewhat, from school to school. (See Table 3-2.)

Table 3-2

Incidence of phonic spellers who were not skilled spellers.

School Number	Number of "not skilled spellers" tested	Number of phonic spellers
1	20	7 (35%)
2	19	6 (32%)
3	22	7 (31%)
4	15	6 (40%)
5	15	7 (47%)

The phonic spellers formed a pool of subjects to be assigned to three groups using stratified random distribution.

Procedure

Following the identification of 96 students who were not skilled spellers, the five schools were involved on a serial basis, in the sequence indicated by their school numbers, between October 7 and December 7, 1980. The physical facilities within the schools varied from regular classrooms in schools one and four, to medical rooms in two and five, to a "quiet corner" of the hall in school three.

Within each school, the following format was followed.

Day 1: (a) Administration of the 100-word pretest.

(b) Analysis, by the researcher, of errors on pretest.

(c) Identification of phonic spellers.

(d) Random assignment, stratified by spelling ability (as indicated by pretest score), sex, and teacher, into three groups--Control (I), Visual Training (II) and Auditory Training (III).

(e) For the two experimental groups (II and III), selection of 50 words for each subject from errors made on the pretest, and preparation of subject list-cards by transferring the selected words onto cards.

Day 2: Groups II and III only.

Individual sessions to complete the following:

(a) Pretest of ability to identify color names.

(b) Twenty minute instruction to teach the first ten words on the subject's list card.

(c) Immediate recall test.

Days 3-7: Groups II and III only.

Individual sessions to complete the following:

(a) Delayed recall test of the ten words learned the previous day.

(b) Individual instruction of the next ten words on the list-card.

(c) Immediate recall test of the words taught in (b).

Day 8: (a) Groups II and III only.

Delayed recall test of last ten words taught.

(b) Groups I, II, and III.

Post-test of the 100 word list, administered on a group basis.

Five training sessions were employed in each school. Time planning, as outlined above, allowed for

six sessions, to reduce the number of subjects lost due to school absence. Individuals who were absent two or more days were eliminated from the study.

Training was provided on consecutive afternoons during which school was in session. Within each school, the sequence in which individuals received their instruction was alternated. In schools one, three, and five, the individuals receiving visual training were seen first for sessions one, three, and five; while those receiving auditory instruction were seen first for sessions two and four. In schools two and four, the subjects receiving auditory training were seen first for training sessions one, three, and five; while the visual training subjects were seen first for sessions two and four.

The training procedures, which are outlined on the following pages, were previously checked for appropriateness, by administering a brief pilot study at Wishart Elementary. That study employed three individuals in each group and three training sessions. A detailed report of the pilot study is presented in Appendix One.

The training procedures for both the auditory and visual methods employed elements of analysis and memory skills, employing the appropriate perceptual modality. In order to include the memory element, a delay-distraction component (color naming) was developed. The researcher

decided against using the delay-distraction procedure employed by Slingerland (1964) because that procedure had been found to be rather tedious and problematic.

Training Methods

The child was seated at a desk, with a chalkboard, chalk, chalk eraser, pencil and pencil eraser, and a stack of color cards, color side down, arranged according to figure 3-1. The researcher was seated at an adjacent desk, with the file box containing the word cards, the stopwatch and the recall test forms. The arrangement of desks is shown in figure 3-2.

