EFFECTS OF SELF-CORRECTION ON THE ACQUISITION, MAINTENANCE AND GENERALIZATION OF THE WRITTEN SPELLING OF ELEMENTARY SCHOOL CHILDREN

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

by

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College of Education
Dedicated to my son
Isaac Kwodwo Okyere

and

In memory of my husband,
Isaac Kofi Okyere
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Applied Behavior Analysis
# TABLE OF CONTENTS

DEDICATION ................................................. ii

ACKNOWLEDGEMENTS ................................. iii

VITA ...................................................... iv

LIST OF TABLES .......................................... x

LIST OF FIGURES ......................................... xii

## CHAPTER  

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>5</td>
</tr>
<tr>
<td>Research Questions</td>
<td>6</td>
</tr>
<tr>
<td>Terminology</td>
<td>7</td>
</tr>
<tr>
<td>II. REVIEW OF LITERATURE</td>
<td>10</td>
</tr>
<tr>
<td>Theoretical Underpinnings of Spelling</td>
<td>10</td>
</tr>
<tr>
<td>Strategies Used in Spelling</td>
<td>13</td>
</tr>
<tr>
<td>Error Analysis</td>
<td>13</td>
</tr>
<tr>
<td>Phoneme-Grapheme Approach</td>
<td>21</td>
</tr>
<tr>
<td>Sequential Developmental Strategies</td>
<td>27</td>
</tr>
<tr>
<td>Teaching Strategies</td>
<td>30</td>
</tr>
<tr>
<td>A Taxonomy of Spelling Approaches</td>
<td>32</td>
</tr>
<tr>
<td>Traditional Approach</td>
<td>34</td>
</tr>
<tr>
<td>Remedial Approaches</td>
<td>37</td>
</tr>
<tr>
<td>Specialized Strategies and Tactics</td>
<td>41</td>
</tr>
<tr>
<td>Generality of Behavior Change</td>
<td>56</td>
</tr>
<tr>
<td>Generality of the Spelling Skill</td>
<td>59</td>
</tr>
<tr>
<td>Social Validity</td>
<td>67</td>
</tr>
<tr>
<td>Methodology for Evaluating Social Validity</td>
<td>68</td>
</tr>
<tr>
<td>Validation of Treatment Goals</td>
<td>68</td>
</tr>
<tr>
<td>Validation of Treatment Procedures</td>
<td>71</td>
</tr>
<tr>
<td>Validation of Treatment Effects</td>
<td>71</td>
</tr>
<tr>
<td>III. METHOD</td>
<td>77</td>
</tr>
<tr>
<td>Students</td>
<td>77</td>
</tr>
<tr>
<td>Setting</td>
<td>79</td>
</tr>
<tr>
<td>Category</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Experimenter</td>
<td>79</td>
</tr>
<tr>
<td>Definition and Measurement of Dependent Variables</td>
<td>79</td>
</tr>
<tr>
<td>Session Posttest Scores</td>
<td>80</td>
</tr>
<tr>
<td>Delayed Posttest Scores</td>
<td>80</td>
</tr>
<tr>
<td>Generalization Measure</td>
<td>80</td>
</tr>
<tr>
<td>Social Validity</td>
<td>81</td>
</tr>
<tr>
<td>Testing</td>
<td>82</td>
</tr>
<tr>
<td>Procedures</td>
<td>83</td>
</tr>
<tr>
<td>Accuracy of Recording</td>
<td>83</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>83</td>
</tr>
<tr>
<td>Training Procedure</td>
<td>85</td>
</tr>
<tr>
<td>Daily Self-Correction</td>
<td>87</td>
</tr>
<tr>
<td>Experimental Design</td>
<td>88</td>
</tr>
<tr>
<td>IV. RESULTS</td>
<td>90</td>
</tr>
<tr>
<td>Interobserver Agreement Accuracy</td>
<td>90</td>
</tr>
<tr>
<td>Dependent Variable</td>
<td>90</td>
</tr>
<tr>
<td>Independent Variable</td>
<td>91</td>
</tr>
<tr>
<td>Acquisition Scores</td>
<td>91</td>
</tr>
<tr>
<td>Student 1</td>
<td>91</td>
</tr>
<tr>
<td>Student 2</td>
<td>96</td>
</tr>
<tr>
<td>Student 3</td>
<td>100</td>
</tr>
<tr>
<td>Student 4</td>
<td>102</td>
</tr>
<tr>
<td>Student 5</td>
<td>105</td>
</tr>
<tr>
<td>Student 6</td>
<td>108</td>
</tr>
<tr>
<td>Delayed Posttest Scores (Maintenance Scores)</td>
<td>111</td>
</tr>
<tr>
<td>Student 1</td>
<td>111</td>
</tr>
<tr>
<td>Student 2</td>
<td>113</td>
</tr>
<tr>
<td>Student 3</td>
<td>115</td>
</tr>
<tr>
<td>Student 4</td>
<td>116</td>
</tr>
<tr>
<td>Student 5</td>
<td>119</td>
</tr>
<tr>
<td>Student 6</td>
<td>123</td>
</tr>
<tr>
