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THE UNIVERSITY OF ALBERTA

SPELLING ACQUISITION: COMPARISON OF DIRECT AND SELF-INSTRUCTION WITH SPELLING DELAYED STUDENTS

BY

© KAREN BAIN

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled Spelling Acquisition: Comparison of Direct and Self-Instruction with Spelling Delayed Students submitted by Karen Bain in partial fulfilment of the requirements for the degree of Master of Education.

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Supervisor

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Date. May 16, 1983.....

Abstract

This study was designed to compare the effectiveness of a self-instruction strategy to a direct instruction strategy for learning frequently misspelled words. A carefully sequenced format for the acquisition of new spelling words was designed. This format was based on principles of effective instruction selected from a literature review of current spelling education as well as recommendations from the literature on direct and self-instruction. Chaining of letter sequences and specified procedures for correcting errors were included in both instructional strategies.

A single subject, multielement research design was used to assess the relative efficiency of the direct and self-instruction methods. The two procedures were alternated every other day over twenty instructional days, so that each condition was in effect during ten sessions. Each instructional session included a 13 minute instruction period and a cumulative test. The test involved all words which had been taught under both procedures up to that instructional day. The subjects had two word banks of ten words each, one for self-instruction and one for direct instruction. The words were selected from a list of frequently missed words at the appropriate grade levels for the subjects.

Four male subjects, between eight and ten years of age participated in this study. They had all experienced a significant delay in spelling achievement, as measured by the Edmonton Spelling Achievement Test. The subjects all attended a special school for children with learning and language difficulties.

The results of this study indicated that although all the subjects learned and maintained words using both strategies, there was not

a great deal of difference between the learning performance under the two conditions. For one subject, self-instruction was more effective as indicated by the Sign Test and through graphic illustration. For the other three subjects performance on cumulative tests over the twenty days was very similar under both procedures. On a two week follow-up measure the number and percentage of correct words retained was also similar with the two procedures.

A discussion of the possible variables influencing these results, teacher direction versus student direction, pacing, and possible implications for classroom use is provided. The basic instructional sequence is recommended for use with spelling delayed children who require a structured strategy to learn new spelling words.

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Chapter I
Introduction

Spelling, one area of language arts instruction, is recognized as both important to academic achievement, and a difficult task to teach and learn. The ability to spell can influence the academic and vocational status of students. Practical needs such as filling out applications for employment, writing letters of request or complaint, and responding to questionnaires may be seriously hampered by a lack of adequate spelling ability. Furthermore, one's written expression is less acceptable to readers if it contains frequently misspelled words. Good spelling ability, on the other hand, tends to lead to greater emphasis on ideas rather than a focus on the mechanics of writing (Graham and Miller, 1979).

Many children who are experiencing academic difficulties are poor spellers. Furthermore, there are more spelling handicaps than reading handicaps (Prith, 1978). In spite of a long history concerning the inadequacy of spelling instruction, however, there continues to be a lack of agreement regarding the role of spelling in academic programs, and the procedures by which it can be most effectively taught (Horn, 1969). Recently, "return to the basics" advocates suggest that spelling skills of students are not adequate. On the other hand, some teachers feel that over-emphasis on spelling stifles creativity, and that spelling should be taught as part of a broad, integrated language arts program (Thomas, 1974).

The difficult challenge of learning and teaching spelling can be partly attributed to inconsistencies in English orthography, the set of rules, principles, standards or conventions by which language is changed into written form. In the English language, orthography is the set of rules used for transcribing phonemes (units of sound) into graphemes (letters of the alphabet which represent those sounds) (Hanna, Hodges

and Hanna, 1971). Some authors suggest that orthography reflects semantic, phonological and syntactic facets of language, not just phoneme-grapheme relationships (Templeton, 1979). There are a variety of linguistic theories which have attempted to explain the theoretical basis of English orthography and its phonological structure (Chomsky and Halle, 1968).

In the English alphabet system 26 letters represent 44 sounds, silent letters, variant and invariant sounds. 300 different letter combinations represent 17 vowel sounds. Furthermore, the English language contains the largest vocabulary of any language, with approximately 490,000 words and 300,000 technical terms (Graham and Miller, 1979). The problem for the novice speller is to choose the correct option from a choice of graphemes representing that sound. The s sound for example may be represented as in city, scene, toss, and sit.

In a large study of the English language, 17,000 words, Hanna, Hodges and Hanna (1971) found that 80% of the consonants in those words had single spellings and that there was a more consistent relationship between sounds and letters than had been believed. Spelling "demons", or inconsistencies were found to represent only 3% of the core vocabulary as represented in this study.

Although proposals have been made which suggest changing the alphabet to correspond to a 1 to 1 relationship between sounds and symbols, real moves to do so have been largely unsuccessful. The complexity of discrete sounds which make up speech, and the number of words in our language which have come from other languages makes this task extremely difficult. The literature reviewed suggested that although experimental attempts to change English orthography have been interesting, the present system is actually quite good. English sometimes reflects knowledge of sound, and sometimes is related to meaning or syntax. Although it is difficult to

learn, the underlying structure is not as irregular as it's surface structure may indicate. The roots of words, meanings and syntactic forms, are often apparent and can contribute to our basic knowledge of language, although initial learning of these meanings may be difficult (Frith, 1978).

The long term goal of spelling achievement is to move from knowledge of sound-symbol correspondences to the abstract, phonological, semantic and syntactic aspects of language (Templeton, 1979). To be a good speller, then, one must know much more than sound-letter correspondence rules, and one must master a number of linguistic generalizations. The linguistic approach is based on the idea that written language follows particular patterns which can be identified and presented to learners. Spelling is then concerned with relationship between the structure of language and linguistic knowledge (Marino, 1980). The beginning speller, therefore, must be concerned with the identification of both regular words which follow sound-symbol patterns, and with the identification of irregular and function words which resist linguistic analysis (Simpson, 1968).

Definitions

Spelling has been defined in a variety of ways. To Peters (1967) it is simply a visual-motor activity which involves the "serial probability of letters occurring". The goal of spelling instruction would be that of learning to write words as easily as one can say them. Another approach considers the importance of semantics, the meanings of words. According to Gentry and Henderson (1978), spelling involves the acquisition of knowledge related to "how the alphabet reflects meaningful language".

Spelling is defined by Hanna, Hodges and Hanna (1971), as the process of encoding, changing spoken words into writing. A more comprehensive definition is "the ability to recognize, recall, reproduce or obtain orally or in written form, the correct sequence of letters in words"

(Graham and Miller, 1979). One can see that each definition differs slightly in orientation, and therefore principles for spelling instruction can vary accordingly.

Several models have been proposed which attempt to visualize the complexity of the spelling process. One which seems particularly comprehensive is Westerman's Task Analysis of Spelling (Hammill and Bartel, 1975). This model includes cognitive, auditory, visual and motor abilities, and their integration as a basis of written spelling.

Spelling Requirements

In spelling one must "move from sound to print, discriminate the correct sound, remember graphemes associated with specific sounds, remember and discriminate the visual appearance of the grapheme, analyze the order of the graphemes, synthesize these to produce the written form and check the grapheme form with a recalled visual image" (Lesiak, Lesiak, and Kirchheimer, 1979). The specific nature and effect of each variable contributing to the spelling process, however, is not always as clear. One must perceive, generate, produce, test and rewrite according to a computerized spelling model proposed by Simon (1976). Analysis and simulation of a spelling task further reinforces the complexity of the spelling process, and the difficulty of providing appropriate instruction.

As spelling usually involves three kinds of knowledge; a. some amount of language knowledge of definitions and word structures, b. internalized rules of words, and c. visual associations, spelling must necessarily encompass a wide variety of strategies and activities (Nicholson and Schachter, 1979). A review of contemporary spelling programs which will be presented later, indicated a wealth of available approaches and programs.

Spelling Research

Considerable research has been carried out in the area of spelling, however much of it has been inconclusive. An example can be seen with regard to teaching phonic generalization rules such as "the final e in a one-syllable word is usually silent" (lake). Many rules are useful for children acquiring initial skills, but they often contain exceptions. There has been conflicting evidence regarding the usefulness of such generalizations (Clymer, 1963).

Other practices which are common during spelling instruction include teaching rhyming words, rules for punctuation, rules of capitalizing, use of synonyms, antonyms and word meanings. Although these skills are all essential for the long-term acquisition of necessary literacy skills they are not necessarily directly related to spelling individual words. They represent common practice, rather than having an empirical basis for inclusion in the spelling program.

Unclear evidence regarding spelling instruction is exemplified further by general reviews which rely on anecdotal rather than analytical results. The suggestions for the development of spelling patterns presented by Forester (1980), for example, considered an analogy to language development, but no experimental data was presented.

Blair (1975) reviewed several current research projects in the area of spelling instruction. The majority found no significant differences between treatments, and offered more heuristic value than actual contributions to improving spelling instruction. Most research has concentrated on auditory and visual discrimination and memory skills. Often this research has resulted in inconsistent findings (Lesiak, Lesiak and Kirchheimer, 1979). Furthermore, some research has been concerned

with factors which may not directly relate to spelling. An example is seen in visual and auditory tasks which do not discriminate spelling ability, although many practice activities for developing these skills continue to be included in spelling programs for young children.

A primary goal in spelling research has been to account for the variance in spelling achievement between pupils. There has been considerable emphasis on materials and strategies, but not on teacher variables. Little evidence regarding the teacher's role has been obtained, although teacher interaction with pupils may be more important than the materials or strategies included in the traditional spelling program (Blair, 1975).

According to Horn (1969), research in the area of spelling has suffered from inadequately described methods and materials, inadequately controlled teacher behaviors, ignoring cultural factors, and inappropriate manipulation of various experimental variables. More recent studies appeared to be suffering from the same methodological problems. This difficulty may be particularly relevant when planning instruction for handicapped or spelling disabled students. Unsatisfactory progress may be due to the type of instruction, materials, inadequate evaluation of individual needs, inappropriate assessment of abilities and an absence of empirically based teaching techniques (Graham and Miller, 1979).

More specifically, in the area of applied behavior analysis, particularly with exceptional learners, there has been little interest in spelling research. Only a few studies have been attempted and these have dealt primarily with rule generalizations (Lovitt, 1975). This research has not been conclusive, but it has been instrumental in raising further questions and pointing out some of the problems with current spelling programs and instructional procedures.

In summary, insufficient and inconsistent research appears to be common in the area of spelling and research has been particularly scarce for exceptional learners. Instructional practices have often been influenced by habits of teachers rather than based on empirical data. The major objective, teaching children to represent spoken words in written code as automatically as possible is a complex task. Viable alternatives to current spelling texts and sound instructional practices must be found. According to Graham and Miller (1979), "spelling instruction should be teacher directed, should contain a variety of relevant instructional options, and should be based on a foundation of research evidence". The current state of spelling research does not appear to meet this criteria.

It is apparent that spelling is a complex matter. The number of variables which contribute to spelling difficulties is large and their nature is diverse (Horn, 1969; Graham and Miller, 1979). Obviously, research in this area must be selective in terms of the multifaceted issue which can be evaluated. The primary goal of this study was to design and test two instructional procedures for the acquisition of unknown, frequently misspelled words. The effectiveness of these procedures in terms of their practical application within a teaching environment was evaluated.

Chapter Two contains a general review of the contemporary literature in spelling. Chapter Three summarizes this literature and identifies the principles of effective instruction and the specific research questions to be considered. A description of the method and instructional strategies employed for this study is found in Chapter Four. Chapter Five describes the results, and interpretations of this research.

Chapter II
Literature Review

The Spelling Program

Templeton (1979) suggested that there is a great mismatch between theory and practice in spelling. As pointed out earlier, research implications have not always been considered when programming spelling instruction for the classroom. Theoretical orientations of teachers and educators are likely to influence the way spelling is presented to learners. For theorists who feel that the English language is quite regular, appropriate instruction is concerned with the presentation of correspondences between sounds and letters.

On the other hand, for those individuals who believe English spelling is controlled by syntax and meanings of words, spelling instruction must include both a study of phonology and linguistics (Chomsky and Halle, 1968). Words would be presented which are similar in meaning and have similar lexical representations. These explanations become a part of the spelling program. Elevation and elevator, for example, are derived from the word elevate (Templeton, 1979), and this relationship would be pointed out to learners. Chomsky and Halle's (1968) theory is more comprehensive than phonological, morphological explanations of spelling, as it accounts for both rational and irrational spellings of words, and their underlying meanings.

The task for students, then, is to first learn the spelling sound system, and later to discover unfamiliar sound patterns which relate more to the system of English orthography. Although no perfect method exists, there must be a systematic progression of language skills (Simpson, 1968).

Although spelling programs differ with regard to content, theory, methods and materials, some common objectives are apparent. The following

overview of spelling instruction is generally accepted (Greene and Petty, 1971). According to these writers, the spelling program should:

1. Develop in each child an attitude that
   a. recognizes that correct spelling is essential for communication
   b. creates a desire to spell correctly
   c. instills a desire to spell and use words more effectively
2. Develop in each child the ability to
   a. recognize all letters, capital and lower case
   b. write all letters legibly
   c. alphabetize necessary words
   d. hear words accurately as they are spoken
   e. pronounce words clearly and accurately
   f. see printed or written words accurately.
   g. group and connect letters of a word properly
   h. use punctuation effectively
   i. use a dictionary appropriately
   j. use phonetic aids for pronunciation of unknown words
   k. apply knowledge of sound-symbol correspondences
   l. use effective spelling rules and generalizations
   m. use effective procedures in learning to spell new words
3. Develop in each child the habit of
   a. proofreading his writing carefully
   b. using reliable sources to determine correct spellings
   c. following study procedures which are effective

An example of a typical method of classroom instruction may be useful. Students are usually introduced to words in lists or context to insure word meaning and pronunciation, and often have a pretest on the first day of a weekly lesson. The student then is involved in a variety of visual and auditory activities and individual study of spelling lists. Word knowledge, linguistic principles and other language arts activities may be introduced on different days. As mentioned earlier, these activities may or may not directly relate to the specific spelling of individual words. Third day tests or individual tests are sometimes included. A test usually falls on the fifth day and children are then required to check their words and chart their achievement on record forms or teacher grade books. In spite of the importance of having children check their own work (Graham and Miller, 1979; Yudkovitz, 1979), many teachers have children trade papers or check spelling themselves.

Words which may still be missed on the final test are frequently recorded for future reference or practice, and the student is ready to begin another lesson the following week.

For many students this procedure is effective, and it has a well organized format easy for students to follow and teachers to administer. In some cases, however, this type of instruction does not meet the individual needs of students who are particularly good or poor spellers. Often inadequate exercises such as creative writing experiences which insure generalized use of newly acquired spelling skills are included. For this reason, teachers often make use of children's own writing or words currently used in their reading program to better insure meaningful, high frequency word use. This practice has the advantage of relevancy but may lack the organization and structure of the more formalized spelling program. Teachers must have well defined procedures for selection of words and spelling practice if this informal, incidental instruction is to be useful and appropriate for individual learners.

The spelling program, then, must develop attitudes, abilities and habits which will contribute to the long term acquisition and maintenance of a difficult sound-symbol system. The final objectives of spelling instruction appear to be agreed upon far more readily than the methods, materials and procedures necessary to reach these goals. A number of variables influence the goal of spelling mastery. Some of these include readiness skills, materials and programs, memory and attention, relationships of spelling to reading and writing, the type of instruction, the sequence of instruction, remedial techniques, attitudes, testing and error analysis and the types of words chosen for inclusion in the program. A review of some of the literature in each area will be presented.

Readiness. Some individual readiness skills appear to be essential prior to spelling instruction. Aural-auditory abilities, understanding rhyming, discriminating beginning and ending consonant sounds, hearing differences between vowel sounds, associating sounds and letters and recognizing the identifying sounds and letters of words may be vital prerequisites to spelling success (Horn, 1969).

One study which attempted to discriminate between good and poor spellers on tasks requiring auditory discrimination, memory, analysis and synthesis of words and auditory visual integration involved 107 third graders and 160 sixth graders. A number of tests were administered to subjects identified as good or poor spellers. Five of the seven tests discriminated between spellers at the third grade level, however, only two discriminated between spellers at the sixth grade level. Simple auditory memory skills were not sufficient, and visual memory was only significant at the third grade level when the additional requirement of writing was added. These researchers suggested that more study was required before the specific processes contributing to spelling success can be identified (Lesiak, Lesiak, and Kirchheimer, 1979).

Although it is not yet possible to positively identify specific necessary skills, some individual assessments should be attempted. During the "readiness" stage, the teacher should consider learner characteristics and answer questions such as: 1. Does the child have sufficient mental ability for spelling instruction? 2. Are hearing, speech and visual abilities adequate? 3. What is the general level of spelling ability or preskills? 4. Has the student areas of specific weakness in spelling? 5. Has the child a modality preference? 6. What systems, techniques or activities might be used to remediate his

difficulties? (Hammill and Bartel, 1975). According to these authors, however, teachers have sometimes become too involved in identifying and attempting to remediate underlying psycholinguistic processes. These processes may or may not predict spelling success and until a proven readiness set of tasks is identified, the teacher should not focus exclusively on associations which may or may not relate to spelling achievement.