Fig. 3-1
Subject's Desk

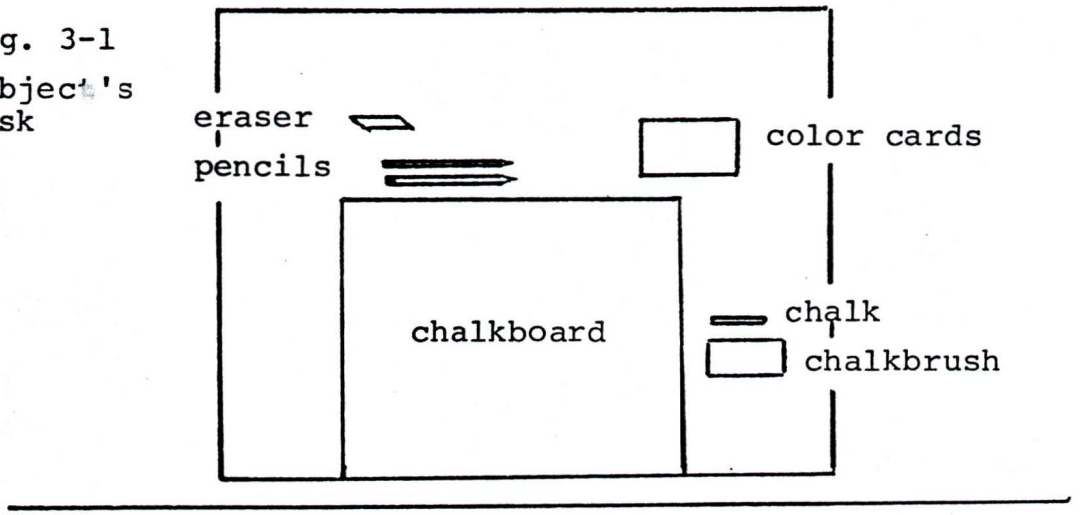
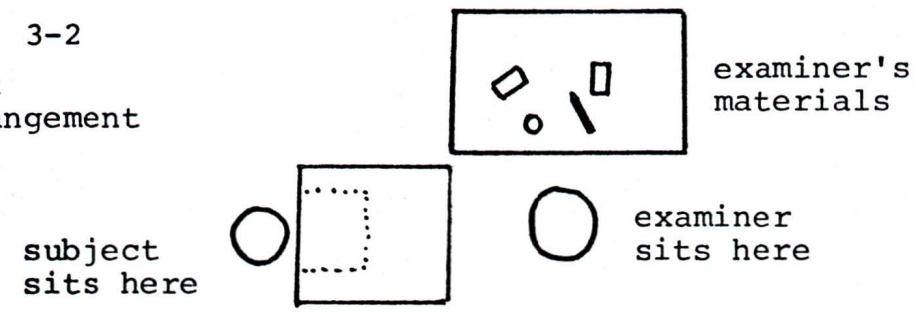


Fig. 3-2
Desk Arrangement



Visual Training Instructions

1. "This is how you spell the word _____." The appropriate word card was placed on the desk, in front of the subject. "Notice the shape of the word. Notice the length of the word. Notice the order of the letters."
2. "Look at the word." The word was exposed for ten seconds, then concealed. "Close your eyes and spell _____."
3. "Look at the word. Were you right?"
4. "Look at the word." The word was exposed for eight seconds, then concealed. "Write _____ on the chalkboard. Look at what you have written. Does it look right? Look at the word. Were you correct? Erase."
5. "Look at the word." The word was exposed for eight seconds, then concealed. "Turn over the top card from the pile that is in front of you. What color is on it? Write the word _____. Look at what you have written. Does it look right? Look at the word. Were you right? Erase."
6. Repeat #5.

Auditory Training Instructions

1. "Listen to the word _____. How many parts (syllables) does it have?" "What is the first part?" "What is the first sound you hear in that part?" "What letter or letters spell that sound?" (If the child indicated a grapheme that is appropriate for the phoneme, but incorrect for the word

being considered, the response used was "You are right, the letter (letters) does (do) make the --- sound, but in the word _____, the sound --- is spelled _ _ _.") "What is the next sound you hear?" "How is it spelled?" "You have spelled the first part of the word _____, what is the next part?" "What sound does it start with?" etc.

2. "Spell the word _____ orally."

3. "The correct spelling of _____ is _ _ _." "Were you right?"

4. "_____ is spelled _ _ _." "Write _____ on the chalkboard." "Sound out what you have written." "Does it sound right?" "The correct spelling is _ _ _." "Were you right?" "Erase."

5. "_____ is spelled _ _ _." "Turn over the top card from the pile that is in front of you." "What color is on it?" "Write the word _____." "Sound out what you have written to see if it sounds right." "The correct spelling is _ _ _." "Were you right?" "Erase."

6. Repeat #5.

During step one of auditory training, words that contain silent letters were handled in the following manner:

(a) When the silent letter occurred initially:

> You are right. The first sound is ---, but the word _____ starts with a letter that does not make a sound. It begins with a silent ___.

(b) When the silent letter occurred medially or finally:

You are right, the next sound you hear is ---, but the word _____ has a letter that does not make a sound between the --- sound and the --- sound (or after the --- sound). It has a silent ___.

The syllables "tion" and "ture" were taught as units, using the format "Yes, /shən/ sounds like s-h-u-n but in this word and some others, it is spelled 'tion'." and "Yes, /chər/ sounds like c-h-e-r, but ... it is spelled 'ture'."

Statistical Procedures

Analysis of Variance (Sax, 1968), with pretest scores serving as the covariate, was used to investigate the significance of the differences in post-test scores among the three groups.

The Scheffé procedure (Sheffé, 1959) was then used to investigage the significance of the paired comparisons.