<td>Generalization Measures</td>
<td>124</td>
</tr>
<tr>
<td>Posttests at Home</td>
<td>124</td>
</tr>
<tr>
<td>Student 1</td>
<td>124</td>
</tr>
<tr>
<td>Student 2</td>
<td>125</td>
</tr>
<tr>
<td>Student 3</td>
<td>125</td>
</tr>
<tr>
<td>Student 4</td>
<td>125</td>
</tr>
<tr>
<td>Student 5</td>
<td>131</td>
</tr>
<tr>
<td>Student 6</td>
<td>131</td>
</tr>
<tr>
<td>Words in Sentences</td>
<td>132</td>
</tr>
<tr>
<td>Student 1</td>
<td>132</td>
</tr>
<tr>
<td>Student 2</td>
<td>132</td>
</tr>
<tr>
<td>Student 3</td>
<td>132</td>
</tr>
<tr>
<td>Chapter/Section</td>
<td>Page</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Student 4</td>
<td>132</td>
</tr>
<tr>
<td>Student 5</td>
<td>134</td>
</tr>
<tr>
<td>Student 6</td>
<td>134</td>
</tr>
<tr>
<td>Variation of Words</td>
<td>135</td>
</tr>
<tr>
<td>Student 1</td>
<td>135</td>
</tr>
<tr>
<td>Student 2</td>
<td>135</td>
</tr>
<tr>
<td>Student 3</td>
<td>135</td>
</tr>
<tr>
<td>Student 4</td>
<td>135</td>
</tr>
<tr>
<td>Student 5</td>
<td>135</td>
</tr>
<tr>
<td>Student 6</td>
<td>137</td>
</tr>
<tr>
<td>Pre- and Posttest Measures</td>
<td>137</td>
</tr>
<tr>
<td>Social Validity</td>
<td>141</td>
</tr>
<tr>
<td>Students Responses</td>
<td>141</td>
</tr>
<tr>
<td>Parents Responses</td>
<td>145</td>
</tr>
<tr>
<td>Teachers Responses</td>
<td>145</td>
</tr>
<tr>
<td>V. DISCUSSION</td>
<td>148</td>
</tr>
<tr>
<td>Verification of Research Questions</td>
<td>149</td>
</tr>
<tr>
<td>Research Question One</td>
<td>149</td>
</tr>
<tr>
<td>Research Question Two</td>
<td>152</td>
</tr>
<tr>
<td>Research Question Three</td>
<td>153</td>
</tr>
<tr>
<td>Research Question Four</td>
<td>155</td>
</tr>
<tr>
<td>Research Question Five</td>
<td>158</td>
</tr>
<tr>
<td>Research Question Six</td>
<td>159</td>
</tr>
<tr>
<td>Limitation of the Study</td>
<td>161</td>
</tr>
<tr>
<td>Setting and Times for the Sessions</td>
<td>161</td>
</tr>
<tr>
<td>Subject Characteristics</td>
<td>162</td>
</tr>
<tr>
<td>Absences</td>
<td>162</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>162</td>
</tr>
<tr>
<td>Time of School Year</td>
<td>162</td>
</tr>
<tr>
<td>Length of Study</td>
<td>163</td>
</tr>
<tr>
<td>Accent of Experimenter</td>
<td>163</td>
</tr>
<tr>
<td>Implications for Classroom Practitioners</td>
<td>163</td>
</tr>
<tr>
<td>Suggestion for Future Research</td>
<td>165</td>
</tr>
<tr>
<td>Summary</td>
<td>166</td>
</tr>
<tr>
<td>References</td>
<td>169</td>
</tr>
<tr>
<td>Appendices</td>
<td>182</td>
</tr>
<tr>
<td>A Experimental Setting</td>
<td>182</td>
</tr>
<tr>
<td>B Letter to Parents on the Study</td>
<td>184</td>
</tr>
<tr>
<td>C Parental Consent Form</td>
<td>186</td>
</tr>
<tr>
<td>D Letter to Teachers on Pretesting</td>
<td>188</td>
</tr>
<tr>
<td>E Letter to Parents on Pretesting</td>
<td>190</td>
</tr>
<tr>
<td>F Letter to Parents on Posttesting</td>
<td>192</td>
</tr>
<tr>
<td>G Sample of List of Words for Pretesting</td>
<td>194</td>
</tr>
<tr>
<td>H Sample of List of Words for Posttesting</td>
<td>212</td>
</tr>
<tr>
<td></td>
<td>Questionnaire for Teachers</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>J</td>
<td>Questionnaire for Students</td>
</tr>
<tr>
<td>K</td>
<td>Questionnaire for Parents</td>
</tr>
<tr>
<td>L</td>
<td>Interobserver Questionnaire</td>
</tr>
<tr>
<td>M</td>
<td>Training Script</td>
</tr>
<tr>
<td>N</td>
<td>Self-Correction Form</td>
</tr>
<tr>
<td>O</td>
<td>Proofreading Marks</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Description of the six students employed in the study</td>
<td>78</td>
</tr>
<tr>
<td>2.</td>
<td>Spelling words maintained by student 1</td>
<td>112</td>
</tr>
<tr>
<td>3.</td>
<td>Spelling words maintained by student 2</td>
<td>114</td>
</tr>
<tr>
<td>4.</td>
<td>Spelling words maintained by student 3</td>