Materials and Programs. A variety of materials, activities and programs are available to teachers of spelling. One recent review of spelling texts and materials, however, found that "materials have seldom been reviewed for content, approach or effectiveness" (Graves, 1976). An examination of nine spelling books published since 1971 was attempted. A large proportion of exercises in spelling lessons dealt with affixes and inflectional endings, phonics and syllabication. The contribution these activities made to spelling was questioned, and a need for reevaluation of spelling books and their content was recommended.

Hammill, Larsen and McNutt (1977) studied several spelling programs commonly used in the United States for effectiveness. A total of 2,956 children in 22 states were involved. Students were receiving instruction in one of the following methods: a. Spell Correctly, b. Word Book, c. Basic Goals in Spelling, d. various other programs, or e. no specific spelling program. Testing was completed using the Test of Written Spelling. Children in grades three and four had about equal scores if they were instructed in Word Book, Basic Goals in Spelling or "other". For grades five and six, no instruction was better than Basic Goals in Spelling, and for grades seven and eight Word Book and Spell Correctly produced the best spellers. After grade four no spelling instruction in a specific program was almost as effective as the designated structured

programs. These researchers suggested that more investigation should be carried out to ascertain why no instruction would have been as valuable as frequently used spelling programs, and to identify developmental or individual variables that may have influenced their results.

Three spelling programs were compared by Grottenthaler (1970) to assess effectiveness of instruction. A word-list mastery approach, a multilevel sight sound program, and a spelling principle mastery approach were employed. No one program was found to be more effective than another in achievement or attitudes toward spelling in the fifth graders involved.

One program which was found efficient was a Computer Assisted Instruction course devised by Dunwell (1972). Students were able to work at their own level and pace to develop new spelling patterns. Weak students found this approach particularly useful for remediation.

Several studies have attempted to identify particular instructional strategies which may contribute to spelling success. White and Treadway (1973) attempted to compare traditional, word-analysis and rule generalizations and their subsequent effects on spelling proficiency. None of the strategies employed were significantly more efficient than any others.

Reinforcement by token, social, and concrete rewards and it's effects on spelling achievement has also been considered (Quick, 1972). Concrete reward was not found to have a greater effect than token or social rewards on the spelling achievement of one group of disadvantaged children.

Few studies have considered the importance of teacher behavior or teacher-student interaction during spelling instruction. Hodges (1973) suggested that the teacher variable is of prime importance and should be

evaluated when attempting to develop or improve spelling programs.

Another effort to identify the critical variables of spelling instruction involved the importance of mental imagery. Caban et al. (1978) suggested that spelling words can be learned and retained more effectively by teaching a mental image practice method. The program involved 150 students who used mental imagery for words with specific drill and practice, or had no specific directions. No significant differences were found between the experimental and control groups, although the mental imagery method had a positive trend. Further study of mental imagery approaches was suggested.

The efficacy of teaching spelling rules and generalizations of rules has been frequently researched. Clymer (1963) completed an extensive analysis of commonly taught phonic rules. He found 18 out of 45 generalizations actually useful. Furthermore, rules were often misapplied, and when children are already experiencing difficulty spelling, additional complicated rule following is often impossible or confusing (Peters, 1967). Only essential rules of spelling and phonics should be included in a spelling program (See Horn, 1969 and Graham and Miller, 1979 for rules of practical value).

Another approach to spelling instruction emphasized the importance of letter names. Letter name learning according to Durrell (1980), was essential for: a. understanding phonemic relationships in obvious words such as b in beaver, b. spelling by letter names aloud, a better technique than sounding out, c. making learners aware of the relationship between sounds and letters, d. providing support for words as visual, semantic units, and e. understanding variations in English spelling. Using this letter name emphasis, the author suggested a smooth transition from speaking to reading to writing.

The traditional approach of introducing all spelling words on Monday and testing on Friday, as described earlier, has been questioned. Rieth et al.(1974) evaluated the effectiveness of distributed practice and daily testing rather than this usual method. In both individual and group studies, introduction of a few words each day and daily testing resulted in superior spelling performance. Giving all words at the beginning of the week, a practice advocated in most spelling programs, appeared inferior to daily practice and testing according to this study.

One review of spelling research presented seven characteristics of an effective spelling program (Fitzsimmons and Loomer, 1977). 1. Words presented in lists are learned more effectively than words presented in meaningful contexts. 2. Spelling lists should comprise words that are used frequently by learners. 3. Self-correction of spelling is vital. 4. Words should be learned whole rather than in syllables. 5. Phonics generalizations are questionable. 6. The test-study method is superior to the study-test method. 7. Time spent on spelling should be 60 to 75 minutes per week. It is interesting that many of these same suggestions were proposed by Horn (1969) almost ten years earlier, however, the articles reviewed have shown that many programs continue using methods which are apparently inappropriate or ineffective (Johnson, Langford and Quorn, 1981).

Memory and Attention. The relationship of memory and attention to success in spelling is somewhat ambiguous. Although memory as a global influence is frequently mentioned in the literature, it is not clear what types and aspects of memory may be essential to spelling achievement. Some related literature regarding memory may be of interest.

Mnemonics are devices which aid memory or provide cues to better remember information. This "association of ideas", remembering something

by associating it with something else has been frequently employed during spelling instruction (Shaw, 1965). In spite of common use, however, few studies have validated the practice of particular mnemonics. Often suggestions are given to learners which may be of minimal value, or confusing (Quinn, 1980).

One study (Negin, 1978), examined the effectiveness of mnemonic training on spelling performance. Forty-two children were involved either in mnemonic instruction or in context activities, using their words in meaningful sentences. The group trained in mnemonics in this study not only performed more effectively, but reported that mnemonics provided enjoyable learning experiences.

Another study compared the sequencing ability of good and poor spellers. Poor spellers may have a gross rather than a sequential memory problem. If students are unable to remember information, it is unlikely they will remember the particular order or sequence of that information (McLeod and Greenough, 1980). During spelling instruction, students should not be expected to remember a letter sequence or chain beyond their gross memory threshhold.

Differences in memory abilities have been noted when comparing students with high verbal IQ's to low verbal IQ's. Students with higher verbal IQ's tended to learn elaboration strategies for increasing meaningfulness of materials more successfully than subjects with higher performance IQ's (Loe, 1978). It was suggested that the two groups of learning disabled children may have different abilities to process auditory information. If verbal IQ's are low, perhaps the student has more difficulty with superfluous verbalizations, and auditory overloading should be avoided. Appropriate assessment of individual learning

characteristics, as mentioned earlier, should include this consideration prior to instruction.

Some studies have assessed the effectiveness of children's verbal and imaginal strategies as they attempted to remember pairs of pictures. In these discrimination tasks, overt imagery and writing a word in the air (writing imagery) was found to be superior to vocalization. These authors suggested that the usefulness of rehearsal strategies depended upon the degree of relevant cognitive processes which are activated in the learner (Levin, et al., 1975). Furthermore, pictorial presentations may be favored in imagery strategies, whereas verbal presentations are favored in rote memory learning (Ross and Ross, 1978). Some pictorial mnemonics have been used for remembering sight words in spelling (Cordoni, 1981), however, the practice is not supported by empirical evidence as to it's effectiveness.

Although research has shown that retarded children often do not use good memory strategies, few studies have attempted to specifically train more effective memories in this population, and none were found which related to spelling learning. One study concerned itself with training digit span memory. The training procedure included chaining and fading techniques and reinforcement for correct responding. The digit span memory of a retarded girl was increased, but insufficient generalization to a sentence task was found (Farb and Throne, 1978). The same problem may be encountered when trying to train memory strategies for letter sequences of individual words without training a generalized spelling practice method.

Another study attempted to compare differences in nonverbal serial recall on short term memory between learning disabled and normal children. Different mediational patterns were not identified between the two

groups. Furthermore, this study did not find that three dimensional materials facilitated recall, although they suggested that the salience of visual information was necessary to facilitate visual rehearsal of new information (Swanson, 1978). Gagne (1977) proposed that teachers should help students improve their memories more specifically by teaching conventions of memory, labeling, teaching mnemonic elaborations, unitizing series of items, and interpreting pictures. Suggestions for spelling, however, are not included.

Auditory memory processes have often been associated with spelling, and have been identified for remediation prior to academic progress. To identify the precise nature of this processing deficit, Torgesen and Houck (1980) conducted a series of experiments. They concluded that a link between processing deficits measured by diagnostic tests and learning problems in school has not been established. As a result, predictions regarding school performance are ambiguous. This opinion was further reinforced by the work of McSpadden and Strain (1977) who did not find a clear connection between auditory memory processes and measures to diagnose learning disabilities.

Some theorists have referred to attention deficits as a possible source of difficulty in spelling. It is possible, however, that for many children selective attention deficits may be a result of developmental delay rather than a long term or permanent defect in learning. Tarver et al. (1977) found a lag in verbal rehearsal strategies of learning disabled children, however, their selective attention did increase over time. More research is needed to interpret the effects of memory and attention abilities or disabilities on spelling achievement with both normally learning and learning disabled students.

Relationships of spelling to reading and writing. Considerable agreement has been reached concerning the importance of linking spelling acquisition and student's writing more effectively (Graves, 1976; Hammill and Bartel, 1975). Current views on spelling instruction reflect a more integrated approach than has been found in the past. Reading and spelling tend to be complimentary skills, rather than separate units of instruction (Blair, 1975).

Correlations between spelling and reading have been reported as .48, .51, .61, and .63 in various studies (Horn, 1969). Some children, in spite of excellent reading ability, can be very poor spellers (Frith, 1978). It is at present unclear how much spelling is acquired through reading, however, it does not seem that mere exposure to words is sufficient for spelling achievment. Peters (1967) proposed that one in twenty-five words was learned through reading. Furthermore, good spellers were more likely to learn new words incidentally than were poor spellers.

Spelling cannot be simply a rote memorization process. It must necessarily go beyond phonics. Word lists for spelling should develop through children's own writing as much as possible (Beers and Beers, 1981). Writing is what makes spelling have meaning. Consequently, spelling must be approached through a multifaceted set of activities. Spelling should not be isolated from the over-all language arts program, but must be emphasized throughout reading and writing as well as programmed spelling instruction (Templeton, 1979).

Direct or indirect instruction. Less agreement is found with respect to a choice between indirect or direct instruction than other considerations regarding the spelling program. The research in this area is not consistent or conclusive. Programs vary from tightly controlled computer programs

or programmed materials, to incidental teaching based on student writing, needs or interests. Many spelling programs are related to an integrated language arts curriculum. Systematic instruction, however, does not have to mean ignoring other parts of the school program or individual needs and differences of students (Greene and Petty, 1971). Often an either-or decision has been made, rather than using different types of instruction for different problems. A more comprehensive review of direct instruction and self-instruction will be presented later in this chapter.

Sequence of spelling instruction. The issue of sequencing spelling instruction has been approached in a variety of ways. Three steps were suggested by Gentry and Henderson (1978). According to these authors, children must first experience words and test hypotheses regarding language and its rules. Secondly, they proposed that standard spelling should not be emphasized to the point that children become discouraged or frustrated. Thirdly, they stated that children should have frequent opportunities to manipulate words and see the relationships between spelling, word meaning and phonology. Furthermore, this ongoing development must be supported and encouraged by a variety of individualized word study activities, as well as constant exposure to words by reading and writing (Zutell, 1978). Familiarity with words was emphasized frequently, especially during initial spelling and writing activities.

Beers and Henderson (1977) attempted to explore how children learn to spell by identifying spelling error types related to developmental sequences. Through analysis of children's creative writing, they discovered that students learn combinations of phonological, morphological and syntactical information, not just letter-sound correspondences.

Children appear to develop a hierarchy of strategies as they become more familiar with standard English orthography. If these sequences are accurate, they reinforce the notion that children must be introduced to language knowledge, visual associations and internalized rules as they learn to spell, not only phonic skills. The word cup, for example, does follow-sound-symbol rules, however, words like medicine and medical have a language based association and words such as ancient must be taught through visual associations or mnemonics (Nicholson and Schachter, 1979).

Forester (1980) proposed that learning to spell was similar to learning speech in terms of a developmental sequence. The stages of development were: a. scribbling or pretend writing, b. one letter spelling, c. two and three word sentences, d. self-programming of simple rules - not necessarily conventional, e. overgeneralization of acquired rules, and f. more accurate conventional spelling. Instruction must, therefore, relate to the stage a learner is at and it must provide support for moving through stages at an individual pace.

Another method of assessing the spelling process and it's sequence is advocated by Simon (1976). Through a computerized simulation of the spelling process (SPEL), individual components of the spelling task were identified. The following considerations must be made according to this approach: a. the task environment - meanings of words used in the directions needed for the spelling task, b. alphabet knowledge - names of letters, shapes of letters for use both visually and motorically, c. relationships between the letter shape, it's name and letter sounds, d. words and their nature, e. rules and general mnemonics, and f. external sources of spelling information. Through the information obtained in this type of assessment, the teacher can sequence instruction at the

appropriate level for each child.

From this review, spelling instruction should be based on a variety of considerations. Whether one is convinced that children move through distinct developmental phases (Forester, 1980), or that a natural sequence of instruction exists, if basic words are not mastered the spelling program is inadequate. At that point, educators must apply more specific procedures or programs to better insure spelling success or provide appropriate remediation.

Remediation. There is at present no complete theory of spelling disability. The types of difficulties exhibited by poor spellers can be attributed to a variety of causes (Frith, 1978). Consequently, there is no one remedial method which may be useful for children who are experiencing spelling problems. Multisensory approaches, individual word studies, and computerized programs have all been employed. Unfortunately, many suggestions to teachers are vague or useless. Such statements as "remediation should be based upon correcting and eliminating errors most frequently made" (Tauber, 1968) are common. Some specific lists of principles and suggestions for remediation are cited, however, and the following list is representative of these (Graham and Miller, 1979).

1. Spelling instruction must be direct and not incidental. Although some students do learn outside instruction, incidental learning is more probable by good spellers.

2. Spelling instruction must be individualized due to the unique skills and needs of each student.

3. Continuous evaluation is essential as progress must be monitored.

4. Successful remediation should use a variety of techniques and methods as no one best method or procedure has been identified so far.

5. Attitudes toward spelling must be considered. Good attitudes are contingent upon providing students with efficient learning technques, presenting words of high social utility, emphasizing student progress, using a variety of interesting activities and games, structuring

tasks so that students can succeed, and limiting instruction to relevant and critical skills.

Often suggestions given to teachers are incompatible, and it is difficult to decide which procedures would be particularly helpful for students. An example was illustrated in an article by Cotterell (1974). This remedial teacher suggested that words be ·ided into syllables for learning, that difficult or "tricky" parts of words ·e identified, and that teaching knowledge of spelling rules would be beneficial. Johnson, Langford and Quorn (1981), on the other hand, stated that words should be learned whole and not broken into parts, that teaching phonic rules is very questionable and that identifying "tricky" parts of words is an ineffective procedure.

Remediation of spelling disabilities may consist of adapting existing programs by adding reinforcement, reducing numbers of words, or offering memory aids such as color coding and diacritical markings. Often students who are experiencing difficulty with methods or materials are simply slowed down in the program, and are not provided with options which may increase their proficiency. Exceptional students who need a different approach are not always provided with relevant activities, or the general word study they experience may not directly relate to their spelling disability (Simon and Simon, 1973). As a consequence, many exceptional learners are not given appropriate opportunities for success.

One program which has approached these issues is that of Stowitscher and Jobes (1977). Through a specified training procedure and scripted format, the teacher in this program modeled, reinforced, corrected and offered specific practice on each spelling word until the students involved reached mastery. In an earlier study by Jobes (1975), eight children who were experiencing severe difficulty with spelling were helped

significantly using this direct approach.

Multisensory approaches to spelling instruction and remediation have been quite popular, especially for children with learning disabilities. A visual-auditory-kinesthetic-tactile technique (VAKT) was presented originally by Grace Fernald (1943). This six step program involved the following procedure; a. inspect the whole word, b. pronounce the word, c. pronounce the word while writing, d. dot i's and cross t's in a left to right sequence, e. pronounce each syllable and underline it, and f. pronounce the whole word again. This approach has been used by a number of educators with positive results (Taschow, 1970; Crawford, 1968; Hill and Martinis, 1973).

Multisensory approaches are generally advocated by many other researchers, both instructionally and for remedial purposes (Hanna, Hodges and Hanna, 1971; Graham and Miller, 1979). Often, however, the suggestions and evidence are anecdotal rather than empirically based. Multisensory approaches may be effective because of the multitude of attentional requirements. Practicing words may be facilitated by using several modalities. Arvidson (1969) proposed that seeing, hearing, feeling and testing were all essential to learning to spell a word. If it is true that educational experiences which employ more senses are more effective (Dieterich, 1972), then the multisensory approach to spelling should be advocated.