Significance, for the purpose of this study, was established at the .05 level.

Hypotheses

H-1 Individuals who are not skilled spellers but spell phonically who receive spelling instruction following the visual method will obtain higher post-test scores on the 100-word test than similar individuals who belong to a control and receive no instruction.

H-2 Individuals who are not skilled spellers but spell phonically who receive spelling instruction following the auditory method will obtain higher post-test scores than similar individuals who belong to a control group and receive no instruction.

H-3 Individuals who are not skilled spellers but spell phonically who receive spelling instruction following the visual method will achieve higher post-test scores on the 100-word spelling list than similar individuals who receive instruction following the auditory method.

CHAPTER FOUR

RESULTS

The final sample for this study consisted of 29 subjects, 19 boys and 10 girls. Four subjects, two from Group I and one from each of the other groups, were lost due to school absence.

Analysis of covariance was used to assess the significance of differences in group posttest scores. Pretest scores served as the covariate.

Initial differences among the groups were found to be nonsignificant, as expected, given the random subject assignment.

The posttest scores for the control group ranged from 16 to 33, with a mean of 29.33. When pretest differences were considered, an adjusted mean of 27.74 was obtained. For the visual training group the range was from 24 to 73, the mean 49.00 and the adjusted mean 49.40. For the auditory training group, the range was from 24 to 52, the mean 36.5 and the adjusted mean 37.53. Detailed results are presented in Table 4-1.

The analysis of covariance produced an overall F value of 10.8 with 27 degrees of freedom, indicating the existance of at least one difference among the means ($p<0.00042$).

Table 4-1 Individual Test Results

Control Group			Visual Group			Auditory Group		
I.D.#	Pre-test	Post test	I.D.#	Pre-test	Post test	I.D.#	Pre-test	Post test
01	34	30	11	39	73	21	41	52
02	33	38	12	35	54	22	34	43
03	33	46	13	30	51	23	32	36
04	33	32	14	30	58	24	29	45
05	30	30	15	28	41	25	27	40
06	25	26	16	26	62	26	21	25
07	23	21	17	22	28	27	18	36
08	21	25	18	19	24	28	18	24
09	20	20	19	16	29	29	18	33
			20	16	70	30	17	31

Subsequent to obtaining the highly significant F value in the analysis of covariance, the Scheffé analysis was used to assess the significance of the differences between the scores of paired groups. The comparison of the Control and Visual Training Groups indicated that the difference between the mean scores of the two groups was significant at the 0.004 level. The comparison of the mean scores of the Control and Auditory Training groups indicated that the difference between the mean scores of the two groups was not significant (probability < 0.1296). The comparison of the Visual and Auditory Training Groups indicated that the difference between the scores was significant at the 0.048 level.

Table 4-2

Probability Matrix for the Scheffé Multiple Comparison of Means

	1	2	3
1	1.0000	0.0004	0.1296
2	0.0004	1.0000	0.0477
3	0.1296	0.0477	1.0000

The statistical analyses indicated that for phonic spellers who are not skilled spellers, the visual training method is superior to the auditory training method for improving spelling achievement. The use of auditory training procedures was not found to be significantly better than providing no training.

Thus, hypotheses one and three are accepted. Hypotheses two is rejected.

H-1 Individuals who are not skilled spellers but spell phonically who receive spelling instruction following the visual method will obtain higher scores on the post-test of the 100-word spelling list than similar individuals who receive no instruction. Accepted.

H-2 Individuals who are not skilled spellers but spell phonically who receive spelling instruction following the auditory method will obtain higher scores on the post-test of the 100-word spelling list than similar individuals who receive no instruction. Rejected.

H-3 Individuals who are not skilled spellers but spell phonically who receive spelling instruction following the visual method will achieve higher post-test scores on the 100-word spelling list than similar individuals who receive auditory instruction. Accepted.

CHAPTER FIVE

DISCUSSION

This study was designed to investigate the relative effectiveness of visual and auditory training procedures for improving spelling achievement among third grade students who were not skilled spellers and who spelled phonically. The results indicate that the visual method is superior to the auditory method for improving spelling achievement among the phonic spellers studied. The numerical differences between the levels of spelling achievement of the auditory and control groups was not found to be statistically significant.

During the course of the study, a number of incidental observations were made that suggest the desireability of further study. The most compelling of these observations relate to the visual training procedures and their effectiveness. A review of individual scores obtained by subjects in the two experimental groups (Table 5-1) reveals that while some improvement in spelling skill was demonstrated by all subjects in both experimental groups, the degree of improvement varied considerably within the visual training group. At one end of the range, gains of five and six occurred, while at the other end a gain of 54 occurred. Such wide variations did not occur

within the auditory training group.