<td>117</td>
</tr>
<tr>
<td>5.</td>
<td>Spelling words maintained by student 4</td>
<td>118</td>
</tr>
<tr>
<td>6.</td>
<td>Spelling words maintained by student 5</td>
<td>120</td>
</tr>
<tr>
<td>7.</td>
<td>Spelling words maintained by student 6</td>
<td>121</td>
</tr>
<tr>
<td>8.</td>
<td>Spelling words maintained by all students</td>
<td>122</td>
</tr>
<tr>
<td>9.</td>
<td>Posttests at home for generalization measure-student 1</td>
<td>126</td>
</tr>
<tr>
<td>10.</td>
<td>Posttests at home for generalization measure-student 2</td>
<td>127</td>
</tr>
<tr>
<td>11.</td>
<td>Posttests at home for generalization measure-student 4</td>
<td>128</td>
</tr>
<tr>
<td>12.</td>
<td>Posttests at home for generalization measure-student 5</td>
<td>129</td>
</tr>
<tr>
<td>13.</td>
<td>Posttests at home for generalization measure-student 6</td>
<td>130</td>
</tr>
<tr>
<td>14.</td>
<td>Target words in sentences</td>
<td>133</td>
</tr>
<tr>
<td>15.</td>
<td>Variation of target words</td>
<td>136</td>
</tr>
</tbody>
</table>
16. Spelling percentile indicated by pre- and posttest results for each student ........................................ 142
17. Student responses to questionnaire ......................................... 143
18. Parents' responses to questionnaire ....................................... 144
19. Teachers' responses to questionnaire .................................... 146
LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A taxonomy of spelling approaches showing the major orientations and subdivisions to teach spelling</td>
<td>33</td>
</tr>
<tr>
<td>2. Number of target words spelled correctly on session tests.</td>
<td>92</td>
</tr>
<tr>
<td>All baselines were zero for each word list</td>
<td></td>
</tr>
<tr>
<td>3. Number of target words spelled correctly on session tests.</td>
<td>97</td>
</tr>
<tr>
<td>All baselines were zero for each word list</td>
<td></td>
</tr>
<tr>
<td>4. Number of target words spelled correctly on session tests.</td>
<td>101</td>
</tr>
<tr>
<td>All baselines were zero for each word list</td>
<td></td>
</tr>
<tr>
<td>5. Number of target words spelled correctly on session tests.</td>
<td>103</td>
</tr>
<tr>
<td>All baselines were zero for each word list</td>
<td></td>
</tr>
<tr>
<td>6. Number of target words spelled correctly on session tests.</td>
<td>106</td>
</tr>
<tr>
<td>All baselines were zero for each word list</td>
<td></td>
</tr>
<tr>
<td>7. Number of target words spelled correctly on session tests.</td>
<td>109</td>
</tr>
<tr>
<td>All baselines were zero for each word list</td>
<td></td>
</tr>
<tr>
<td>8. Posttests administered by parents at home</td>
<td>138</td>
</tr>
<tr>
<td>9. Word variations spelled correctly by students</td>
<td>139</td>
</tr>
<tr>
<td>10. Target words in sentences spelled correctly by students</td>
<td>140</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Spelling is an essential skill for students to master because it allows for the clear expression of thought in written form. It is one of the important tool skills in written communication and an essential component of a total language arts curriculum. Even though spelling is usually not taken seriously compared to other academic activities such as reading and math, children who develop their spelling skill are free to concentrate on the clarity, logic, and substance necessary for effective writing rather than on the mechanics of spelling. Conversely, misspellings may have negative repercussions on written expression and the communication skills so far as they convey an unfavorable impression of the individual (Mercer & Mercer, 1989). The poor speller is considered "uneducated" or careless while the individual who spells correctly is perceived to be "educated" (DeStefano, 1978).