Attitudes. Confidence in spelling is essential according to Greene and Petty (1971). In spite of the instructional program or remedial techniques, developing a good attitude toward correct spelling is a prerequisite to the spelling process. Positive attitudes can be established by: a. providing a definite and efficient method of learning, b. providing

words to be learned that are most needed in writing, c. making students aware of their spelling skill and progress, d. making spelling instruction meaningful and interesting, and e. developing an interest in language and a desire to spell correctly. This development of a "spelling consciousness" is frequently referred to in the literature, but specific methods for meeting this goal are infrequently found. Ideally, this attitude would be beneficial for all academic achievement. Unfortunately, students do not always acquire a positive attitude toward their school work, especially students who are experiencing difficulty acquiring basic academic skills.

Testing and error analysis. Spelling testing can be carried out through diagnostic, standardized or criterion referenced measures. Standardized testing may be useful for teachers when gross discriminations between students or grouping information is required. Diagnostic tests and criterion referenced tests give more specific information concerning skills and strengths of individual students. The most important aspect of spelling skill evaluation is to analyze errors made by students and thereby to match needs to appropriate content and materials (Hammill and Bartel, 1975). Error analysis gives the teacher an opportunity to detect particular weaknesses, therefore making remediation more meaningful (Graham and Miller, 1979; Marino, 1981).

The Larsen-Hammill Test of Written Spelling (1976) is comprised of regular and irregular words, offering teachers an assessment procedure designed to discriminate phonic and nonphonetic skills. Categorizing spelling errors has been further described by Marcus (1977) in an attempt to offer specific suggestions for individual remediation. Locally, the Edmonton Spelling Achievement Tests provide information concerning error patterns.

By analyzing specific types of errors in children's writing, Marino (1981) pointed out qualitative differences between developmental problems and those which actually required remediation. Although some errors are logical, others may require memory aids, changes in strategy, or more focussed intervention.

Yudkovitz (1979) attempted to increase awareness of errors by teaching students to scan for errors both in their own spelling and in the spelling of others. If the child was able to do so, he was also expected to correct errors. If visual recognition capabilities were inadequate, a multisensory program involving visual, oral and kinesthetic procedures was implemented. Results indicated an improvement in auditory and visual information matching, which may have been due to increased attention or positive reinforcement.

Kauffman et al. (1978) compared two methods of correcting spelling errors. Two mentally retarded boys served as subjects. During one phase the boy's spelling was corrected by the teacher saying, "Here is the way to write this word". During another phase the children's errors were imitated, "Here is the way you wrote the word", then written correctly, "and this is the right way to spell it". The imitation plus model procedure resulted in faster acquisition of spelling words.

A similar experiment by the same researchers was carried out with a learning disabled boy. Imitating the child's spelling errors before showing him the correct word was found to be an effective procedure, especially for irregular sight words. This may have been a result of teaching through presentation of a negative instance (Engelmann, 1980), or the result of focussing attention on the critical aspects of a word. In any event, contingent imitation was in this case a therapeutic procedure.

Boder (1971) proposed that children make three different kinds of errors in reading and spelling. Disphonetic errors were nonphonetic approximations to whole words. Children who made these kinds of errors tended to have inadequate basic word attack skills. Dyseidetic errors were phonetically acceptable, but children who made these errors had difficulty with sight words and irregular whole words. Alexic errors were made by students who had both an inability to use phonetic skills or to perceive words as wholes. Boder has claimed that all children with reading disorders exhibit reading and spelling problems in one of these three groups. Looking at patterns of errors is emphasized by this approach, as well as multisensory remedial techniques.

Holmes and Peper (1977) attempted to further assess Boder's claims by comparing differences in types of errors between retarded and normal readers on a standardized spelling test. Errors were scored according to error categories which included: a. phonetically acceptable, b. vowel deletion, c. vowel substitution and addition, d. consonant deletion, e. consonant substitution, f. consonant addition, g. incomplete processing, h. reversal of letter order and letter doubling, and i. garble. Results indicated that the patterns of errors made by retarded and normal readers were almost identical. Although retarded readers made more errors in spelling, the types of errors did not differ from those of normal readers.

According to these studies, teachers should become more sensitive to the number and types of errors made in written work. Most spelling errors are made on phonetically ambiguous or irregular words, and often the middle of the word tends to be most challenging (Simmon and Simon, 1973). Error analysis should be an intregal part of the spelling program.

Word selection. Considerable interest has been shown regarding what words to teach and their appropriate instructional sequence (Horn, 1927; Rinsland, 1945; Thomas, 1974). The most relevant analysis for the purposes of this paper was an evaluation of the frequency of word use by school children carried out in Alberta (Thomas, 1972). Collected writing samples of 1287 students resulted in a total study of 117,878 words. Only 7,365 different words were found. Furthermore, 100 words accounted for 58% of all the words used. These words were further analyzed to find the most frequently misspelled words at different grade levels.

Nicholson and Schachter (1979) proposed that words should be classified in order to identify the most appropriate teaching method. If words follow particular rules, for example, it would be expedient to teach those rules. On the other hand, visual associations and mnemonics (Quinn, 1980), may have to be taught for sight words or irregular words in which letters do not represent their most common sounds. Hanna, Hodges and Hanna (1971), suggested that many words could be spelled by sound due to their findings of a high degree of correlation between phonemes and graphemes.

Some "demons", in spite of their irregular or ambiguous nature, may have an underlying meaningfulness. In this case, teaching the spelling pattern may be enhanced by introducing students to a historical or structural clue, providing another set of interpretations for word study (Templeton, 1980).

It is readily apparent that some words are more difficult to spell than other words. One survey of research in this area summarizes the interpretations of word difficulty (Cahen, Craun and Johnson, 1971). This review described individual word difficulty as related to the magnitude of correspondence between the phonemes and graphemes within words.

Another perspective (Brown, 1970), however, suggested that word frequency rather than sound-symbol regularity is the critical variable when assessing word difficulty.

Apart from the difficulty of the word, frequency has also been considered when deciding what words to include in the spelling program. Words which children ask the spelling of, words which are frequently misspelled and words teachers know children will often need in their writing are commonly included in the instructional program (Johnson, Langford and Quorn, 1981). Thomas (1974) further reinforced the importance of teaching high-frequency words. He suggested that children who have trouble spelling should concentrate on a few words and that those selections should be ones they are most likely to need in their writing.

Summary and practices to avoid. In summary, spelling instruction is a multidimentional challenge for teachers and students. A variety of methods, principles and proposals have been reviewed. Green and Petty (1971) listed a number of practices which teachers should avoid while teaching spelling. These points serve to summarize the foregoing literature.

1. Attention should focus on the whole structure of a word, not hard or tricky individual letters or syllables.
2. Writing words in the air is of doubtful value. This practice does not give a realistic picture of a word, nor does it require the same movement as writing with a pen or pencil.
3. Copying words without attempts at recall is ineffective. Copying randomly tends to encourage poor work and attention habits.
4. Reinforcement should be provided to children who ask how to spell.
5. When spelling words for children it is best to write them down, including both visual as well as auditory impressions.

6. Spelling and writing should never be used as a form of punishment.

7. Rules are of little help unless there is clear evidence as to their generality. Rules can be confusing, especially to poor spellers.

8. For a slow learning child, directly teaching spelling may be essential.

Exceptional Learners

Some children find spelling particularly challenging. Although of average intelligence, they experience frustration and a lack of normal development in spelling achievement. It is often unclear what specific difficulties these children may have, and the literature presents conflicting viewpoints regarding the causes, characteristics and remedial techniques which may be most appropriate for these students.

Children with spelling disorders frequently have difficulty with visual imagery, auditory and visual discrimination and/or sequencing skills, motor problems, information processing inadequacies, phonics confusions and attentional deficits (Yudkovitz, 1979). Other difficulties may include poor attitudes toward spelling, reading disabilities, handwriting problems, visual and auditory defects, poor school attendence, speech defects and a variety of health or personality characteristics (Greene and Petty, 1971). Spelling success may be further hampered by external factors such as social, motivational and/or educational variables.

Exceptional learners may exhibit any one or more of this complex array of possible problems. Furthermore, it is possible to have adequate processing abilities and still be a poor speller. Although poor spelling and poor reading are often correlated, some students may be good readers and exhibit severe spelling disabilities (Wykis, 1981). In fact, some children have difficulty securing remediation, as their

teachers expect spelling to improve due to their good reading ability (Frith, 1978).

Among children with dyslexia, severe reading retardation, it has been found that only 50% of their reading vocabulary could be spelled. In contrast, normal readers were able to spell 70% of the words in their sight vocabularies. Furthermore, normal readers were much more likely to make good phonetic equivalents for misspelled words than were dyslexic children. Dyslexic students tend to display problems with: a. phonetic word analysis, b. deficits in perception of configuration or visual gestalts, and c. difficulty with both visual and phonetic skills (Whiting and Jarrico, 1980). It can be seen from these findings that some children require an individualized assessment of spelling ability with a consideration of reading skill in order to plan a relevant instructional program.

In the case of exceptional learners, grouping may not be as easy as it is with more consistent learners. The important considerations may include a reduction of the number of words taught to better insure success, teaching a study procedure which works for each child, making sure instruction is meaningful and efficient, and including only words which are frequently needed.

As a majority of children who are labeled handicapped tend to be poor spellers (Graham and Miller, 1979), special education professionals must be particularly sensitive to the development of spelling programs which consider individual strengths and weaknesses of each student. As mentioned earlier, error analysis is of particular value when identifying specific spelling patterns and developmental stages. Remedial teachers must also be willing to coordinate reading and spelling in order to teach necessary skills to children who may have inconsistent reading and

and spelling behaviors (Cotterell, 1974).

Blau and Loveless (1982) suggested that acute spelling difficulties of the dyslexic child may be a specialized syndrome that includes other individuals who have a particular inability to spell. They advised an alternative to multisensory remediation strategies, making use of a tactile procedure rather than a visual exposure to words. They further hypothesized that using the left hand was viable due to the current theories of hemispheric dominance. One would have to subject their results to replication before implementing their procedures, however. As with earlier research in the area of spelling instruction for learning disabled children (Academic Therapy, 1968, 4), inconclusive evidence supports their instructional techniques.

In summary, spelling disabled children present a particular challenge for the teacher. Inconclusive evidence regarding methods and materials, unique individual learning styles, and inadequate theoretical models all contribute to the complexity of providing spelling instruction for exceptional learners. A review of two general methods of education may provide some further suggestions. Direct instruction and self-instruction techniques, examples of various programs, and the implications these procedures have for the teaching of spelling will next be reviewed.

Direct Instruction: General Procedures

The importance of direct instruction and systematic presentation of spelling lessons and skills are frequently supported as essential to spelling achievement. In spite of the recent move toward integration of language arts programming and the need to use children's own language as the basis of the spelling program, there continues to be a need for

direct instruction of specific skills. Systematic instruction does not necessarily conflict with individual needs and interests. In fact, direct instruction can insure necessary prerequisites for the expansion of individual language arts programming. Rather than suppressing creativity, knowledge of basic words and rules makes it possible for young writers to concentrate on ideas rather than the mechanics of writing and spelling (Hammill and Bartel, 1975). Furthermore, for some learners, the incidental, self-initiated instructional procedures have not been proven effective.

Direct instruction is an approach to establishing and maintaining new behaviors. It is ideally an alternative, preventative rather than remedial program of instruction (Carnine, 1977). Although the principles of direct instruction have been used predominately with exceptional learners, the basic teaching model is relevant for all students. Most teaching could benefit from more careful programming and more specific evaluation of teaching-learning environments. Furthermore, the procedures of direct instruction have an empirically sound basis and have been proven effective in a variety of teaching situations (Englemann, 1980).

Basically, direct instruction is concerned with teaching all essential skills directly, rather than relying on incidental or chance learning. As the types of learners and the severity of learning problems have become more challenging in classrooms, more sophisticated instructional methods have been required. Retarded and hard to teach children now demand and expect quality education and many programs to meet their needs have been based upon direct instructional techniques (Carnine and Silbert, 1979).

The direct instruction teacher must decide what to teach and how to accomplish the teaching in the most efficient manner. The emphasis

on teaching shifts from the child's etiology to an assessment of the most effective procedures by which new information can be learned. Direct instruction teachers are concerned with teaching, getting a response to occur reliably in the presence of appropriate stimuli (Carnine, 1977). This process involves securing attention, presenting information appropriately, and giving adequate feedback contingent upon the learner's responses. If a child is not learning, the teacher has a responsibility to change one of these processes. Teaching in this model is, therefore, evaluated by the amount and type of learning exhibited. In the area of spelling, if the same words are continually misspelled, the teacher is not providing adequate teaching or strategies to change this spelling behavior.

Educational programming which involves direct instruction procedures must consider ten specified variables (Baine, 1978).

1. Attention. Direct instruction programs usually consider the essential nature of attention and prescribe attention signals to learners. "Look". "Watch me". The teacher must secure and maintain attention throughout the lesson.

2. Task stimulus. The task stimulus includes the materials, objects or activities involved in the lesson. These should be relevant to the concepts or illustrations presented.

3. Stimulus directions. The stimulus direction tells the learner generally what to do. "Look at the page". "Feel the cloth".

4. Stimulus prompt. Stimulus prompts are optional, but are often necessary for hard to teach children. They provide cues as to where to look, by drawing attention to particular features or discriminating characteristics of a stimulus. They may include pictures, color coding, or other discriminating features.

5. Response direction. A response direction indicates the general nature of the response required. It may be a naming (oral) response, or a production (written) response.

6. Response prompts. Response prompts are optional and are used when the learner does not respond. They may be imitation cues, verbal

instructions, non-verbal motions, or physical prompts. They should be faded quickly as they can become too well established by both the teacher and learner.

7. Do-it signals. Signals to respond might be verbal. "Say it". "Your turn". They may be hand signals cuing the learner to respond. The do-it signal is preceeded by a response direction, a pause for organizing the response. They give a cue as to when to respond, after learners have had time to organize their answers. These signals are particularly important during group instruction.

8. The task response. This is the answer. An important consideration here is pacing. Research has shown that within reason, more quickly paced lessons generate better attention and more efficient practice of skills and concepts (Carnine, 1976).

9. Correction procedures. The importance of effective and immediate feedback is stressed in direct instruction. Correction procedures are included as a prescribed aspect of the instructional format. They may include feedback for signal violations such as calling out too early or too late during group responding, for not responding to questions as well as for actual errors in responses.

10. Reinforcement. Direct instruction involves the application of ongoing reinforcement which is contingent upon specific skills, maintaining good attention and appropriate work habits as well as correct answering.

Organizing a direct instruction program includes the following: a. setting goals and objectives, b. task analyzing essential skills and preskills, c. sequencing those skills in an appropriate manner, d. organizing instruction to maximize learner and teacher time, e. selecting teaching procedures that actually work, f. designing formats that include what the teacher will say and do, including both instruction and correction procedures, g. selecting examples and modeling behaviors which are clearly communicating to learners, and h. producing a lesson that includes rehearsal or review of past lessons, pretrains necessary vocabulary for future learning, presents new skills, and provides opportunities for generalization of basic applications to new situations (Carnine, 1979).

Unfortunately, there are few studies which apply direct instruction

procedures to teaching spelling. One such attempt was explained by Stowitschek and Jobes (1977). Individual students were taught spelling by a direct imitation training procedure. The instructional format contained direct instruction principles including modeling, immediate feedback, practice and scripted teaching formats as well as a mastery criteria and intermittent reviews of past learning. The results of remediation with spelling disabled children using this program were quite positive.

One spelling program which is available for grades four through twelve is based on direct instruction principles. Morphographic Spelling (Dixon and Engelmann, 1976), is a morphographic analysis or set of rules through which 12,000 words are taught. The program includes direct instruction of all necessary skills and rules, exercises for cumulative practice and an intermittent review of past learning. An assessment of the effects of Morphographic Spelling in comparison to the Nelson Spelling Program was carried out. The Morphographic group made relatively greater gains than the Nelson group (Earl, Wood and Stennett, 1981).

The Distar Spelling Program, part of Distar Reading I and II (Engelmann and Bruner, 1975), is a direct instruction program. It contains scripted teaching lessons, sequenced instructional formats and correction procedures. Children are taught the spelling of a carefully developed sequence of sounds, then words and finally whole sentences. Spelling is closely coordinated with the reading program to insure children learn to spell words in their current reading vocabularies.

Several studies are available which describe the use of direct

instruction for reading acquisition (Carnine and Silbert, 1979). An example was a comparison between a cognitive and operant model of reading instruction, the Distar and Palo Alto Reading Programs. Stein and Goldman (1980) found that the Distar, direct instruction model resulted in superior performance with initial reading skills. Furthermore, the children in the Distar program had a successful feeling about their own reading ability due to their obvious progress.