Table 5-1

Individual results

Visual						Auditory					
subject	sex	school	pretest	posttest	gain	subject	sex	school	pretest	posttest	gain
11	1	4	39	73	34	21	2	4	41	52	11
12	2	3	35	54	19	22	2	3	34	43	09
13	2	2	30	51	21	23	1	5	32	36	04
14	2	5	30	58	28	24	2	2	29	45	16
15	2	3	28	41	13	25	1	2	27	40	13
16	1	1	26	62	36	26	1	1	21	25	04
17	1	1	22	28	06	27	1	5	18	36	18
18	1	5	19	24	05	28	1	2	18	24	06
19	1	2	16	29	13	29	1	4	18	33	15
20	1	5	16	70	54	30	1	1	17	31	14

The variation among the scores of the visual training group suggests that although the method has been found to be superior to the auditory method, it may vary from one individual to the next in its degree of effectiveness. These variations do not appear to be related to initial spelling levels. There may be some interaction between the method and factors of individual differences. Limitations of the present sample size prevented the investigation of such possible interactions at the present time. Sex and school attended may have played a role in the differences. Handwriting practices may have had an effect. (It was noted that some individuals wrote the

words using large letters, others used small; some were very precise in letter formation, others wrote hastily; some seemed overly concerned with letter formation, others appeared careless.)

Limitations of the Study

This study does not apply to the spelling performance of the general population. It cannot be assumed that the superiority of the visual training procedure would apply to all individuals who are not skilled spellers. The subjects of this study are assumed to have developed proficiency in the use of phonic analysis skills prior to being included in this study. (This assumption is based on the consistent production of phonically correct misspellings.) No attempt to generalize the results of this study to individuals who have not developed such proficiency would be appropriate.

No I.Q. or reading scores were obtained for the subjects studied. Objective socio-economic information for individual subjects was not available to the researcher. It is not possible to be certain that the three groups were equal in terms of these variables.

All aspects of this study, including the testing, the error analysis and the training were performed by the researcher. Since directional hypotheses were stated, it is possible that the expectations of the researcher may have resulted in some unintentional experimenter bias.

Certain other aspects of this study have not

been ideal. The variations in physical facilities from school to school are not desireable. These variations should not have affected the study results, however, since both training groups received their treatment in the same environment in all cases. It was also noted that the facilities roughly paralleled the facilities provided for learning assistance and, as such, represented the various circumstances under which the results of this study might be put to use.

The delay-distraction procedure for developing memory is open to some question, as well. A similar procedure is employed by the authors of the Slingerland Screening Tests for Specific Language Disability. Research on the topic was not available to the writer. In the present study, it was noted on several occasions that a subject, concentrating on developing the image of a word, paused noticeably prior to identifying the next color presented, seemingly to shift his attention away from his focus on the spelling image and onto the color. This suggested that the color cards did, in fact, provide an appropriate level of distraction. An objective assessment of this factor would be desireable.

Implications for Further Study

As indicated above, an objective assessment of the delay-distraction procedure would be desirable.

Similarily, the exposure time for the visual presentation of words might be investigated to identify an optimum exposure time. For short words the 10 second exposure seemed excessively long for some individuals. These subjects stated "Okay," or "Got it," prior to the expiration of the exposure time, indicating that they wanted to proceed. (To avoid discomfort for such individuals, the verbalization was heeded and the subject was allowed to proceed.) For longer words, the exposure time may not have been long enough, since initial attempts to spell the words tended to be inaccurate. Perhaps a "seconds-per-letter" approach would have been more appropriate than the uniform times employed in this study. An investigation of this factor would be desirable.

Another aspect of the visual training process that might benefit from further study is the possible variations in print used on the word cards. Perhaps the Mosely (1969) cuing system would be more effective than the plain print used in the present study.

The use of individual training procedures limited the number of subjects that could be involved in the present study. The limited sample size, in turn, precluded the analysis for interaction between sex and method and between school and method. The individual training method was used because the June pilot study had indicated

that the isolation of a sufficient number of words for group instruction would be extremely difficult. (See Appendix One.)

In the present study it was found that the majority of the subjects misspelled the same words, suggesting that group training procedures might have been feasible. Adapting the present training procedures to accomodate group training processes is recommended for future study. Such adaptations could increase the number of subjects involved and enable the investigation of interaction effects.