Spelling is an integral part of reading and writing. Children who experience difficulty in recognizing words in reading usually have poor spelling skills (Carpenter & Miller, 1982; Lerner 1981). Further, the same types of errors may be present in reading and spelling (Ekwall, 1985). For example, a phonetic speller may mispronounce phonetically irregular words when reading.
Likewise, a student who lacks phonetic word attack skills in reading may not be able to spell because of his poor phonetic skills (Mercer & Mercer, 1989). A spelling problem almost invariably accompanies a reading problem, and in most cases, it is the more severe of the two deficiencies (Stanback, 1980).

Several studies have demonstrated high correlations between reading and spelling, however these studies have not shown a causal relationship (Carpenter & Miller, 1982). Carpenter and Miller (1982) investigated the differences in the spelling ability of reading disabled learning disabled students and able readers. The learning disabled students demonstrated word recognition deficits at least two years below their grade placement in school, whereas the able students possessed word recognition skills within one year of their grade level. Three research questions were addressed: (a) do reading able and reading disabled students differ in phonetic spelling ability? (b) do they differ in nonphonetic spelling ability and (c) do they differ in recognition spelling ability?

Several tests, including the Peabody Picture Vocabulary Test (PPVT), Peabody Individual Achievement Test (PIAT)-Reading Recognition, Peabody Individual Achievement Test (PIAT)-Spelling, Test of Written Spelling (TWS)-predictable words and the unpredictable words were administered to all the subjects. The results of the tests showed that the groups were not equivalent in their ability to spell out phonetic words. On their nonphonetic and recognition spelling ability, a significant difference was found between the groups. In effect, the results revealed that the reading disabled pupils differed from able
readers of the same chronological age in phonetic spelling ability, nonphonetic spelling ability, and recognition spelling ability.

The conclusions suggest that the children with learning disabilities in the sample who experienced deficiencies in reading recognition also lagged behind their nondisabled age mates in their ability to spell phonetic and nonphonetic words from dictation and to select the correct spelling of a word from four choices. Second, the reading disabled children exhibited spelling abilities like those of the younger children in the sample. Finally, it appeared that disabled children with reading recognition deficiencies also demonstrated spelling problems.

Ehri and Wilce (1987b) also conducted a training study to examine the contribution that phonetic spelling skill makes to word reading. Their subjects were kindergarteners who had just started learning to read. Even though they knew letters, they could read only a few words. The experimental group were taught how to spell phonetically and they practiced using letter tiles to spell consonant-vowel-consonant words and words with consonant blends. The control group on the other hand practiced associating single sounds with letters. After the training, the two groups were given several trials to learn to read 12 similarly spelled words. The results showed that the experimental group learned to read more words than the control group. These results indicate that spelling training improves beginners' ability to read words and also improves their ability to divide words into phonetic constituents.

Spelling a word is a more difficult task than reading a word. In reading, the child can receive cues that enable him to recognize words without
necessarily knowing how to spell them. However, in spelling, the individual must respond without preceding and complete visual stimuli and therefore fewer cues are available. The written symbols for reading are concrete and permanent, while the stimuli for spelling are speech sounds which are less tangible or durable (Cronnell, 1971). The child must have the precise detailed sequential information in order to write the word accurately. While recognition, memory, and total recall are required to enable the individual to spell correctly, the reader does not need to recognize every letter to read accurately and fluently. That is, a word may be recognized in reading without full information about spelling whereas for spelling, precise and detailed information is needed to accurately reproduce the word (Gibson & Levin, 1975; Weisberg, 1985).