Other studies have not been as positive with regard to the Distar reading program, but do emphasize the value of direct instructional strategies for some learners (Ogletree, 1977). In an attempt to encourage teachers to use the blackboard for drill on necessary skills, for example, Chandler (1978) reviewed the value of direct instruction. He stated that clear goals, constant monitoring, immediate feedback and specific basic steps of instruction make the direct instruction approach superior to other teaching strategies.

Direct instruction procedures were implemented to teach sight vocabulary words to moderately retarded students. In this study some words were taught incidentally, by children observing others being taught, and some words were taught directly. Although there was considerable variability, all students improved their reading. The percentage of directly taught items correctly read was significantly higher than items taught incidentally. Furthermore, the higher ability group tended to gain more from incidental teaching than the lower ability group (Hanley-Maxwell, Wilcox and Heal, 1982).

In summary, direct instruction procedures provide an opportunity for teachers to present concepts and skills in an efficient, effective manner. All necessary information is included in teaching sequences to maximize student achievement. A variety of new academic programs in

arithmetic and language arts are available, as well as programs for teaching motor and self-care behaviors. The effectiveness of these programs are well documented (Carnine and Silbert, 1979), however, they have received some criticism.

Some critics have suggested that students should be more involved in their own learning, and that direct instruction stifles creativity of teachers and students. A more cognitive, less directive approach is sometimes preferred. A general review of self-instruction techniques will now be presented.

Self-Instruction: General Procedures

The literature reviewed earlier frequently referred to the importance of young spellers acquiring effective procedures for studying spelling words. Poor spellers are particularly encouraged to learn specific steps for practice of new words. These steps vary from program to program (Graham and Miller, 1979), however, several are common to all. The following list is generally representative of these self-study procedures (Greene and Petty, 1971).

1. Look at the word carefully and pronounce it correctly. If you do not know the pronunciation, ask someone or look in the dictionary.
2. Cover the word or close your eyes and think how it looks. Try to visualize the word. Spell it with your eyes closed.
3. Look at the word again and be sure you could spell it. If not, start over.
4. Cover the word and write it. Check the accuracy.
5. If correct, write it again without looking. Check for accuracy.

It is interesting that variations on these steps are stated in many spelling programs, however, the ways children may be taught to use these steps effectively are not presented. Recent literature on

self-instruction (Meichenbaum, 1977) may offer assistance. Furthermore, although self practice of words is common, spelling programs do not generally include a review of considerations which make children's self learning more viable.

It is important when practicing spelling, for example, that recall be included. Children should be made aware of the importance of this technique. Copying a word several times without attempted recall has not been proven effective (Horn, 1969). It has also been shown that checking one's own work is superior to having it checked by another child or the teacher. Students should be told the importance of checking their own words and the value of attending carefully to details in each.

Principles of self-instruction are of current interest to a variety of professionals who deal with changing behavior. Self-instruction involves teaching subjects verbal strategies which prompt, direct or maintain behavior (Meichenbaum, 1977). How individuals learn and remember in order to perform new tasks has been viewed as an essential step in understanding cognitive processes, and is especially important in assessing how learners acquire information in academic settings. Although a cognitive orientation toward learning has been theoretically influencial for many years, it appears that a new emphasis on cognitive processes is currently prevalent in behavior therapy (Beck, 1976), in understanding how inappropriate cognitions are responsible for overt behavior (Kazdin and Hersen, 1980), and in problem solving interventions for normal and exceptional individuals (Meichenbaum, 1977; Bryant and Budd, 1982).

The internal variable most often stressed in cognitive-behavior modification literature is verbal mediation, or as Meichenbaum (1977) refers to it, "internal dialogue". Becoming aware of one's own inner

talk is a major goal of cognitive behavior modification and self-instruction programs (Meichenbaum et al., 1979). The influence of one's own personal speech upon behavior is an important consideration when acquiring and performing new skills.

The cognitive-behavior modification, self-instruction model usually includes: a. a component of self-treatment such as self-control or self-instruction, b. client verbalizations, both overt and/or covert, c. a sequenced instruction or series of instructions for problem solving, and d. instruction, usually through modeling, to teach the client how to perform.

Although cognitive behavior modification studies have resulted in both positive and negative effects (Abikoff, 1979), there continues to be a proliferation of interest in this area (Mahoney and Kazdin, 1979). Several reasons have been stated for this interest. First, difficulties with generalization and maintenance of behavior change following behavior analysis programs have resulted in interest toward programs with a self-instruction component (Meichenbaum, 1980). Secondly, the importance of speech, language and verbal mediation on behavior has become more obvious and cognitive behavior modification addresses these issues (Meichenbaum, 1977).

Another factor relates to individuals with exceptional learning styles. Many handicapped children have negative experiences learning, and consequently develop a helpless or passive attitude toward new tasks and problem solving. Mastery oriented children, on the other hand, often engage more frequently and more successfully in self-instruction without external guidance or specific procedures. If a child is not task oriented, and does not employ effective learning strategies, his acquisition and maintenance of new skills may be hampered (Meichenbaum,

1980). Passive learners (Lloyd, 1980), retarded children who do not use verbal mediators (Ross, 1971), and children who lack cognitive self-awareness and understanding of cognitive tasks (Loper, 1980), may all benefit from cognitive-behavior modification approaches. It is both self-respectable and efficient for learners to assume personal responsibility for their own learning (O'Leary and Dubey, 1979).

Meichenbaum and Goodman (1971) developed a training format for teaching children to control impulsive behavior while completing tasks. Their model has been used or adapted by many of the following researchers in this area. The experimental group was trained using the following sequence:

1. The experimenter did a task while talking aloud to himself and the subject watched. (Cognitive Model)
2. The subject performed the task while the experimenter again gave the instructions out loud. (Overt, external guidance)
3. The subject performed the task and verbally instructed himself out loud. (Overt, self-guidance)
4. The subject performed the task while directing himself in a whisper. (Overt faded self-guidance)
5. The subject performed the task self-instructing himself without overt signs. (Covert self-instruction)

This procedure, therefore, involves seeking the attention of the learner, defining tasks, guiding behavior in a particular manner, evaluating behavior and sometimes reinforcing (Dennis and Mueller, 1981). A variety of studies with both exceptional and normally learning children have been carried out to test the effects of self-instruction procedures.

Impulsive, retarded adolescents were able to develop an effective language mediation system (Peters and Davies, 1981); task attention for academic skills was improved (Burgio, Whitman and Johnson, 1980);

errors were reduced on the Leiter Scale following self-instruction training by moderately retarded subjects (Norton and Lester, 1979); and additional studies have dealt with juvenile delinquency (Williams and Akamatsu, 1978), hyperactivity (Bornstein and Quevillon, 1976) and motor behavior (Burron and Bucher, 1978).

Not all of the reported investigations have resulted in positive changes in behavior due to the use of self-instruction. Difficulties with generalization (Guralnick, 1976), problems with research and insufficient experimental control (Ledwidge, 1978), and inconsistent or lack of replication (Robin, Armel and O'Leary, 1975), have also been noted. Lloyd (1980) concluded that modeling, self-verbalizing and strategy training may all have instructional relevance, but further research was required. At the present time, little interest has been shown in applying self-instruction to remediate academic difficulties.

Several factors relate to the effectiveness of particular self-instruction strategies. First, children must know what it is that they are to change, in specific terms (Friedling and O'Leary, 1979). It is essential that the learner become active rather than passive. Secondly, self-statements must be clear, concise and easily understood by the learner. Thirdly, it appears essential to model, guide and test the self-instruction strategy to insure the learner's success. Practice must be sufficient for mastery of the skill sequence required. The challenge is to develop a set of instructions which are specific enough to be easily learned and therefore applicable to specific situations, but general enough to have application to other problems of the same nature. The techniques must be practical, easy to monitor and assess,

socially appropriate, and consistent with the teacher's goals and expectations.

According to Meichenbaum (1977), some self-instruction programs may have failed because of an incorrect or insufficient task analysis of the skill required. If a self-instruction strategy for correct performance or decreased errors is implemented, the child must first have mastered the skill completely. If a task is very specific and does not require general skills, the self-instruction strategy can be specific (O'Leary, 1980). If, on the other hand, a general skill such as social problem-solving is required, the task may include problem definitions, goal statements, impulse delay, choices of alternatives and considerations of consequences (Kneedler, 1980). Obviously, this type of program would require a more complex training sequence.

The application of self-instruction techniques to the area of spelling instruction appears promising. Considerable agreement has been found regarding the importance of independent study of words, and an individualized spelling program. The ability to benefit from individual programs is contingent upon the ability to work at one's own speed and pace instruction appropriately. The process described to children, however, is often limited to a vague set of steps with no training or teaching of the self-study procedures. Using a model to teach study behavior, monitoring study on an ongoing basis, and reinforcing appropriate study would better insure correct study of new spelling words.

In summary, self-instruction appears to be a viable option for both learning new skills and controlling behavior. The learner, who is trained to follow specified instructional sequences, becomes actively involved in his own learning. He acquires procedures which can be

generalized through additional training to new tasks or problem situations. By defining tasks, focussing attention on critical features, acknowledging errors and recognizing accomplishments, a learner is in a position to take on personal responsibility for current and future education.

This review has now included a discussion of various spelling methods and materials as well as considerations for sequencing instruction. Direct instruction and self-instruction models have been defined and studies representing the use of those models have been mentioned. The following section will describe single subject research design, with an emphasis on instructional research.

Single Subject Research Design

Research in education must relate to applied problems in naturalistic settings if it is to be effective. Research which increases the communication between clinicians and investigators is particularly beneficial (Guralnick, 1978). Identifying relevant variables, assessing conditions and manipulating events in educational settings, however, is often a difficult process. It is essential that an appropriate research design be employed, especially when one is interested in applied problems.

Until recently, most experimental designs have been concerned with group behavior, and the individual characteristics or patterns of behavior of single individuals have been largely ignored. There is currently, however, an increasing interest in single subject research designs which are attempting to understand the unique behavior of individual subjects. The goal of single subject research is to demonstrate a relationship between specific events and defined target behaviors of participants (Bailey, 1977).

The move toward single subject research may be a result of

several problems with group designs and the use of inferential statistics which have been popular in the past. Several of these problems were described by Hersen and Barlow (1976), and Ulman and Sulzer-Azaroff (1977).

1. Withholding treatment from control groups, a common practice, is ethically questionable. In spite of evidence as to the usefulness of particular treatments, individuals who have been selected as control subjects may never have an opportunity to benefit from therapy, drugs or treatment.

2. It has been difficult to match individuals on all variables, therefore making it difficult to be certain an experimental group is homogeneous in nature. This has been particularly challenging in applied settings where children in classrooms or patients seeking treatment are often quite dissimilar.

3. Using averages, a common procedure with the collection of group data, tends to make individual data obscure. No one individual may have the described average scores or behaviors and, therefore, no useful information about specific individuals is available to practitioners.

4. There may be difficulty generalizing group results, particularly if the results are a mean or statistical composite rather than specific to any one individual.

5. The variability of individual performance in group data tends not to be described sufficiently. Although statistical procedures account for group differences, the individual results of target behaviors are often not assessed.

For these reasons group research designs offer insufficient information for some problems, especially specific questions in applied settings. Generalizing group results to exceptional learners may be even more questionable due to the unique learning styles and behavior characteristics of these subjects (Guralnick, 1978).

Single subject designs, on the other hand, tend to offer an accountable alternative, particularly with individuals who cannot be grouped homogeneously with any degree of certainty. Several advantages of single subject research are described in the literature (Hersen and Barlow, 1976; Ulman and Sulzer-Azaroff, 1975; Kazdin, 1978; Kratochwill, 1978).

1. Single subject designs tend to identify relevant, practical problems. They are usually employed for meeting specific needs of clients or students rather than directed toward theoretically ambiguous questions.

2. Single subject designs are ideal for natural settings as they usually do not require large intrusive procedures frequently required by large group research designs.

3. Single subject designs often require the collection of data on an ongoing basis, and usually, therefore, assess individual behavior with greater precision. When measurements are taken repeatedly, they must necessarily set exact conditions. This control contributes to more standardized results.

4. Single subject designs tend to be compatiable with teaching and instruction and therefore enhance rather than interfere with ongoing programs in natural settings.

5. Because the same subject is usually exposed to all conditions, subjects serve as their own control. Variability and individual performance, therefore, is evaluated more realistically.

6. Frequent collection of data tends to result in more believable results. The more often interventions are manipulated, the more acceptable are the experimental findings.

7. An increasing emphasis on accountability, especially in special education, has made methods which are empirically based more in demand. It is becoming increasingly important to show that methods, materials and instructional procedures are actually advantageous to individual learners.

The most common single subject designs are the multiple-baseline and reversal designs or their variations (Kazdin, 1978). Multiple-baseline procedures include measuring performance prior to treatment until stable behavior is found, then introducing treatments sequentially across subjects, environments or responses. After each intervention, change in performance can be attributed to that intervention. A relationship between behavior and intervention is demonstrated if behavior changes only when intervention is introduced. When this procedure is replicated a convincing verification is demonstrated.

Reversal designs demonstrate the effects of treatment by collecting baseline, data prior to treatment, then introducing the intervention.

After stabilizing performance, the intervention procedure is withdrawn. Again after performance is stable the intervention is reintroduced. The systematic changes in performance as indicated by the data show the relationships between the treatment and behavior (Kazdin, 1978).

Several problems are apparent with reversal designs, especially for instructional or teaching interventions. Behaviors that have been changed due to instruction are not likely to return to baseline levels (Cuvo, 1979). After a child has learned to perform a particular academic task, withdrawl of program variables may result in some decrease in performance, but data is not likely to reflect a return to baseline level. Treatment effects in this case tend to carry over to withdrawl periods.

Another problem inherent in reversal designs is staff resistance. Clinicians and teachers are not willing to remove a set of conditions that are beneficial to the client, or have resulted in more functional relationships with an individual (Cuvo, 1979). For these reasons reversal procedures, although frequently used, may not be ideal for many educational research problems.

The major strength of multiple baseline designs is the possibility of observing variability and consistency of behaviors across situations. This emphasis as well as repeated measures to predict future behavior gives an opportunity to validate individual performance. Furthermore, multiple baselines can be used in various combinations across behaviors, people and settings and replication of results leads to greater generality (Strain and Shores, 1979).

On the other hand, some difficulties have also been apparent when using multiple baseline procedures. There is often a lengthy probe or baseline period which is boring or undesirable for subjects who are waiting for treatment (Strain and Shores, 1979). Multiple baseline

designs can also be complicated by the relationship between treatment and behaviors other than the target behavior, causing ambiguous results. Researchers must be careful to evaluate daily trends and changes in behavior which may be influencing the single independent variable under study (Bailey, 1977).

As can be seen, although reversal designs and multiple baseline designs have been valuable for evaluating behavior change, they may not always be appropriate for instructional research. When the goal is acquisition and maintenance of new behaviors, different research methods may be required (Strain and Shores, 1979). The goals of instructional research include finding antecedent and consequent means to teach discriminations, and attempts to replicate successful procedures across teachers and students.

The multielement design (Sidman, 1960; Ulman and Sulzer-Azaroff, 1975; Bailey, 1977) meets the requirements for instructional research concerned with comparing methods and materials. In the original description of a multielement design, Sidman (1960) explained the merits of using the same subject for more than one experimental condition. "In the ideal case, stimulus control of each baseline element acts, so to speak, to split the single subject into two (or more) identical organisms, each performing appropriately to its controlling variables and each strictly comparable with respect to the factors which normally would have produced intrasubject variation".

Multielement designs may involve two or more independent variable comparisons, although more than three or four would be difficult (Bailey, 1977). Each set of conditions generally has it's own antecedents and consequences. The experimental and/or baseline components are alternated

independent of behavior change and treatment effects are demonstrated through analysis of performance under the different conditions (Murphy, Doughty and Nunes, 1979). The multielement design usually involves many manipulations of conditions and there is, therefore, a convincing demonstration of treatment effects. Additional advantages include a rapid visual demonstration, and immediate programming can be implemented. The procedure is ethically responsible due to the positive treatment model with no long baselines or withholding of treatment (Sulzer-Azaroff and Reese, 1982). Furthermore, there is considerable control over hard to manage variables, experiments can be terminated more rapidly, and if procedures must be stopped early, existing data can serve as a pilot for future work (Ulman and Sulzer-Azaroff, 1975).

Several disadvantages of multielement designs are also described (Ulman and Sulzer-Azaroff, 1975; Bailey, 1977). It is sometimes difficult to make clear conclusions due to interactions which may be established, but not identified, between treatments. "Contrast effects" between alternating treatments, one treatment causing a change in behavior in another treatment, may occur. Because multielement conditions are brief, however, less problem is apparent than with some other research models. It is important that stimuli for each condition be distinctive, and that generalization and carry over treatment effects be minimal.