Interaction between personality and method is another possibility that warrants investigation. Subjects 15 and 17 seemed to resist the visual training procedure, demonstrating a reluctance to look at the word card when instructed to do so. Subject 18 consistently spelled words correctly during the training procedures that involved the chalkboard. When he wrote the recall test at the conclusion of the training it was revealed that he was unable to spell the majority of the words. Some further investigation of these effects is desireable.

A review of the data related to the visual training method has suggested several possible avenues for further research.

Summary

The results of this study indicate that visual training procedures are more effective than auditory training procedures in the remediation of phonic spelling.

Further research in the area is desirable. The training methods should be compared at other grade levels. The investigation of possible interaction effects between sex and method, between school and method, and personality and method is desirable.

Intensive investigation of various aspects of the visual method--the exposure time, the delay-distraction technique, the print type--is desirable to develop an optimum training program.

Conclusion

Visual and auditory methods of spelling instruction have been compared to assess their relative effectiveness in the remediation of phonic spelling among third grade students who are not skilled spellers. Visual training procedures have been found to result in a higher level of spelling achievement than auditory procedures when employed with third grade phonic spellers studied. Further study involving additional grade levels is desirable to establish a degree of confidence for generalizing the results of this study beyond the grade level studied.

This study involved students who had previously developed phonic analysis skills. The superiority of the visual method cannot be assumed to apply to individuals who have not developed such skill.

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Appendix One

A Pilot Study

In June of 1980, a pilot study was conducted. It was completed in three stages:

1) the assessment of the reliability of the procedure for classifying spelling errors as being phonetically correct or incorrect.

2) the application of the phonetically correct/incorrect classification to errors made on the Wide Range Achievement Test (W.R.A.T.) and on the pretest of the 100-word list, to assess the selection procedures.

3) the assessment of the workability of the proposed procedures.

In order to assess the reliability of the error classification procedure, 147 errors made on the W.R.A.T. test were analysed by the researcher and by an inexperienced rater. The raters agreed on the classification of 96% of the errors. The items on which the raters had disagreed were discussed. The inexperienced rater had counted as phonetically correct words that had been spelled "probably the way he says it", and words that contained letter reversals, "he spelled it like it sounds, he just got the 'b' backwards".

The words being analysed varied in difficulty, according to where they had occurred in the test.

It was found that most of the "probably mispronounced" items were words that had occurred in the latter part of the test. To reduce the possibility of misspelling being related to mispronunciation, it was felt that the classification of phonic spellers might be more appropriately based upon words that were more familiar to the subjects and were of more uniform difficulty.

Since the substitution of a "b" for a "d" may be a reversal or may reflect poor auditory discrimination, it was decided that such substitutions would not be considered phonetically correct misspellings.

For the second stage of the study, the spelling section of the W.R.A.T. was administered to 23 third graders at Wishart Elementary School. The lowest 12 scores were designated as revealing students who were not skilled spellers. The errors made by those students were analysed in terms of phonetic plausibility. Eight students were found to be phonic spellers.

Careful analysis of the error patterns revealed that in some cases the phonetic plausibility of errors increased as the words became more difficult. It was therefore suspected that some students might employ different spelling strategies with words that were somewhat unfamiliar than with words that were more familiar to him. A pretest of the 100-word list was administered to see if some of the

students who had been classified as phonic spellers, according to their errors on the W.R.A.T. might not appear to be such on a test of more familiar words. The results of the error analyses are presented in Table 6-1.

Table 6-1 Results of Error Analyses on the W.R.A.T. and the 100-word pretest.

Student	W.R.A.T. raw score	Phonetic plausibility	100-word test score	Phonetic plausibility
Lisa	21	P	64	NP
Daniel	20	NP	82	NP
Judy	20	P	71	P
Jenny	20	P	59	P
Kim	20	P	58	P
Laura	20	P	36	P
Laurence	20	P	27	P
Shae	19	P	66	P
Rachelle	19	P	55	NP
Kela	18	NP	19	NP
Monique	17	P	38	P
Jason	16	NP	32	NP
Trisha	16	P	56	NP
Steven	(ab)		9	NP