Also, reading is a receptive language process. In reading, one receives the language and thoughts of another through print. On the other hand, spelling is a productive language process. Professionals in developmental language attest that production is usually harder than reception. In sum, one requires specific information about phonology, phonemic segmentation, sound-symbol correspondence, and specific orthographic rules in order to acquire the spelling skill (Gerber & Hall, 1982).

However, most individuals progress through a series of developmental stages (i.e., Preliterate, Prephonic, Phonetic, Transitional) in order to acquire the spelling skill (Gearheart, DeRuiter, & Sileo, 1986; Gentry, 1984; Wallace, Cohen, & Polloway, 1987). Several factors contribute to the length of time each individual remains at the various stages. These factors include the
individual's direct language experiences, the quality and duration of spelling
direction, amount of reinforcement and feedback, and short-and long-term
memory capability.

The importance of correct spelling is evidenced by the several research
studies devoted to finding effective ways of teaching it (Hillerich, 1987;
Mazzio, 1987; Mihail, 1987). In fact, there are several methods related to the
teaching of spelling. These methods can be conveniently categorized into three
major approaches, that is, the Traditional Approach which emphasizes on
phonology, morphology and syntactic rules or word patterns, the Remedial
Approaches, and the Specialized Strategies and Tactics for students who fail to
acquire the spelling skill through the other approaches.

Through research several specialized strategies and tactics in teaching
spelling have been suggested and used in different classrooms. Self-correction
is one such strategy suggested as a teaching procedure to improve spelling.
Through self-correction, students learn to spell by first comparing their
misspelled words to a model (match-to-sample), identifying specific types of
spelling mistakes (e.g., omissions, repetitions, transpositions), then
correcting their mistakes by themselves using proofreading marks, and finally
writing the correct sequence of letters for the word.

Using proofreading marks, the student is given the opportunity to locate
the types of spelling errors made in a particular word and to correct those
errors. Therefore, the individual is able not only to acquire the spelling skill
but also to use the proofreading and self-correction skills in other academic
areas (McNeish, 1985; Mazzio, 1987; Horn, 1947).
PURPOSE OF STUDY

This study examined the effects of a self-correction procedure on the spelling performance of elementary school children. Specifically, the study determined whether self-correction would improve spelling in isolation (i.e., spelling single words), and spelling in context (spelling words in sentences). Also, the study examined whether the use of self-correction affected the spelling of the variations of words that students learned (i.e., receive/receiving; believe/believing, attend/attendance; maintain/maintenance). The dependent variables in the study were the percentage or number of words spelled correctly in isolation on written spelling session tests, and in sentences. Also delayed posttest scores were obtained to determine maintenance of words learned, and correct spellings of variations of the target words.

RESEARCH QUESTIONS

The following research questions were addressed in the study:

1. Did a self-correction procedure on spelling assignments affect the accurate performance of elementary students' spelling?

2. Did self-correction have a differential effect on student spelling performance of words in isolation and words in context?

3. Did self-correction during spelling acquisition affect the students' ability to spell varied forms of words?

4. Did self-correction improve the students' overall spelling performance on pre- and post normative tests?
5. Did the students recognize a change in their spelling skill and did their teachers and parents also think so?

6. Did the students prefer self-correction over other spelling procedures they have experienced in the past?

TERMINOLOGY

Special terms used in this study are listed below.

**Self-correction procedure.** Self-correction is a teaching procedure through which students correct their own spelling mistakes by comparing their misspelled words to a model (match-to-sample). The student first identifies specific types of spelling mistakes (e.g., omissions, repetitions, transpositions), then uses proofreading marks to correct the mistakes.

**Session posttests.** These were tests administered on the list of words after each session's self-correction activities. There were three such tests for every student per week.

**Delayed posttests.** Delayed posttests were tests administered on the lists of spelling words learned, two weeks after the last session posttests and then on the third session after that, to determine whether spelling words initially learned were maintained.

**Spelling in isolation.** Spelling in isolation means learning to spell single words correctly. Students were taught how to spell single words using the self-correction procedure.

**Spelling in context.** After learning to spell target words correctly, students' spelling skill was tested on the words they had learned in sentences.
Spelling variation of words learned. Posttests were administered on a sample of variation of the words they learned to spell correctly using the self-correction procedure. For example, if a student learned to spell the word "admit" he was later tested on a variation of the word i.e., "admitted" or "admittance".