If the conditions necessary for using the multielement design can be met, it appears to be a promising design for assessing the value of instructional procedures. Because of the increasing emphasis on individual programming and accountability in education, the use of multielement designs may be particularly beneficial in special education applied settings.

Although multielement designs have not been used extensively,

some studies employing this procedure have been described in the literature. The effect of teacher aides or no aides was assessed during language arts lessons (Loos, Williams and Bailey, 1977). In this study the design was chosen because it allowed for repeated replication of specified treatment effects in an applied setting.

To evaluate the characteristics of leisure behavior in residents of a half-way house, Johnson and Bailey (1977) employed a multielement design. These researchers were interested in what factors were responsible for nonparticipation and wanted to make a number of experimental manipulations within a given number of sessions, an opportunity which is provided with this design.

Training and baseline conditions were alternated using a multielement design to assess the effects of interspersing known words with unknown words in a reading acquisition task. Six retarded adolescents were presented words using an interspersal procedure and a baseline condition (Neef, Iwata and Page, 1980). The multielement design provided a chance to alternate conditions concurrently, and thereby monitor the ongoing effects of instruction.

Murphy, Doughty and Nunes (1979) described a multielement design employed to investigate upright head positioning in mentally retarded individuals. By counterbalancing two ten minute segments, response contingent reinforcement and a baseline procedure, the effects of music reinforcement on upright head positioning was evaluated. These authors stated that they used a multielement design because it "permitted a more rapid and complete assessment of the reinforcement capability of a particular consequence and the cuing value of a specific stimulus than did either a reversal or multiple baseline design".

A multielement design may be most appropriate when: a. evaluating

one or more different procedures, b. it is necessary to observe rapid effects over a limited time, c. target behavior is unlikely to be reversed, d. there is a problem achieving stable baselines, e. sequence and contrast effects can be minimized, and f. an ethically responsible procedure is required for applied settings (Sulzer-Azaroff and Mayer, 1977). This design is ideal for complex behavior analysis and for evaluating schedules of reinforcement (Ulman and Sulzer-Azaroff, 1975).

Summary

In summary, this literature review has included a general description of spelling programs and the common instructional procedures by which they are taught. Exceptional learners and unique learning characteristics which may contribute to spelling difficulty were considered. The general procedures of direct instruction and self-instruction methods of teaching were described, including examples of specific programs which relate to instruction in spelling. Research methods, specifically concerned with single subject experimentation were examined, with an emphasis on the multielement design. The literature review will next be summarized into a composite problem which forms the basis of this research project.

Chapter III
Statement of the Problem

A good spelling curriculum, as described in the literature reviewed, is based on selecting appropriate words, defining procedures and sequences of instruction, as well as considering the personal characteristics of individual learners. A lack of agreement with regard to the value of particular procedures or theories of instruction has been indicated (Templeton, 1980; Hammill, Larsen and McNutt, 1977). Even when agreement has been reached, teachers have not always used this information to change or improve their spelling methods or materials.

Several principles of effective spelling instruction and suggestions for teaching have been presented. For the purpose of summarizing and formulating a research problem, these principles can be grouped into three general areas: a. what to teach in spelling, b. how to teach spelling, and c. how to evaluate spelling research. References to exceptional learners and direct and self-instruction as they relate to the research problem will also be made.

What to teach

Spelling should be based on words which are familiar in meaning and pronunciation (Johnson, Langford and Quorn, 1981). Furthermore, spelling lists should be comprised of words most frequently needed by the learner (Thomas, 1974), and integrated with the total language arts program. For children who are experiencing difficulty learning, rules and generalizations of a complex nature are apt to cause confusion rather than helping the child who is experiencing spelling delay (Peters, 1967). Phonic rules are particularly questionable and should only be taught when they have wide applicability (Horn, 1969). When deciding what to teach, the teacher must meet the individual needs of students, and

present those words which will be most frequently needed. For children with auditory, visual or cognitive deficits, special care must be taken not to teach unnecessary concepts, expect correct spelling of too many words in a single lesson, or use inappropriate instructional techniques.

How to

The literature discussed a variety of recommendations regarding to teach spelling. The variables presented which can be integrated into a practical spelling program were numerous. According to Johnson, Langford and Quorn (1981), the single most important variable affecting spelling success was that children correct their own work. It was important to several researchers that students be involved in their own instruction, not just copy or write words without frequent opportunities for recall (Wykis, 1981). The described principles of self-instruction as an active learning process contributed to this point of view. Frequent testing and distributed practice was supported by Rieth et al. (1974) as effective for spelling achievement. Scanning for errors and matching visual with auditory information has also been recommended (Yudkovitz, 1979).

Writing words appears to be a slightly different task than oral spelling and both should be included in the spelling program (Graham and Miller, 1979). Verbalization, as shown from spelling bees in the past, has been proven effective, at least as a verbal mediator (Lovitt, 1975). Teaching of letter names must be an integral part of the spelling process according to Durrell (1980). The need for a combination of verbal, auditory and visual practice is therefore supported, especially for hard to teach children. Students who are already experiencing specific learning difficulties may require a program which includes all modalities.

In terms of teacher involvement, individualized structured teaching has often been more successful for hard to teach children that incidental instruction (Carnine, 1977). Direct teacher involvement including modeling, praising and providing corrections and feedback contingent upon responses has been proven effective (Stowitschek and Jobes, 1977). Individualizing instruction has been appropriate, particularly for children experiencing difficulty acquiring basic spelling skills (Graham and Miller, 1979). Petty (1971) stated that teachers had a responsibility to teach a student some systematic procedure for practicing new spelling words. The principles of direct instruction are thereby supported, both for teaching words directly, and for teaching specific spelling study method.

How to evaluate research

As pointed out earlier, single subject research designs have been particularly appropriate for evaluating behavior and treatment effects of individual students (Kazdin, 1978). A useful design is the multielement procedure which compares one or more treatment methods or interventions with single learners (Sidman, 1960; Bailey, 1977). In terms of spelling, it is possible to assess the effects of instruction on the acquisition of words by alternating instructional procedures over time and recording correct spelling of words under individual procedures.

Research Proposal

For the purpose of this study, these principles of spelling instruction were combined with a scripted instructional sequence for learning frequently misspelled, new spelling words. The questions to be answered in this investigation related to the relative effectiveness of direct and self-instruction methods on the learning of unknown words.

Specifically, would a strategy where pacing and direction of spelling word practice which was controlled by the teacher be more effective than a similar study format which was controlled by the learner? Secondly, would a difference be found on a follow-up measure to be administered two weeks following the instructional program? In other words, would direct or self-instruction lead to better acquisition and maintenance of frequently misspelled, common words? The next chapter describes the specific procedures employed to assess and answer these questions.

Chapter IV
Method

Participants

The students involved in this study were between 8 and 10 years of age. They were able to print legibly, and had adequate visual and auditory skills as well as experience with oral and written spelling. Furthermore, they were all behind grade expectation in spelling ability. For their chronological age, they all exhibited a one to three year delay in spelling achievement. They all attended a special school for children with learning and language difficulties.

The Edmonton Spelling Achievement Test, Grade 2, Form A (1981), was used for an initial achievement screen. As a result of this test, four students were selected for further testing. These children misspelled at least 75% of the words on this test, placing them at the 25 percentile or below for Grade 2.

Each of these students was then required to: a. write the letters of the alphabet when the letter names were given orally, b. write the letters of the alphabet when the letter sounds were presented orally, c. write the two spelling pre-tests of words to be used in the instructional program, and finally, d. to complete the Peabody Picture Vocabulary Test - Revised (Dunn and Dunn, 1981).

The four subjects chosen were able to write the sounds and letters of the alphabet with more than 95% accuracy, were below their expected chronological grade levels in spelling, were male, and of English speaking background. They had no physical, auditory, visual or emotional problems which would contribute to their spelling difficulty or interfere with participation in this study.

Subject 1 was aged 9 years and 3 months. He was able to write all letter names presented orally, and knew all letter sounds with the exception of u. This subject received a standard score of 89 on the Peabody Picture Vocabulary Test-Revised (1981). He correctly spelled 8 words on the Edmonton Spelling Achievement Test for Grade 2. This placed him at the 17 percentile on this measure. Chronologically, he should have been in Grade 4.

This student was described by his teacher as inconsistent, distractable, and often off task during seat work activities. He has had difficulty acquiring basic skills in the language arts area. One problem has been inconsistent speed, and he often exhibited work behavior which was too fast or too slow for the task required. This boy has required individual, structured programs and external reinforcement for maximum success in school.

Subject 2 was aged 8 years 1 month. He was able to write all letter names and sounds correctly with the exception of a confusion between q and j. This boy received a standard score of 96 on the Peabody Picture Vocabulary Test-Revised (1981). On the Edmonton Spelling Achievement Test, Grade 2, he correctly spelled 7 words placing him at the 12 percentile. This student should have been in Grade 3.

This subject had very limited reading skill when he entered school in the fall of 1982. He has learned sounds, sound blending skills and many basic sight words in one school term. This subject was described as very quiet and attentive during instruction and seatwork. According to his teacher, he has been well motivated and can work for up to twenty minutes independently. He has shown initiative to continue studying when concepts and directions are clear.

Subject 3 turned 10 years of age during this study. He could identify all letter sounds and names and write them when they were presented orally. On the Peabody Picture Vocabulary Test-Revised (1981), this subject received a standard score of 104. On the Edmonton Spelling Achievement Test, he correctly spelled 5 words, placing him at the 4 percentile for Grade 2. This subject should have been in Grade 4 at the time of this study.

This boy has characteristically been very talkative and highly distractible. He was reported to be frequently off task during his independent work. He was also quite inconsistent with regard to effort and correct responding. His teachers related that he worked best under constant supervision and in a well structured environment. He has had particular difficulty following directions consistently.

Subject 4 was 9 years 3 months of age. On the Peabody Picture Vocabulary Test-Revised (1981), he obtained a standard score of 85. This subject could correctly identify and write all letter sounds and names. On the Edmonton Spelling Achievement Test for Grade 2, he spelled 9 words correctly, placing him at the 23 percentile on this measure. Chronologically, he should have been at the Grade 4 level.

This subject was described as inconsistent with regard to his classroom assignments. He worked best when structure and external guidance was available, according to his teachers. In the classroom, he has required constant supervision to maintain motivation and task attention.

Test Instruments

The Peabody Picture Vocabulary Test - Revised (PPVT-R, 1981), was chosen to assess receptive, hearing vocabulary for Standard

American English, ill required for spelling. This test measured one aspect of intelligence, vocabulary, which is thought to relate to school success (PPVT-R Manual, 1981). Subjects in this study were administered Form M prior to and two weeks following the instructional program. The test required selection of a picture which best illustrated a stimulus word presented orally.

The PPVT-R was standardized on 5,028 individuals. Raw scores can be converted to age-referenced norms, age equivalents and/or standard score equivalents, derived scores which allow comparison of individual performance with the standardized group. Standard scores were calculated for the purposes of this study. Split half reliabilities on the PPVT-R, Form M, range from .61 to .86 (Median .81). Retest reliability ranges from .73 to .91 (Median .82). According to the test manual, the reliability is therefore satisfactory, with scores stable for up to one month.

In terms of validity, the PPVT-R measures reception and comprehension of the spoken word. Construct validity was established according to a hearing curve for each stimulus word. Vocabulary is thought to correlate more highly than any other subtest scores with Wechsler Intelligence scales and school success. The content validity was established by an evaluation of each word and it's definitions as defined by Webster's Dictionary. No criterion validity was established. The test manual states that the PPVT-R is a "reasonably good measure of scholastic aptitude". The PPVT (1959) correlated .60 with the spelling subtest of the Wide Range Achievement test, but no data has yet been collected on the PPVT-R.

The Edmonton Spelling Achievement Test, Grade 2, Form A, was administered as an initial screening measure of spelling achievement and two weeks following the instructional program. This test was developed and normed in Edmonton between 1976 and 1980 on Edmonton public school children. Words for the test were chosen from Canadian Word Lists (Thomas, 1974), Basic Goals in Spelling (Kottmeyer et al., 1972), local word lists and subject content words. Words were field tested in grades one to seven with the final selection of 240 words and four parallel forms. Each word selected had a 5% or greater growth rate for each grade. Percentile norms and means for grades 2 through 6 were calculated for January, May and October test dates. Field testing was completed between 1976 and 1980. The test is intended to provide general ranking information in spelling achievement. Error pattern tests were also included on this measure, but were not used in this study.

The test was administered as described in the test manual. A word was pronounced, sentence given using the word, then the word was given again. The children were tested as a group. This measure includes a total of 35 words. See Appendix 1.

Instructional word lists for this study were selected from the list constructed by Thomas (1974). In an extensive research project undertaken in Alberta in 1972, an evaluation of 25,000 compositions was carried out. Approximately 200 compositions per grade were analyzed by computer. From this data, 2000 words based on a composite of grades 1 to 6 were selected as the most frequently written by Alberta school children. Furthermore, the compositions were analyzed for spelling errors to determine which words caused the greatest problem for students. The most frequently mispelled 25 words were selected at each grade level.

Considerable overlap was indicated as some words were frequently misspelled at all six grade levels.

The subjects in this study were pretested with a total of 40 words from the Grades 1, 2, 3, and 4 word lists as compiled by Thomas. Homonyms, words of less than four letters, hyphenated words and any words correctly spelled by any one of the four subjects on either pretest were eliminated. The pretest was administered twice, one week prior to instruction and the day before instruction began. In this way 20 words were selected which were misspelled by all four students on both pretests. These words were then randomly assigned to Word Bank 1 or Word Bank 2, providing two sets of ten words each, unknown to all four subjects. See Appendix 2 for a list of the pretest, and Appendix 3 for the two Word Banks.

The random selection of the two groups of words into word banks was an effort to establish two groups of words of generally equal difficulty. It was not possible to empirically establish the specific difficulty of each word for each child, and the complexity of analyzing each word for features such as syllables, blends or digraphs was also beyond the scope of this study. Random selection, therefore, was the only feasible option.

Further attempts to eliminate word difficulty as a variable for this study were accomplished by use of a counterbalance design. The Word Bank 1 words were used for direct instruction by two students and self-instruction by two students. The other two students used Word Bank 2 for direct instruction and Word Bank 1 for self-instruction. This provided two groups of words of generally equal difficulty randomly assigned into two instructional word banks, and counterbalanced for instructional procedure across subjects.

Procedure

A chain is a set of verbal and or motor response links which are performed in a fixed order. Spelling is a cumulative, forward chain. As a word is spelled, one letter can become a discriminative stimulus for the next letter, and so on. In teaching spelling, therefore, it is essential that letters be taught in order and practiced successively to reinforce the chain, in the end a correctly spelled word. Repeated practice adding letters successively focuses attention on each link and provides repeated practice with each letter link. During instruction it is important to practice the letters in the order in which they must be spelled and to sequence this practice of adjacent links closely (Baine, 1982). According to Sulzer-Azaroff and Mayer (1977), "Each behavior in a chain, then, has a dual-stimulus function. Each reinforces the behavior that it follows and each serves as an S^D to occasion the behavior that it precedes".

The instructional sequence employed in this study used the chaining technique for written spelling. The subject was required to write one letter, then compare it with a stimulus model. If the letter was corfect, the subject then turned to a clean page and wrote the first two letters of the word. If that comparison was correct, the first three letters were attempted and so on. In each case the stimulus word was said orally before writing. If errors were made in the chain, they were corrected immediately. Pronouncing the whole word and spelling the whole word orally followed each letter chain attempt. Pronouncing the whole word and writing the whole word another time was required following a complete chain. This further reinforced the total links and insured sequencial practice and feedback for the completed task.

Each subject was instructed individually by the experimenter.

The subjects went to a small office for 23 consecutive school days following the pretest sessions. Each session consisted of an instruction period of 13 minutes followed by a cumulative test. For each subject the instructional procedure alternated day by day, so that the self-instruction procedure was in effect one day and the direct instruction procedure was in operation the following day. A sign served to inform the subjects which procedure he was involved in for each session.

The instructional period consisted of reviewing words missed from that day's instructional list for the two previous cumulative tests and/or learning new words if no errors requiring review had been made. The cumulative test at the end of the session included all the words which had been completely instructed and written once correctly in a record book. The subjects were instructed to watch carefully and spell words out loud as they completed their cumulative tests. If they found errors they were required to cross out the whole word and write it again properly. The cumulative test included all words learned up to that session in both self-instruction and direct instruction. This was the performance measure used to assess the effectiveness of the procedures, and to evaluate differences between the number of words learned in self-instruction in comparison to the number learned in the direct instruction procedure.

In both procedures the word to be learned was written in red marker on a laminated card which fit into a cover. The word could slide out to be fully exposed, or it could slide out one letter at a time for checking and comparison. The card could be wiped off with a damp cloth for the next instructional word. All words were printed on the card by the experimenter and the subjects were instructed to

print rather than write to avoid any confusion between cursive and manuscript writing.