P Phonic Speller NP Not a Phonic Speller

With reference to the hypothesis of varying technique, one individual who was not a skilled speller, Trisha, was of interest. On the W.R.A.T., she spelled words phonetically (ocupi for occupy, purches for purchase, nacher for nature); but on the second test, she did not consistently employ phonetic spelling. She frequently confused the sequence of letters (gusse for guess, fuirt for fruit), omitted phonemes (unafaid for unafraid, arithmeic for arithmetic, ivite for invite); and substituted (Webseday for Wednesday, doy for boy). It appeared as though both

visual and auditory skills were only partially developed. Following Schonell's (1942) classification, we found "errors typical of the first type of weak visualizer... confusion of similar letters [hunan for human], transposition of letters [ininge for engine] ...mistakes which could be minimized if the children supplemented their faulty visual powers by auditory-articulatory aids." (Schonell, 1942, p. 299) There was also evidence of "the second type of weak visualizer, who neglects the visual form of word... and relies almost wholly on auditory recall of words [enuf for enough]." (p. 302) Weakness in auditory analysis and synthesis of verbal material was also suggested by the apparent difficulty in differentiating similar sounds (capper for chapter, punnpin for pumpkin, hunan for human). Although the analysis of Trisha's errors on the W.R.A.T. indicated that she was a phonic speller, the analysis of errors on the test of grade four spelling words indicated the presence of multiple weaknesses. It was concluded that more than one type of remediation would be required to overcome such weaknesses.

Lisa did not qualify as a student who was not a skilled speller, but her error pattern was also of interest. Although she was a better speller than Trisha, she also tended to spell phonetically on the W.R.A.T. (natcher for nature, exsplane for explain) but did not employ similar

tactics on the second test. Like Trisha, she made errors of several varieties. Some were phonetically correct (boughtum for bottom); but not enough to meet the 80% criterion for designation as a phonic speller. Some errors suggested attempts to employ visual memory or revealed sequencing difficulties (wirghter for writer). In some cases the errors suggested confusion of the various methods of representing a given phoneme, with preference often being given to the more difficult spelling of the phoneme (igh instead of i-e). Other errors suggested auditory or articulatory difficulties (helfy for healthy, pupkin for pumpkin).

Some of the students who appeared to be phonic spellers, judging from their errors on the W.R.A.T., did not appear to be so when errors from the grade four list were considered. None of the students who spelled phonetically on the 100-word test did not do so on the W.R.A.T.

The grade four spelling list was assumed to be more representative (than the W.R.A.T.) of the type of spelling the child employed on a daily basis. The error patterns revealed by the second test were assumed to be more representative of the students' spelling patterns and a more reliable indicator of phonic spelling. It was decided that the 100-word list, rather than the W.R.A.T., would be used to identify phonic spellers in future research by the writer.

To further assess the selection procedures, the two tests, as well as the ranges of the tests' scores, were compared. It was found that the W.R.A.T. had a rather limited range of scores. As a result, the cut-off point for designation as "not a good speller" appeared to be somewhat arbitrary. It was expected that the involvement of students from several schools and from a variety of socio-economic backgrounds would increase the range of scores and the significance of the cut-off point. The 100-word list was more uniform in difficulty and was, therefore, not expected to be effective in discriminating between nonskilled and average spellers. It was also found to be quite tedious to administer to a large group and very time consuming. It was deemed to be impractical for use as a criterion measure. A decision was made to use the W.R.A.T. for the identification of students who were not skilled spellers. This decision was supported by the observation that those who did well on the W.R.A.T. also did well on the 100-word test, but the reverse could not be said to be true, indicating that some individuals had developed strategies that were effective for words that were familiar but were not effective in the spelling of less common words.

Since some subjects who did not do well on the W.R.A.T. did quite well on the 100-word test, it was suggested that some difficulty might arise in attempting to

isolate 50 words for each phonic speller that he did not know how to spell. It was believed that conducting the study at the beginning of the school term, rather than at the end, would reduce the likelihood of such a problem arising.

Following the investigation of the selection procedures, the training procedures were tested.

The analysis of errors on the pretest identified seven subjects who were not good spellers who spelled phonetically. These students became the subjects for the next stage of the pilot study. They were divided into three groups, a control group, a visual training group, and an auditory training group. The sample was first stratified into "weak" and "moderately weak" categories, then systematically assigned to groups with the best spellers in each category being assigned to the control group, the next best to the auditory group and the weakest to the visual group. Individuals assigned to the two experimental groups each received two twenty-five minute training periods, during each of which ten words were taught, according to the prescribed methods. Immediate and delayed recall tests were administered.