Instructional transparencies. Transparencies were made of the facts and concepts on proofreading marks and the self-correction procedure taught students during the training sessions before the intervention was initiated. Each training session had two instructional transparencies. The transparencies were prepared using water soluble markers. For the proofreading marks, a different color marker was used for each proofreading mark, and a different color was used to label the five columns on the self-correction form.

Write-on response cards. These were white blank cards measuring 9 centimeters by 12 centimeters on which each student wrote in response to questions on the types of the proofreading marks and when they could be used. The students used dry markers to write on their cards. After writing the responses, the students simultaneously held up their cards for the experimenter to review answers.

Student preference and opinion. The experimenter read a questionnaire prepared to determine what the students thought about the self-correction procedure and whether they preferred it to the traditional approach; their teachers used in their spelling lessons.

Teachers' opinion. The students' teachers were issued a questionnaire to read and write their responses to determine whether they noticed any changes in
either the students spelling performance, their attitude about spelling, or their school work in general.

Parents' opinion. The parents were administered a questionnaire to read and write their responses to the questions.
CHAPTER II
REVIEW OF LITERATURE

This literature review consists of five major sections. First, the theoretical underpinnings of spelling including definitions and assumptions will be presented. Second, various strategies children use to spell will be discussed. Third, a taxonomy of methods of teaching spelling is presented. The taxonomy classifies spelling methods into traditional, remedial, and specialized tactics. Fourth, issues associated with generality of behavior change will be addressed. Finally, the criteria for determining the social validity of treatment techniques and outcomes in applied behavior analysis is also presented.

THEORETICAL UNDERPININGS OF SPELLING

Spelling is defined as the forming of words through the sequential and meaningful arrangement of letters (Mercer & Mercer 1989). It is the process of encoding or rendering of spoken words into written symbols (Hanna, Hodges & Hanna, 1971). Spelling has also been defined as the ability to produce in written or oral form the correct letter arrangement of words (Breuckner & Bond, 1955). The formal name given to the system of representing spoken language in written form is orthography. According to Weisberg (1985), the term orthography is derived from two Greek words: ortho, which means correct, and graphy meaning writing.
Beers, Carol and James (1981) examined three long-standing assumptions that have influenced spelling instruction in elementary grades. The first assumption presupposes that learning to spell is based primarily on a child's knowledge of phonics. That is, as a result of the heavy emphasis on phoneme-grapheme relationships in early reading, teachers and parents have linked phonic and spelling abilities. However, research indicates that beginning writers use knowledge of phonetics i.e., how sounds are articulated and not phonics when they spell (Beers & Henderson, 1977; Gentry & Henderson, 1978; Read, 1971, 1975). Primary-aged children attend more closely to the characteristics of English sounds when writing than to conventional letter-sound relationships.

Read (1973) conducted a study that supported the notion that children hear sounds clearly, but they use that information differently than adults. His subjects--children and adults--were asked to choose one of two words that sounded most like a nonsense word. Whereas the first graders in the study paired short "i" and long "e" words together more frequently, the adults paired words with short vowel sounds together. The adults' pairing therefore reflected a more conventional understanding of sounds and letters. In sum, research on the first assumption shows that children in early primary grades are more prone to learn the phonetic features of English sounds and make judgments about sound similarities based on those features.

The second assumption states that learning to spell is primarily a rote memorization process. This belief stems from the notion that English spelling system is irregular, with more exceptions than rules (Bloomfield, 1933).
Therefore, the only way to become a proficient speller is to memorize words. The "Demon lists" of troublesome words were developed to help with memorization. However, a study conducted by Hanna, Hanna, Hodges and Rudorf (1966) revealed that English spelling contains many regular letter-sound patterns. Also regularity in English spelling is not always directly linked to pronunciation. Syntax and semantics are involved (Venezky, 1967; Chomsky & Halle, 1968). Studies by Beers and Henderson (1977), Zutell (1979), and Templeton (1979) have questioned the practice of word-list memorization since their studies revealed that children's ability to spell follows a sequence of developmental stages.

The third instructional assumption suggests that children should not write if they cannot spell words correctly. This assumption stems from the notion that children usually learn to misspell when they eventually read their misspelled writing. However, there is little carry over from rote memorization of spelling lists unless the lists are related to words used by children in their actual writing (Freyberg, 1964; Maine & Morsey, 1962). Beers et al. (1977) therefore, concluded that the products of children's spelling indicate whether they can spell or not and what spelling stage they use most frequently. Second, children should be encouraged to write often using the spelling strategies they have developed in school and that during writing, the rationale and function of spelling becomes clear to the primary-school child. Third, copying sentences or words repeatedly provides little opportunity for children to use their knowledge about written words. Finally, young writers should be
taught and encouraged to proofread and edit their own writing before they submit their work.