For each word, the subjects used a practice booklet of a number of paper strips stapled together. The first letter was written on the first page, the first two letters on the second page and so forth. After writing the complete word correctly and matching and comparing each successive letter sequence, the word was given orally to be written in the record book. All new words and correction-review words were completed in this manner.

The experimenter pronounced the word orally when it was given to the student for both the self-instruction and direct instruction procedures to insure the child pronounced the word correctly. All words completed were given orally for the record book by the experimenter. No erasing was allowed. If an error was realized by the subject, or found during letter comparisons it had a line drawn through the word and a new attempt from the beginning of the word was made.

Following the cumulative test, the experimenter spelled the words out loud, touching the letters, as the student watched. A check (✓) was placed beside correct words. In this way each subject was daily made aware of the number of words spelled correctly.

An oven timer was set when each subject began working. At the end of the 13 minute instructional period, the cumulative test was administered. If the subject was in the middle of learning a word, that word was dated and put away for the next session of that procedure (every other day). On that day, the student would begin at the point where he left off practicing that word. If only two steps, writing the word a final time or oral dictation for the record book remained

when the bell rang, the subject was permitted to complete the word.

Teachers in the two classrooms from which the subjects came were informed generally as to the procedures used in the study and were told they could have copies of the procedures following the end of the program. The words taught were not words which were in the weekly spelling lessons of the subjects, however, they were common words which were likely to have been used in reading and other language arts assignments. No special instructions were given to the classsroom teachers as part of this study. The teachers contacted the parents of each student involved and explained the program. Oral permission for all student participation was readily granted by these parents.

Self-instruction Procedure. Each subject was trained for three days to follow a series of steps for practicing an unknown spelling word. These sessions were 15 minutes in length. The first word was studied by the examiner, using the whole instructional format, by modeling each step out loud while the student observed. One error was made by the experimenter on the last letter to demonstrate correction procedures. In this way both the same and different options for matching letters written with the stimulus word were taught. This model took the entire first session.

On the second day, the subjects participated with the experimenter who modeled and reinforced the steps while the subjects actively followed the procedure. Two demonstration words were completed during the second session.

During the third session, the direct instruction format was employed with one word and the self-instruction format with a second word. The direct instruction procedure, as it was so similar, served as a further model and practice before beginning the actual program

on the fourth day. The subjects each indicated on the self-instruction word that they could: a. follow the instructional steps sequentially, b. complete the study of a word within 7 minutes, and c. read the steps when they forgot what to do next. Although the subjects did not always read or follow the procedures verbatim, they indicated that they could use them in a manner thought not to deviate in any significant way.

Self-Instruction Format

1. Pull the word out of the cover.
2. Look at the red word.
3. Say the whole word out loud.
4. Touch and say each letter out loud.
5. Say the whole word out loud.
6. Touch and say each letter out loud.
7. Say the whole word out loud.
8. Put the word back into the cover.
9. Say the word out loud.
10. Write the first letter.
11. Slide the first red letter out of the cover.
12. Look at the first red letter.
13. Say the first red letter.
14. Say the first letter you wrote.
15. Are they the same?

Same

Pull the whole word out.

Touch and say each letter out loud.

Put the word back into the cover

Turn to a clean page.

Different

Pull the whole word out.

Touch and say each letter out loud.

Say the word.

Touch and say each letter out loud.

Same (Continued)

Say the word.

Start with the first letter.

Print all the letters you got right before and add one letter.

Slide the letters out of the cover one at a time.

Say the red letter.

Say the letter you wrote.

Are they the same?

Different (Continued)

Say the word.

Touch and say each letter out loud.

Say the word.

Put the word into the cover.

Turn to a clean page.

Print all the letters you got right and add the correct letter.

Slide the red letters out one at a time.

Say the red letter.

Say the letter you wrote.

Are they the same?

16. Write the whole word one more time.

17. Check the word you wrote with the red word.

18. Are they the same?

19. If so, ask for a test on this word.

During the self-instruction, the experimenter remained at the desk with the subject, but did not involve the subject in any conversation, give feedback or corrections. After the stimulus word was presented and pronounced for the subject, the experimenter remained quiet until the subject asked for a test on that word, indicated that he had completed the instructional procedures as required. After the word was recorded in the record book, if time remained in the instruction session, the next word was presented to the learner who began the study steps for that word.

Direct Instruction Procedure. The self-instruction and direct instruction procedures were essentially the same. The responsibility for guidance, pacing and correcting were the major variables which differed between the two procedures. Self-instruction, as described, allowed the child to move at his own pace, control his own task attention and control the speed by which he completed the study of a word. The experimenter controlled the rate and direction of the spelling practice during the direct instruction sessions, as well as provided feedback and correction for specific responses. In the direct instruction format which follows, what the experimenter said is in quotes and what was done is in brackets.

Direct Instruction Format

1. (Pull word from cover).
2. "Look at this word". (Point to base of first letter).
3. "This word is _____." (Slide finger along base of word and say it).
4. "Say it with me when my finger moves along. Ready." _____ (Slide finger along base of word).
5. "What word?"_____ (Slide finger along base of word).
6. "I can look at the letters and spell this word out loud. My turn." (Successively touch the base of each letter and spell letter names).
7. "Spell it with me when I touch each letter". _____ (Successively touch base of each letter and spell out loud with child).
8. "What word?"_____
9. "When I touch the letters you spell ____." (Touch base of each while child spells).
10. "What word?"_____
11. "Now you're going to write the word _____". (Put word into cover.)
12. "Write the first letter in _____".
13. (Slide the first letter from the cover). "Look at the first red letter". (Touch the first red letter). "What is the first red letter?" ____ "What is the first letter you wrote?"

14. "Are they the same?"____

Same	Different
(Pull the whole word out).	(Pull the whole word out).
"When I touch the letters you spell ____". (Touch base of letters).	"Look at this word. What word?" ____
(Put word back into cover).	"When I touch the letters you spell ____". (Touch base of each successive letter).
"Turn to a clean page".	"What word?" ____
"What word are you spelling?" ___	"When I touch the letters you spell ____". (Touch base of each letter).
"Print the first ___ letters in _____".	"What word?" ____
(Slide letters out one at a time).	"When I touch the letters you spell ____". (Touch base of each letter).
"Say the red letter". ____	"What word?" ____
"Say the letter you wrote". ____	"Turn to a clean page."
"Are they the same?"	"Print the letters you got right before and add the correct letter."
	(Slide letters out one at a time).
	"Say the red letter". ____
	"Say the letter you wrote". ____
	"Are they the same"?

15. "Now write the whole word one more time. What word?" ____

16. (Slide the letters out one at a time).

17. "Say the red letter". ____

18. "Say the letter you wrote".

19. "Are they the same?"

20. "Now get ready to write the word in your record book". (Pronounce word orally and child writes in book).

During the direct instruction procedure, if the child did not answer correctly, the answer was modeled, led, then tested. For example, if the child said the wrong word when asked, "What word?", the examiner would say, "No, this word is ____". "Say it with me". ____ "Now, what word?" ____

Correction procedures were also employed if the subject did not reply at all. The model, lead, test format was further used if a child made an error in oral spelling, or pronounced a letter incorrectly. If the subject was not attending or attempted to discuss another topic, specific orientation directions were employed. "You weren't looking at the word, try it again." "You have to look at the red letter, do it again". The verbal prompts, and model, lead, and test format was used consistently throughout the direct instruction procedure. It was sufficient to correct orienting errors in this study.

This completes a description of the direct and self-instruction procedures used for the instructional program. The formats and specific experimental training sequences have been defined. The four subjects have been characterized, in terms of spelling ability and general behavior during academic tasks. The design used for the study will now be described.

Research Design

The multi-element, single subject design (Ulman and Sulzer-Azaroff, 1975; Bailey, 1977) was employed for this study. As described earlier, this design has been used effectively when comparing methods of instruction with behaviors that are unlikely to be reversed. It is an appropriate procedure for the evaluation of academic research and comparison of two instructional conditions. Intersubject differences do not interfere

with the interpretation of learning in the individual case, so this design is attractive when evaluating the effects of instruction on individual children. Individual and situational differences, however, may account for outcomes, and generalization can only be accomplished through replication.

The multielement design involves comparing conditions or treatments by alternating them over time and measuring the effects of this manipulation upon the target behavior. In this study, self-instruction procedures were in effect one day, and direct instruction procedures were in effect the following day. By alternating the two conditions over twenty instructional days, the subjects were involved in ten days of instruction in each procedure. A word bank of ten words was assigned to each of the two strategies. The subjects, therefore, had an opportunity to master 20 words, ten in each condition. This was felt to be adequate to assess the possibility of difference between the self instruction and direct instruction strategies in terms of the performance measure, correctly spelled words.

Cumulative tests on each instructional day measured the effectiveness of the two individual strategies. As words were randomly appointed and word banks were counterbalanced across subjects, any consistent differences in results would have indicated the control or lack of control the two procedures had over behavior, in this case, learning to spell frequently misspelled words. Results are described in the following chapter, followed by interpretations and discussion.

Chapter V
Results and Discussion

Research Question 1

The first question to be considered concerned the relative effectiveness of direct instruction as compared to self-instruction for the acquisition of unknown, frequently misspelled words. These effects were measured by a cumulative test given each day following the instructional session. The words represented all the direct and self-instruction words that had been taught up to that point in the program. Figures 1a and 1b illustrate the number of words correctly spelled on cumulative tests for each of the twenty instructional days. Self-instruction words and direct instruction words are presented separately.

Subject 1. As can be seen in Figure 1a, Subject 1 learned words under both procedures equally well until day 12 of the program. From day 12 to day 20, he was slightly more successful with his self-instruction words, Word Bank 2 in his case. The subject correctly spelled a total of 92 words from the self-instruction word bank on cumulative tests, and 72 from the direct instruction word bank. He completed total instruction for 7 direct instruction words from Word Bank 1 and for all 10 of the self-instruction words from Word Bank 2.

Subject 2. Subject 2 completed 9 direct instruction words and 8 self-instruction words during the program. Word Bank 1 provided the word pool for direct instruction with this subject and Word Bank 2 was used for self-instruction. This subject correctly spelled 75 direct instruction words and 69 self-instruction words on the daily cumulative tests. He performed in a similar manner under the two procedures, both in terms of numbers of words learned and spelled correctly, as can be seen in Figure 1a.

Subject 3. Subject 3 completed all 20 instructional words by day 17 of the program. Word Bank 2 was used for direct instruction and Word Bank 1 for self-instruction. In total, this subject correctly spelled 97 self-instruction words and 93 direct instruction words on the daily cumulative tests. As with Subject 2, Figure 2b indicates a fairly consistent performance under both conditions, with little obvious difference between the numbers of words learned and correctly spelled on cumulative tests.

Subject 4. Subject 4 completed all 80 words in the spelling program on day 14. Because his performance on cumulative tests was perfect on days 14 and 15, he was allowed to skip days 16 and 17, given a test of the 20 words on day 18, skipped day 19 and was tested finally on day 20. Of the four subjects, he learned the words most rapidly and had the most consistent performance on cumulative tests. This subject correctly spelled 105 self-instruction words and 86 direct instruction words on the daily cumulative tests. Word Bank 1 was used for self-instruction and Word Bank 2 for direct instruction by this subject.

Figures 1a and 1b, therefore, visually indicate a similar performance for all four subjects. Although all the subjects learned new words using the procedural chaining steps of the spelling program, there was little significant difference between the two conditions under study. The teacher direction or child direction variable did not greatly affect the speed or consistency by which the subjects acquired new words. Furthermore, the number of total words learned did not vary notably. Only Subject 1 exhibited a difference in the number and accuracy of words learned.

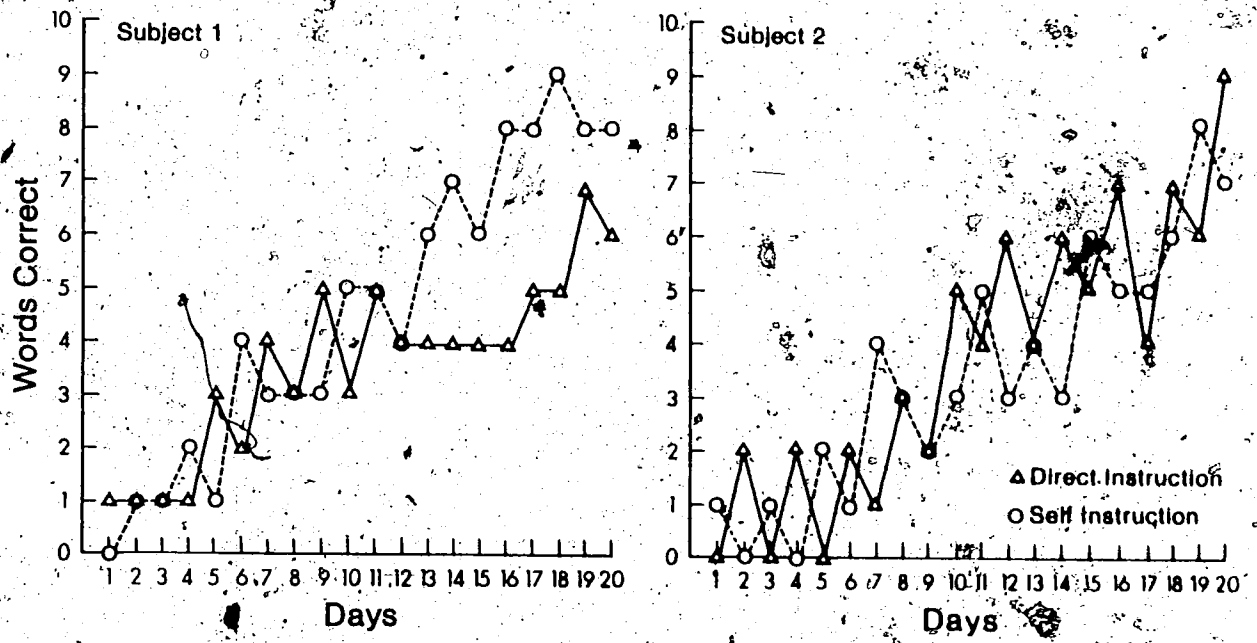

Figure 1a. Cumulative words correct on daily tests. Subjects 1 and 2.

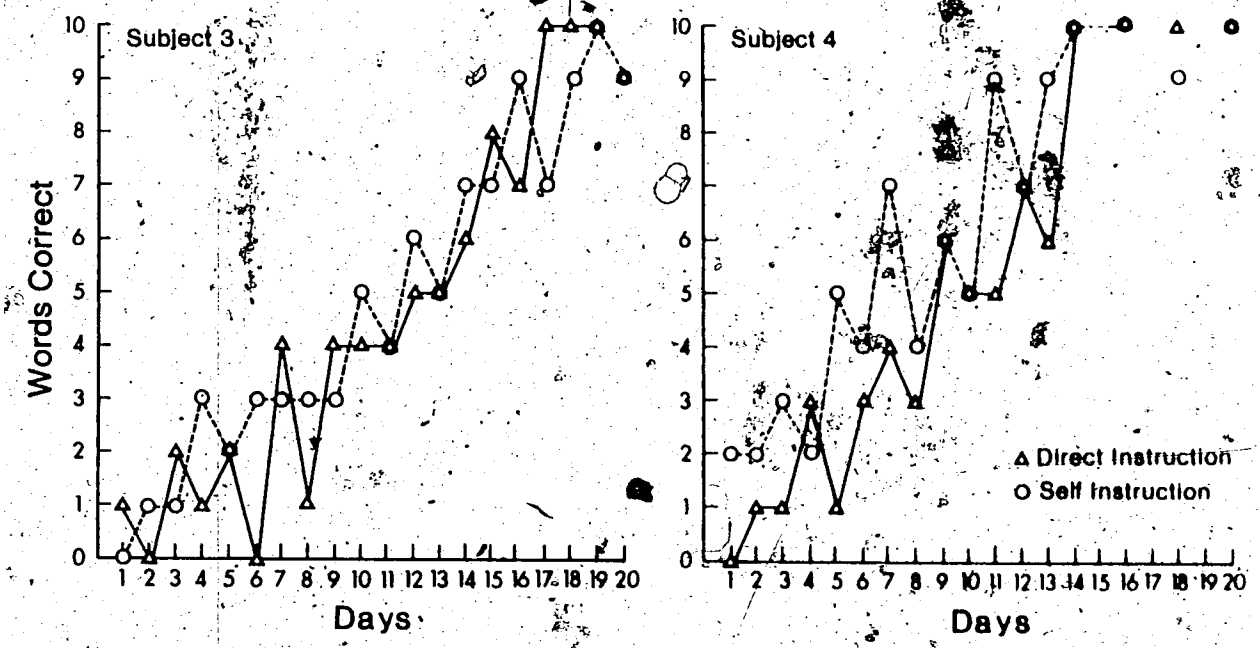

Figure 1b. Cumulative words correct on daily tests. Subjects 3 and 4.