Training Procedures Employed

Visual Method

1. "This is how you spell the word _____."
   (A card with the word typed on it was presented.)
   "Look at the length of the word. Look at the letters that go above the line. Look at the letters that go below the line. Look at the order of the letters."
2. "Look at the word."
   (Word was exposed for ten seconds.)
3. "Spell _____."
4. "Look at the word."
   "Were you right?"
5. "Look at the word."
   (Word was exposed for eight seconds.)
6. "Write the word _____."
   "Does it look right?"
7. "Look at the word."
   "Is it right?"
8. "Look at the word."
   (Word was exposed for eight seconds.)
   "Turn over the top card from the stack that is in front of you and tell me what color is on it. Write the word _____."
   "Does it look right?"
   "Look at the word."
   "Were you right?"
9. Repeat 8.

Auditory Method

1. "The first word we are going to learn how to spell is the word _____. How many parts does the word have?"
   (If incorrect, the word was repeated slowly to reveal the syllables and the question was repeated.)
   "What is the first part of the word?"
   "What is the first sound that you hear in that part?"
   "What letter(s) spell that sound?"
   (If incorrect, grapheme was indicated, the phoneme-grapheme correspondence was taught using the format: "You are right. -- does sometimes spell _____, but in the word _____, the -- is spelled by the letter(s)--.")
   "What is the next sound that you hear?"
   "How do you spell that sound?"
   ETC.
2. "Spell the word _____."
3. "The correct spelling of the word _____ is ---."
   "Were you right?"
4. "_____ is spelled ---. Write the word _____."

5. "Sound out what you have written to see if it sounds right."
6. "The correct spelling of the word _____ is _ _ _."
   "Were you right?"
7. "_____ is spelled ---. Turn over the top card from the pile that is in front of you and tell me what color is on it."
   "Write _____."
8. "Sound out what you have written. Does it sound right?"
   "The correct spelling of the word _____ is _ _ _."
   "Were you right?"
9. Repeat 7 and 8.

In neither method were subjects informed when they were correct.

Following the training periods and the final delayed recall tests, a posttest of the 100-word test was administered to all three groups of subjects. The numbers of errors on the pre- and posttests were compared.

Table 6-2 Results of Pilot Study

Student number	Group	Pretest errors	Posttest errors	Difference
1	visual	73	54	19
4	visual	41	10	31
2	auditory	62	50	12
5	auditory	41	36	5
3	control	61	52	9
6	control	34	36	-2

Although the differences between the groups were not statistically significant, the numerical differences were in the direction hypothesized. A larger sample might have produced significant results.

The pilot study indicated that spelling errors could be reliably classified as being phonetically plausible or implausible. The procedure for identifying subjects was finalized and the training procedures were found to be workable.

Appendix Two

100-Word Spelling List

1. nest...The bird built a nest in a tree...nest
2. hungry...The boy was very hungry...hungry
3. blind...The man was blind...blind
4. village...She used to live in a village...village
5. fruit...He had some fruit for lunch...fruit
6. through...A bird came through the open window...through
7. tired...The man felt very tired...tired
8. guess...Joe could not guess the answer to the riddle... guess
9. picture...Mary painted a pretty picture...picture
10. speech...The leader made a long speech...speech
11. dollars...The new hat cost ten dollars...dollars
12. writer...Jim wants to be a writer when he grows up... writer
13. nurse...The nurse came to check his eyes...nurse
14. enough...Sally did not have enough time to finish the work...enough
15. useless...A broken pencil is useless...useless
16. bottom...The bottom of the block was blue...bottom
17. because...I was late because I slept in...because
18. shining...The sun is (is not) shining today...shining
19. pumpkin...Ted had a pumpkin for Halloween...pumpkin
20. somewhere...The cat must be somewhere...somewhere

21. Wednesday...Wednesday is the middle of the week... Wednesday
22. January...January is the first month of the year... January
23. size...What size shoes do you wear?...size
24. nearly...Kim is nearly as tall as John...nearly
25. month...Next month it will be November (December or January)...month
26. learn...Mother will learn how to speak French...learn
27. invite...Jack could not invite the whole class to his party...invite
28. hello...Little Susie said hello when she answered the phone...hello
29. chase...My dog likes to chase cats...chase
30. weather...We had good weather for Halloween last year. ...weather
31. danger...We try to stay away from danger...danger
32. rich...My dad would like to be rich...rich
33. knock...You must knock on the door before opening it...knock
34. herself...Margaret made lunch for herself...herself
35. since...Ken has attended this school since he was in kindergarten...since
36. pack...I need to pack a suitcase...pack
37. beginning...The baby is beginning to speak...beginning