**STRATEGIES USED IN SPELLING**

**Error Analysis**

Individuals use various approaches to spell. Ganschow (1984), for example, provides two reasons why teachers have to observe the performance of poor spellers systematically: (a) gain insight into a student's hypothesis about the writing system, and (b) help diagnose individual patterns of strengths and weaknesses. Ganschow (1984) charted at least 25 words from his subject's (children's) weekly lists and writings. The chart had four columns. These were (a) the misspelled words, (b) the correctly spelled word, (c) types of errors made, and (d) proposed remediation. He recommended that teachers should devise their own system to classify errors and pointed out that most teachers used phonetic/ nonphonetic distinctions.

Discovering children's learning strategies for spelling through error pattern analysis can help teachers formulate teaching strategies for spelling. Ganschow (1981) outlined six important assumptions about error pattern analysis.

**The spelling errors made by children are not random.** Errors stem from children's hypotheses about the rules governing a particular task. Research on invented spellings of young children who learned to write before or simultaneous with learning to read, shows that they usually draw from their intuitive knowledge of sound-symbol relationships in their language (Ganschow, 1981).
Common errors they made in spelling were preconsonantal nasals for example "bopy" for "bumpy" "numbrs" for "numbers" "agre" for "angry" etc. The children's hypotheses become more abstract as they are exposed to reading and phonics instruction in school. According to Ganschow (1981) spelling is based on an individual's predictions and knowledge of the rules governing a writing system. Examining spelling errors as predictions is an important diagnostic tool for teachers and they can focus prescriptions on the error in question.

Some errors are more productive than others. In looking at misapplications of rules, teachers are able to detect what the child has learned and how productive his strategies are; that is, how close a misspelling approximates the correct spelling.

A systematic collection of errors made on a specific task provides diagnostic information about a child's "rule". A collection of a child's sample of misspellings can enable teachers to determine what a child finds acceptable for spelling i.e., the samples will provide important cues to the child's skills in spelling.

Given sufficient samples, teachers can simulate a child's rule system. Teachers can simulate a child's rule system if they are given sufficient samples of a child's work. Moreover, knowing what a speller is likely to produce can guide teachers to determine what is needed to change the students' approach to conform to standard spelling.
Children can assist teachers in understanding their learning strategies. Students can tell teachers why they spell a word the way they do. Knowing a child's strategies will help teachers to plan instruction for that particular child.

Hendrickson, Gable, and Hasselbring (1988) present a stepwise method for collecting, categorizing, and analyzing spelling errors. The method involves six basic steps to guide the teacher through error analysis, remediation, and evaluation. The six steps are:

1. Obtain samples of spelling errors
2. Interview the student
3. Analyze and classify errors
4. Select a corrective strategy
5. Implement the strategy and evaluate its impact
6. Apply normative standards

**Obtain a sample of spelling errors.** The first step in gathering useful diagnostic information is to obtain samples of error patterns. List of words can be drawn from various sources and dictated to obtain an estimate of a students error patterns. Once students become familiar with the free dictation format, they perform optimally. Spelling in context closely parallels actual usage, therefore free dictation is very beneficial to the student of spelling. While Spache (1976) recommends collecting a sample of at least 75 errors in order to validly assess error patterns and initiate instruction, Hasselbring and Owens (1982) suggest as few as 25 incorrect responses for initial error classification.
A student's spelling rate may also be diagnostically informative in addition to collecting sufficient sample of errors. Teachers' observation of student behavior while spelling may also yield valuable diagnostic information. Points of hesitancy, nonproductive body movement, and fluidity of task completion can be noted.

**Interview the student.** Structured interviews are advocated for obtaining a valuable source of diagnostic data by various authorities (McLoughlin & Lewis, 1981; Zigmond, Vallecorsa, & Silverman, 1983). Verbally describing their erred words can expose faulty problem-solving strategies. As the students talk about their misspelled words, teachers get the opportunity to detect errors in applying rules, or difficulties with particular phoneme-grapheme correspondence. Information about successful spelling and memory strategies used by the student can also be obtained. Interview data may also serve as a confirmation of the content validity of the original sample of misspelled words (Hendrickson, Gable, & Hasselbring, 1988).