Graphically, to further compare the two procedures, the average of the cumulative test scores for every two instructional days was calculated. The subjects would have been involved in self-instruction one day and direct instruction the other day. Figure 2 illustrates this data. Cumulative words correct combining two days at each data point are indicated. As in Figure 1, only Subject 1 has an obvious difference between the two types of procedures as indicated by the data paths. The closeness of the graphs for Subjects 2, 3, and 4, indicate little difference between the two methods of learning new spelling words.

Figure 3 represents the percentage of completed words which were spelled correctly on the cumulative tests. As described earlier, when the subjects had completed the instructional formats and indicated by writing the word in a separate book that they had mastered it, the word was added to their cumulative test. The percentage of the words correctly spelled following mastery was calculated for each day. The number of successive words learned under each procedure is also indicated in Figures 3a and 3b.

Subject 1 reached 100% correct on 6 occasions for his direct instruction words and 6 times with his self-instruction words. Subject 2 correctly spelled all completed direct instruction words on 8 tests, and correctly spelled all his self-instruction words on 9 tests. Subject 3 reached the 100% criteria on 9 occasions for direct instruction words and 3 times with self-instruction words. Subject 4 was somewhat more consistent, correctly spelling all completed direct instruction words 9 times and self-instruction words 8 times.

Sign test. The sign test is a within-subject test used to indicate differences between treatment conditions. Although there is no strength-

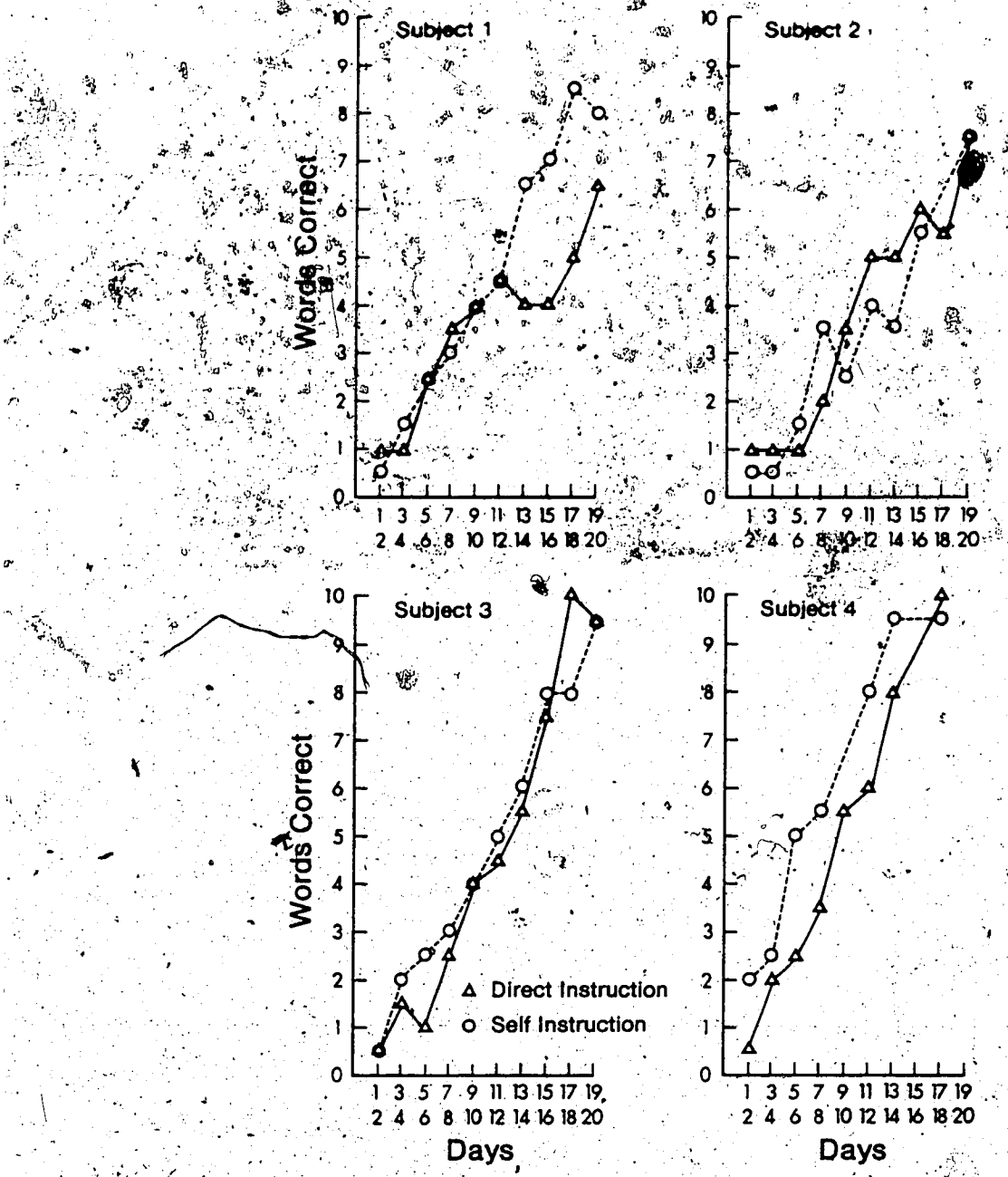

Figure 2. Cumulative words correct combining two days at each data point

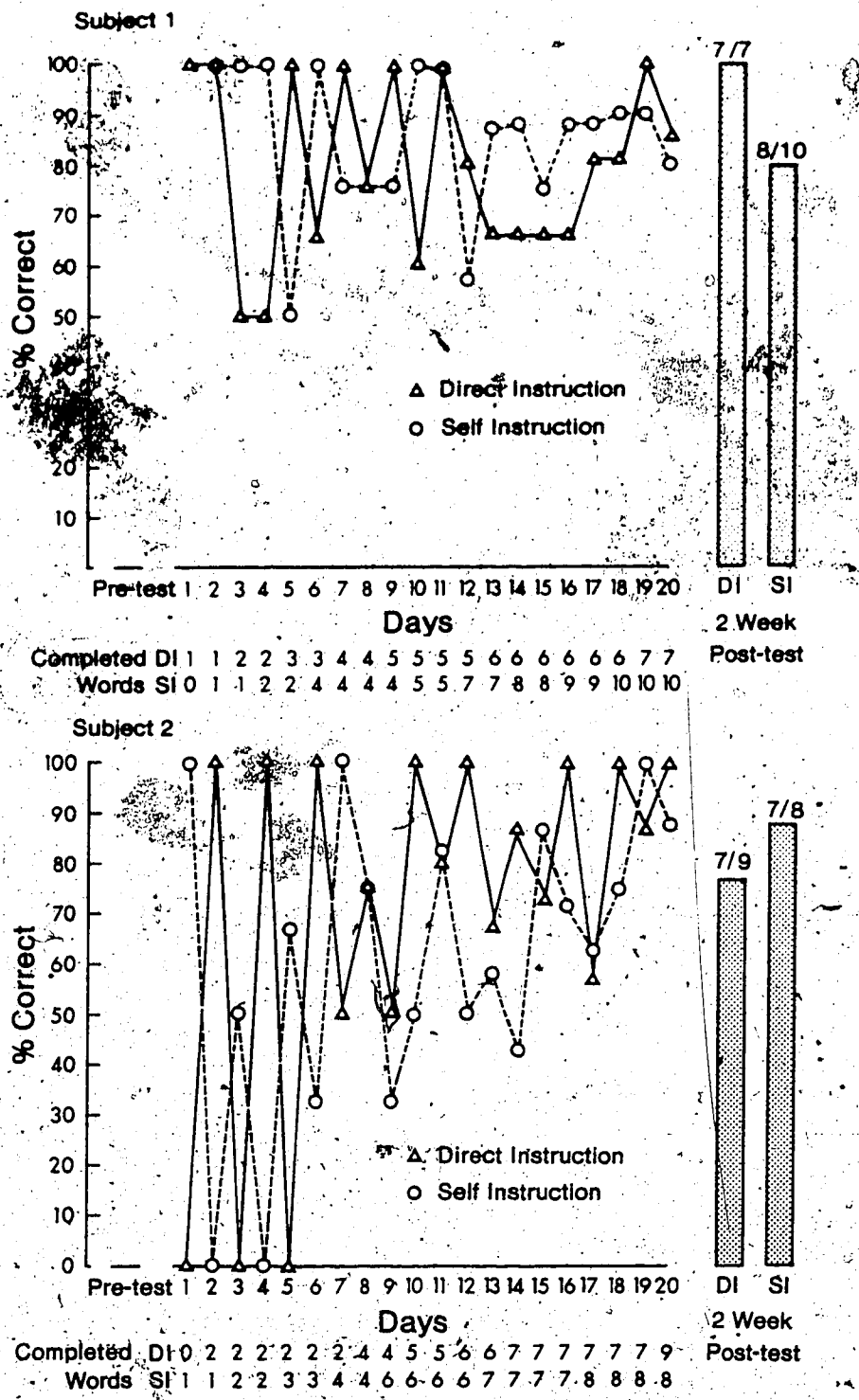

Figure 3a. Percentage completed words correct on daily cumulative tests. Pretest and posttest percentages correct. Subjects 1 and 2.

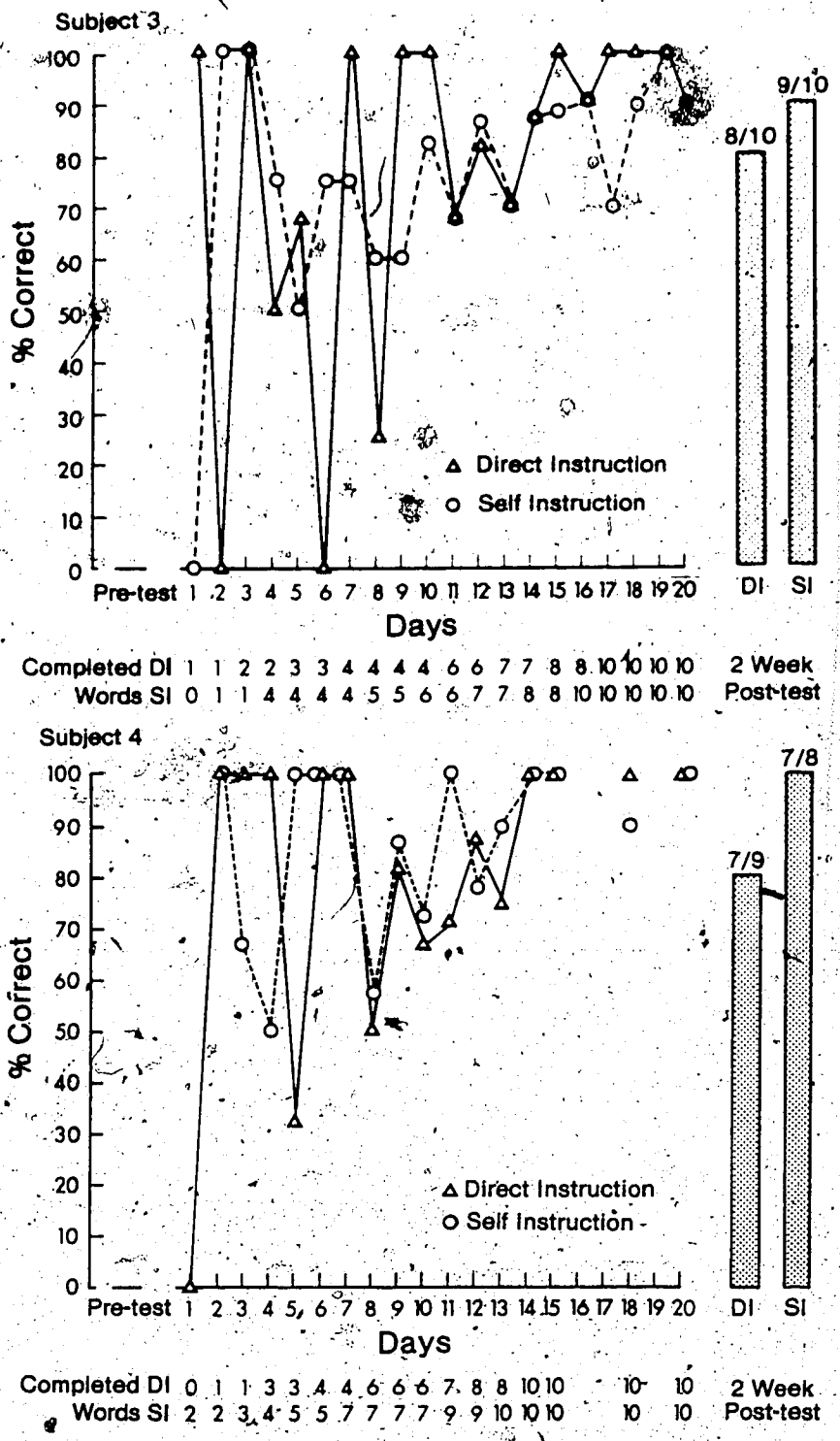

Figure 3b. Percentage completed words correct on daily cumulative tests. Pretest and posttest percentages correct. Subjects 3 and 4.

of-association measure available, a form of ranking can be obtained (Linton and Gallo, 1975). For this study, days 11 through 20 were randomly paired with days 1-10, using a table of random numbers, for each subject. This procedure was used because of the correlation between data points for each day and the need to separate the data into independent units. For both self-instruction and direct instruction, the number of words correctly spelled on the paired day sessions 11-20 minus the correlated day from Sessions 1 to 10 was calculated. For example, the number of direct instruction words spelled on the first instructional day was subtracted from the number of direct instruction words spelled on day 15, day 2 from day 11 and so forth.

In this manner, ten direct instruction independent scores were obtained and ten self-instruction scores were calculated for each of the ten paired days. By transforming the ten comparisons between the two sets of scores, the original data was changed into signed data. The number of "+s" (number of instances direct instruction scores were larger) to "-s" (number of times self-instruction scores were larger) across days was evaluated. Table 1 illustrates the total of these comparisons for each subjects, as well as the total for all four subjects combined.

At the .05 level of significance, according to this sign test, a difference of 1 between these two scores is the critical value. A difference of 1 was found for Subjects 2, 3, and 4, indicating a small difference in their performance between procedures, two in favor of self-instruction, and one supporting direct instruction. Subject 1, however, exhibited significant support for self-instruction having 9 day pairs in favor of the self-instruction strategy. That is,

Table 1

Sign Test Values

	+ (DI Greater)	- (SI Greater)
Subject 1	0	9
Subject 2	3	4
Subject 3	4	5
Subject 4	4	3
Total	11	21

in all comparisons for the ten data points the self-instruction cumulative test score was larger than the direct instruction score. This subject learned the ten self-instruction words more quickly and consistently spelled them on cumulative tests more accurately than the direct instruction words.

Research Question 2

Figure 3 exhibits percentages of words spelled correctly on pre and posttest measures. As none of the instructional words were spelled correctly on two attempts prior to instruction, the pretest level is 0 for all subjects. On the posttest measure, two weeks following the program, Subject 1 correctly spelled 100% of 7 direct instruction words and 80% of 10 self-instruction words, those completed in the program. Subject 2 correctly spelled 87% of 8 self-instruction words and 77% of the 9 direct instruction words he mastered. Subject 3 spelled 90% of 10 self-instruction words and 80% of the direct instruction words. Subject 4, who had mastered the ten words in each procedure, correctly spelled 100% of the self-instruction words and 80% of the direct instruction words. Again, one can see there is little significant difference between the two procedures in terms of the second research question. All subjects remembered the words acquired after the two week period, with slightly better maintenance for three subjects of words learned through self-instruction.

Edmonton Spelling Achievement Test

The Edmonton Spelling Achievement Test, Grade 2, Form A, was given before the instructional program and 2 weeks after completion as an independent measure of spelling progress. For Subject 1, there was no difference between the two measures. He correctly spelled 8

of the 35 words correctly on both occasions, placing him at the 17th percentile on both tests. Subject 2 correctly spelled 7 words on the first test which placed him at the 12th percentile, and 6 words were correct on the second test, which is the 8th percentile.

Subjects 3 and 4, however, did improve on this measure of spelling. Subject 3 correctly spelled 5 words the first time and 13 words the second time. He consequently moved from the 4th to the 45th percentile on this measure. It should be noted that he was more careful, verbally stated that he was going to try harder, and attended more appropriately to the stimulus words than he did on the first effort prior to instruction. Subject 4 correctly spelled 9 words on the first test and 13 on the second. He was also observed taking more time and listening more carefully on the second test. He went from the 23rd percentile to the 40th percentile on this measure of spelling achievement.

Variability of performance was a behavior attributed to these subjects, and as there is no standard error of measurement cited for the Edmonton Spelling Achievement Test, the change in behavior is difficult to assess. As these are common words in the classroom work of these students, they may have used them recently in their language arts activities. Furthermore, they may have spelled more correctly through chance, use of phonics, wanting to please the experimenter, or generalization of skills from the instructional program.