38. kitchen...There are lots of cupboards in the kitchen... kitchen
39. happen...Accidents do happen...happen
40. build...The children will build a birdhouse...build
41. chapter...Terry has read the first chapter of the book ...chapter
42. section...Janet likes to sit in the front section of the room...section
43. agree...Steven did not agree to share his candy...agree
44. pardon...I hope that you will pardon me for being late ...pardon
45. narrow...In some places the road is very narrow...narrow
46. glare...It is not nice to glare at people...glare
47. pudding...Phillip likes to have pudding for desert... pudding
48. ceiling...The ceiling of the kitchen is white...ceiling
49. banana...A banana is a fruit...banana
50. human...A monkey is different from a human being...human
51. unafraid...Karen was unafraid of the big dog...unafraid
52. late...I will be home late today...late
53. break...That glass will break if you drop it...break
54. ankle...Fred hurt his ankle...ankle
55. button...Kevin lost a button from his coat...button
56. engine...The train engine made a lot of noise...engine
57. selfish...People who will not share are selfish...selfish

58. bacon...Dad likes to have bacon for breakfast...bacon
59. broken...The old toy is broken...broken
60. quiet...The library is a quiet place...quiet
61. shine...I hope the sun will shine all day...shine
62. played...We played a game at recess...played
63. cloud...The cloud was very black...cloud
64. ought...We ought to do our work before we play...ought
65. wagon...Sam got a new wagon for his birthday...wagon
66. bear...Jeff saw a bear at the zoo...bear
67. scarf...Mom got a new scarf...scarf
68. chance...He had a chance to win a prize...chance
69. fond...Paul is very fond of chocolate cake...fond
70. leaves...the leaves are falling from the trees...leaves
71. ugly...That witch is very ugly...ugly
72. eighteen...Steven's sister is eighteen years old... eighteen
73. boil...You need to boil water to make tea...boil
74. arithmetic...Steve likes to do arithmetic...arithmetic
75. cane...Grandfather walks with a cane...cane
76. echo...The cave had an echo...echo
77. bought...Dad bought a new car...bought
78. sell...He will sell the old one...sell
79. broom...You need a broom to sweep the floor...broom
80. closed...I like to keep the door closed...closed
81. frozen...The meat was all frozen...frozen

82. yours...Is this book yours?...yours
83. raisin...George likes raisin pie...raisin
84. woman...That woman is very happy...woman
85. sudden...All of a sudden, the dog was gone...sudden
86. better...I hope she will feel better soon...better
87. healthy...My cat is very healthy...healthy
88. cupful...Mom put a cupful of berries in the bowl... cupful
89. foolish...Grandmother does not like foolish people... foolish
90. worse...Keith's cold is getting worse...worse
91. common...It is a very commom mistake...common
92. fasten...She did not remember to fasten her seatbelt ...fasten
93. mean...That dog is mean...mean
94. howl...Some dogs like to howl at the moon...howl
95. silly...That is a silly game...silly
96. creature...There was a tiny creature on the floor... creature
97. heard...I heard a very pretty song...heard
98. surprised...Kathy was very surprised that she won the contest...surprised
99. pretty...Mother likes pretty flowers...pretty
100. eraser...Ned found an eraser...eraser

Appendix Three

Card Samples

Sample Color Card

Sample Word Card

woman

Sample Subject List Card

Side 1

Nicole	F-C-M				V	
	8, 6			6, 6		8, 5
1. hungry	+ +	1. enough	+ +		1. knock	+ +
2. village	+ −	2. useless	− −		2. since	+ +
3. fruit	+ −	3. bottom	− −		3. beginning	+ +
4. through	+ +	4. pumpkin	+ +		4. kitchen	+ +
5. tired	+ +	5. Wednesday	+ +		5. happen	+ −
6. guess	− −	6. January	+ +		6. build	+ +
7. picture	+ +	7. nearly	− −		7. section	− −
8. speech	+ +	8. learn	+ +		8. banana	+ −
9. dollars	− −	9. weather	− +		9. pardon	− −
10. nurse	+ +	10. hello	+ −		10. narrow	− −

Side 2

	7, 6.		10, 10	
1. human	− −	1. ought	+ +	Pretest 30
2. alone	+ +	2. wagon	+ +	Post-test 58
3. pudding	+ +	3. bear	+ +	
4. ceiling	− +	4. scarf	+ +	gain 28
5. unafraid	+ +	5. ugly	+ +	
6. ankle	− −	6. lighten	+ +	
7. button	+ +	7. cane	+ +	
8. engine	+ −	8. arithmetic	+ +	
9. bacon	+ −	9. boil	+ +	
10. cloud	+ +	10. bought	+ +	

VITA

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Boyd, L. L. The Ginn 720 testing program: an assessment of content validity. Prime Areas. In press.

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April 15, 1981
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