It should be noted here that one word was on the Edmonton Spelling Achievement Test and the instructional program (Word Bank 1) by mistake. Interestingly, although this word (caught) was correctly spelled on the post test by all four subjects, it was not spelled correctly on the Spelling Achievement Test by any subject. Only a

one letter error, substitution of o for a, was noted in two cases, and all four attempts were closer approximations than were exhibited on the first administration of this test. The misspelling of the word caught by all subjects, only a short time after correctly spelling it on the posttest of the instructional program, however, was quite surprising.

Peabody Picture Vocabulary Test - Revised

The Peabody Picture Vocabulary Test - Revised (Dunn and Dunn, 1981), was administered two weeks prior to and two weeks following the spelling instructional program. As a seven point standard error of measurement is given for this test, there were no significant differences in performance between the two administrations for any subject. Table 2 represents the standard scores obtained for the first and second test sessions. All the standard scores for these subjects were within the normal range, within one standard deviation from the mean. Table 2 represents the standard scores obtained on this measure.

Summary

In conclusion, the results obtained do not support a substantial difference between the two procedures tested in this study. Both graphically and through the sign test, it is apparent that minimal differences were found in both the acquisition of the spelling words with regard to speed and consistency of spelling, and maintenance of mastered words after a two week period. For all subjects the general techniques of chaining letter sequences, frequent practice and visual feedback were effective for learning new spelling words.

Table 2

Peabody Picture Vocabulary Test - Revised
First and Second Administrations

	PPVT-R 1	PPVT-R 2
Subject 1	89	91
Subject 2	96	101
Subject 3	104	101
Subject 4	85	87

As indicated earlier, these subjects were characterized by inconsistent performance on academic tasks. This behavior was frequently noted during this study. Attention, willingness to follow procedures, and motivation were variable from day to day. The extent to which individual behavior contributed to the results of this study, in terms of attention and motivation are difficult to ascertain. Only Subject 1 manifested a significant difference in performance under the two procedures. He learned more efficiently under the self-instruction procedure, in spite of inconsistent following of the study procedures on some days. Subject 2, on the other hand, followed the self-instruction procedures very carefully and appeared the most attentive of the four subjects, although his spelling performance in the self-instruction condition was not more effective.

Discussion

The results of this study indicated little difference between the self-instruction and direct instruction strategies described for learning new spelling words. As there was not a distinctive training method for each procedure, the variables under consideration related to the control of pacing and correction procedures. Although the instructional procedures of chaining, matching and practicing words, as defined in this study, are apparently valid, it was not clear that teacher direction or student direction was more or less effective. For one subject, however, self-instruction seemed more appropriate.

It is necessary, then to examine the procedures more closely to consider why these results may have been obtained. One critical problem may have been the structure over which the self-instruction procedure was controlled. Although the examiner did not direct the practice steps on self-instruction days, giving the completion tests, providing the next word and actual presence were likely to have influenced the subjects significantly. It was noted that when the subjects began studying a word independently, they would often skip steps or make errors, then look at the experimenter and correctly review the word. If the experimenter had not been sitting at the same table throughout the self-instruction practice, it is possible that the procedures would not have been followed as rigidly. Furthermore, if the subjects would have been in a classroom setting with more distractions and less feedback from an observing adult their performance may have been quite different.

As the experimenter gave the completion test on each word, even in the self-instruction format, each subject received attention fairly often. That amount of structure and support is not usual in

self-instruction programs, as reviewed earlier. Following initial training, it is more common that students work more independently, using more covert verbalization. Using taped mastery tests, or having the student ask another child for tests may have led to less specific direction following, and therefore a greater difference in performance under the two conditions. In comparison to other self-instruction programs mentioned in the literature review, this program had the advantage of a tightly scripted, task analyzed strategy for studying a spelling word. The procedure appeared both efficient and effective for the individual learners involved. The effect of an experimenter sitting at the same table with the student, however, could not be assessed.

Research Design. The multielement design employed for this study was very useful. This design provided the opportunity to begin instruction immediately after pretests. No lengthy baselines were required. This is a real advantage for teachers and educational consultants who wish to begin teaching new skills without wasting student time. This procedure did not require expensive materials or intrusive techniques which would interfere with ongoing classroom organization. It was possible to manipulate the two conditions on alternating days and measure correct spelling as a performance indicator. A multiple baseline or reversal design would not have provided the same possibilities.

In terms of single subject designs in general, the variability of performance exhibited by these four subjects supports the use of individual designs for exceptional learners. Although similar in age and spelling ability, these four individuals were quite different in terms of speed and attention during the spelling sessions. They would

not be comparable in terms of attention, pacing of instruction, or learning style. Group results of their performance would not be representative of their unique learning patterns.

For the teacher or educator, therefore, who is responsible for curriculum planning, this type of research affords an accountability which is likely to benefit exceptional children. Long term monitoring of target behaviors and learning performance can be carried out with relative ease.

One problem of this design, however, may have been the lack of sufficient difference between the two conditions measured. As mentioned earlier, the amount of support offered during the self-instruction condition may have been too great. The feedback, correction and orientation procedures controlled by the experimenter during the direct instruction sessions were likely to have carried over into the self-instruction conditions by the subjects. This lack of contrast between the two procedures has been mentioned as a possible problem with the multielement design.

Pacing. All of the subjects acquired words more rapidly when they were instructing themselves. They moved through the instructional format more quickly because they were not corrected for attention or orientation errors. It was noted that they occasionally skipped steps and did not follow the self-instruction routine as carefully as required in the direct instruction method. Consequently, they were able to progress more rapidly. In the direct instruction method, on the other hand, when errors of attention were made they were corrected and the step was repeated. For highly distractible students or those unwilling to cooperate fully, the direct instruction procedure would be much slower.

Two questions should be asked. First, would going more quickly have made a difference in acquisition and maintenance of words in the direct instruction procedure? Secondly, did as many attention corrections have to be made? Subject 1, for example, did not like attention corrections, and often looked away or closed his eyes when asked to look at a word. For this reason, considerable time was spent correcting behavior, to the detriment of instructional time for teaching new words on his direct instruction list. As noted, although this subject completed all ten self-instruction words, he completed only 7 direct instruction words. As his performance was better under the self-instruction condition, it is questionable that the negative feedback and corrections actually influenced spelling performance. On the other hand, it should be noted that although this subject only learned seven direct instruction words, he did spell all of these words correctly on the posttest, and he misspelled two of ten self-instruction words.

Faster pacing of lessons and not making unnecessary corrections for the sake of perfect attention may have made a difference in this study. The time saved would have possibly allowed for faster teaching of the direct instruction words. Fast pacing has also been instrumental in maintaining attention more effectively than slower paced lessons have been in other studies (Carnine, 1976). In the self-instruction method the students were much less consistent in terms of pacing, sometimes moving very quickly through words, and other times moving very slowly. In direct instruction a consistent pacing was maintained. There appeared to be considerable variability in both the speed and accuracy of practicing words in the self-instruction condition.

Correction procedures can be interpreted as punishing to some students. Statements such as "You weren't watching my finger", "No, try it again", and "Look at the word carefully" can cause some students to react negatively and reduce motivation. In the brief time of this study it was difficulty to ascertain individual characteristics which may have interfered with willingness to comply. The effects of correction procedures, and individual compliance would be important to assess prior to implementing a program of this nature in the classroom.

Furthermore, the relationship of attention to the actual spelling task is critical. Feedback should be given only if it is directly related to the spelling of a word. The correction of attention responses appeared to interfere with the appropriate pacing of the lessons, may have influenced motivation, and perhaps did not matter to the spelling of a word. If the student was involved and working with the word, writing, and looking at the critical visual stimulus, he was appropriately participating. This type of behavior appeared more consistent during the self-instruction format. He was not required to attend aurally to instruction which may not have been paced appropriately for his specific learning style or attention level.

Reinforcement. No specific reinforcement system was in effect during this study. On several occasions the experimenter gave the subjects a piece of candy following the instructional session, they were thanked daily for their good work and participation and they were praised in front of their teachers for "working hard" or "really trying". No contingent reinforcement, however, was provided for correctly spelling words or following instructional procedures. The verbal/social reinforcement was for effort and participation and was not task specific.

For these four subjects it was not thought necessary to employ an extrinsic reinforcement system as they were cooperative and appeared to enjoy the experience. If the study were to be repeated, however, a reinforcement plan contingent upon correctly spelled words would be implemented. This system would focus on following the practice steps more consistently and correctly spelling and checking over words on cumulative tests. All of the subjects were careless about making sure words were spelled correctly. They frequently began words quickly, looked at them, crossed them out, made the same error again, crossed it out and finally would say they didn't remember the word. They often forgot to spell the word out loud again or look carefully after their attempts on cumulative tests. This type of behavior resulted in inconsistency from day to day, spelling words correctly one day, incorrectly the next, then being annoyed about having to review words they felt they knew. Variability and impulsivity were frequently exhibited and a reinforcement system may have eliminated some of this type of behavior.

Charting correct words on a visual display, and some extrinsic reinforcement for cumulative growth and change would also have been appropriate. These students were not intrinsically motivated to correctly spell words, especially words which were challenging for them. At that point in their school careers, it may have been beneficial to initiate a feedback system which would have focussed on learning style and correct completion of specific tasks, in this case spelling words.

Another reason why a reinforcement system may have been useful was the progressive deterioration of specific attention and direction following in the self-instruction condition over time. For the first

few days following training, the students were very careful to follow the procedures exactly. Over time, however, the steps were less rigidly followed. Contingent intermittant reinforcement for following the procedure as well as spelling words correctly on cumulative tests may have increased the care and attention given to the instructional formats. A decrease in performance due to progressively deteriorating learning style would likely be seen.

Other considerations. As the first two days were devoted to training the self-instruction procedure, it was possible that the subjects had more familiarity and interest in this procedure. They were given verbal reinforcement for working properly, learning steps and attending to the training procedures. No direct training was necessary for the direct instruction procedure, and therefore the subjects had two more days of familiarity with the self-instruction steps. Although they were essentially the same, some interest or personal motivation may have influenced their ability to use the self-instruction formats. Taking an active interest in their own learning, as taught during the pre-instruction sessions, may have had an effect on the results of this study.

When interviewed regarding their interpretations of this research, all the subjects stated they enjoyed the self-instruction procedure best because they could go faster and didn't have to wait for the experimenter to say what to do because they already knew what to do. They also felt that this was a good way to practice spelling words and indicated they would find this method helpful for hard words in their classrooms. As mentioned earlier, however, without some reinforcement system, it is likely that the complex steps and lengthy procedure would not be followed consistently over time.

Because this program was basically an oral procedure, it did not call for covert self-instruction to any large degree. Many self-instruction programs have expected students to study procedures or attend to learning tasks silently, by internal dialogue. In this way, this program differs from the usual self-instruction program. As the subjects were required to speak out loud and spell words orally, the experimenter was in a better position to evaluate how well they were following the designated formats. As mentioned earlier, a problem with some self-instruction programs has been assessment of the student's actual behavior during the program. In terms of spelling principles, the child in a program such as this is getting the oral practice and auditory feedback as well as visual stimulation required for a multisensory approach. In terms of self-instruction, the teacher or experimenter always knows how the student is performing the task and little is left to chance or wondering if the student is actively studying the assigned word.

Classroom Use. The effectiveness of this chaining and practice procedure for unfamiliar spelling words was apparent. As with any study carried out in a small office on a one-to-one basis, however, a difficulty with generalization of results to the classroom must be addressed. The procedures themselves were found to be quite suitable for classroom use and would not require much time or effort to implement.

The self-instruction strategy has the advantage of allowing students to work at their own speed and level. Students enjoyed the experience, and it is efficient in terms of teacher time. With a minimum amount of organization, students could work for 10 to 15 minutes independently on new or review spelling words and the teacher

would need only serve as a monitor and reinforcer. Each student would require training and procedural information, but could work without direction following the initial instruction. The problems to be addressed would include type and mount of external reinforcement, noise level of the classroom, and a way to give mastery and cumulative tests which would be different for each student. The expense in terms of cost or time to set up, however, would be minimal.

The direct instruction procedure would be efficient for group instruction. If a homogeneous group of students requiring the same word teaching and practice were identified, these procedures could easily be used for a ten or fifteen minute session daily. The teacher's time in terms of monitoring, mastery tests and cumulative tests would be reduced as the group could complete all tasks together. Attention, correction procedures and pacing would be controlled by use of the general principles of direct instruction described earlier.

Generalization. As with generalization or transfer in any educational situation, it is not to be expected, but must be taught. As indicated with the word caught in this study, the student may not necessarily generalize a learned word or skill to another situation. Just as they did not spell this word outside the instructional setting, they were not likely to use this type of a study method without additional training and encouragement. If a student was expected to use a chaining practice sequence for studying a spelling word, that procedure would have to be taught, practiced and reinforced in the setting in which it was to occur. Furthermore, after words in a spelling program are learned, they must be practiced in creative writing, workbooks, and other language arts games and activities.

In this particular study, the students were expected to use a very distinctive and unusual method of studying words. They then wrote their mastered words on cumulative tests and were instructed to orally say the letters and check the words as they wrote. They had been accustomed, therefore, to speaking out loud as necessary. Little distraction had been ongoing during the instructional sessions. Under those conditions they had learned, and correctly spelled the word caught on cumulative tests.

Furthermore, although this word had been a difficult one for the students, and required more trials than some other instructional words, all of the students had eventually mastered it during the program. On the two week posttest, again it presented difficulty for two students who made more than one attempt during the test, but did spell it correctly.

On the Edmonton Spelling Achievement Test, the independent measure given prior to and also two weeks following this program, none of the students spelled caught correctly on the first attempt, and none spelled it correctly on the second attempt, given the same day as the program posttest.

During the Edmonton Spelling Achievement Test, the students were all together. They did not spell out loud, they did not have the same behavioral set of conditions which had been reinforced during the instructional sessions, and they did not recheck the words in the same manner they had begun doing in the program, saying the letters as they wrote. Although two of the students spelled the word with only a one letter error, which was an improvement over the initial attempt, they did not appear to generalize the strategy used during the instructional program. Specific direction to do so would be necessary.

This program attempted to teach 20 frequently misspelled common words. It did not attempt to teach meanings, syntax, synonyms or generalized word families containing these words. The program was designed only to address a particular type of word learning. There is no doubt that all necessary skills for individual words are necessary for students attempting to become literate adults. It may be, however, that teaching individual skills in a more specific manner than most spelling programs have is a necessary prerequisite. The next task would be to integrate individual skills into a sequenced composite of word knowledge. In this way, the teacher could be sure students have acquired all the necessary subskills to better meet the challenge of spelling for academic and vocational success.

Future Research. The self-instruction procedure used in this study was beneficial for learning and maintaining new spelling words. It was, however, influenced by the presence of the researcher during the self-instruction strategy, at least to some extent. It would be interesting to repeat this research, but on self-instruction days the experimenter would be absent. Furthermore, to make a more ecologically valid point, carrying this study out in a classroom would be of interest. Maintenance of the rigor required to follow these instructional procedures may be influenced by the complex array of distractions in the average classroom. The use of direct instruction formats employed in this study could also be attempted with small groups to assess their usefulness.

The use of a reinforcement system and faster pacing should be assessed. Equal opportunity for learning words per unit of time may also be considered. If the amount of time one is exposed to individual words is influencial, the teacher could better plan an individual

spelling program according to time required for specific students. Subject 4, for example, learned the twenty words rapidly and could have learned more, however, Subject 2 learned words much more slowly. These students should not be expected to follow the same weekly spelling sequence, as they obviously learn at different rates. In many schools these students, being in the same classroom and at approximately the same level in spelling achievement at that time would be expected to complete the same assignments. This point further supports the advantages of single subject research and the evaluation of individual learning styles for exceptional learners. Development of sequenced, effective instructional strategies for children who are experiencing academic difficulties will hopefully, over time, eliminate the high number of students who are currently not benefitting from traditional educational experiences.

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Appendix 1

Edmonton Spelling Achievement Test Grade 2, Form A

play
will
you
he
ran
snake
yellow
very
lots
wanted
kind
pretty
doors
when
called
blue
swimming
beginning

music
export
digging
uncle
dairy
shadow
their
interesting
plastic
mountain
else
electric
traffic
rough
caught
division
juicy

Appendix 2
Pre-Instruction Words
Tested on Two Occasions

because	again
would	didn't
straw	holiday
goes	scared
friend	ghost
when	morning
went	nobody
they	summer
little	through
nice	where
wants	another
said	finally
like	know
after	beautiful
there	heard
then	caught
teacher	everyone
sometime	chief
wheels	grabbed
about	outside

Taken from most frequently misspelled words of Thomas (1974).

Appendix 3

Instructional Word Banks

Word Bank 1	Word Bank 2
everyone	because
wheels	chief
clothes	finally
many	didn't
listened	course
caught	would
beautiful	heard
nobody	through
straw	holiday
ghost	scared