**Analyze and classify errors.** After obtaining a sample of the students' spelling, correct and incorrect words are charted and analyzed. One of five approaches can be used to score spelling errors. The five approaches are: whole words, syllables, sound clusters, letters-in-place, and letter sequencing. The whole word approach can be identified by entering a slash either next to the word or through each error. The four other approaches to error analysis should include recording the actual response, the stimulus word highlighting the erred component of the response with a circle or caret. When the errors were identified the teacher then entered the word or made a tally to correspond with
the appropriate word type, error type, and error tendency on an Error Analysis Chart.

Information derived from analyzing student errors can be organized according to (a) prevalence to error types and tendencies (b) errors that have the greatest potential to generalize (c) errors that best lend themselves to easy correction (Ganschow, 1981). The majority of spelling errors occur in vowels in mid syllables and two thirds are substitutions or omissions.

Select a corrective strategy. After classifying and analyzing misspellings the next step is to identify corrective strategies that can be used to remediate specific errors. For example, mistakes in regular words with or without words with phoneme-grapheme correspondence may be remediated through a phonics or linguistic approach. Correspondence between phonemes and graphemes are consistent more than 80% of the time (Hanna, Hanna, Hodges & Peterson, 1971). Emphasis should be placed on written rather than oral spelling skills regardless of the strategy used. This will encourage correct written spelling in written expression. One procedure for promoting generalization is teaching the student to proof read all writing. Mastery learning and generalization training should be an integral part of the instructional program.

Implement strategy and evaluate its' impact. Repeated measures should be obtained to evaluate the remedial program. Through repeated evaluation teachers can validate their error assessment and make instructional adjustment based on objective data. Both the extent and frequency of evaluation should be
determined according to the learning stage and severity of the learning problem (Evans, Evans, & Mercer, 1986).

**Apply normative standards.** Both qualitative and quantitative measures should be employed in the analysis -remediation process in spelling. Substandard performance may be maintained if both quantitative measures (rate of words per minute) and qualitative measures (rate compared to rate of regular education peers) are not considered for special needs students. Hendrickson et al. (1988) concluded by stating that even though they were aware that student error patterns are unlikely to conform neatly with the model, they were convinced that detailed analysis should be preferred to assessment practices that usually are not linked to teaching strategies.

Lydiatt (1984) also studied the ability of students to detect and correct their own errors. Within the classroom environment, the ability to detect and correct one's own spelling mistakes is as important as other spelling skills mastered by students (Lydiatt, 1984). He described the ability to monitor, detect, and affect a correction in spelling as metacognitive behavior, a method to track or monitor progress in any activity (Flavell, 1976). Error detection represents a set of behaviors spellers usually used internally to review and monitor ongoing processes while spelling words (Lydiatt, 1984). On the other hand, correction refers to attempts to alter all or part of the spelling word with the intention of improving the original response. Systematically reviewing errors in search of patterns may uncover strategies students use in spelling that will enable appropriate and effective teaching strategies for spelling to be used.
Lydiatt (1984) described two interesting measurement techniques that can be used to assess error detection and correction skills. These were signal detection analysis and qualitative scaling of error correction. Signal detection is a complex act of detecting spelling errors and is measured in terms of sensitivity and bias, two important outcome values. Sensitivity refers to detectability, that is, how aware a student is about errors. Bias indicates the criterion the individual uses for deciding whether errors do or do not exist. In measuring sensitivity and bias, a set of correct and incorrect words must be presented to spellers who are then asked to mark each one right or wrong. With the use of a signal detection matrix and appropriate equations, sensitivity and bias values can be computed (Lydiatt, 1984).

On the other hand, qualitative scaling of error correction makes it possible to determine students' degree of spelling knowledge. The scales can indicate dominant types of spelling attempts produced by students. As students gain more knowledge about representing phonemic information in written form, type of error changes from primitive representations to written forms that begin to approximate correct spelling. Therefore, qualitative scales can be used to analyze and document spellers' correction strategies (Lydiatt, 1984). Lydiatt (1984) suggested that error detection and correction should be examined separately and taught as independent skills.

Marino (1981), on the other hand, identified examples of error patterns and suggested teaching strategies that can be used to help students. In his view, since spelling is more than a mere memory task, different kinds of spelling errors may suggest different approaches to instruction. He stated that beginning
spellers use a logical, systematic spelling scheme of their own. Therefore, in teaching beginners, the teacher should encourage exploration through writing. Another error pattern he identified is associated with irregular, high-frequency words. He suggested that word tests, daily practice with partners, pre- and post-tests, and flash cards should be used.

Lack of knowledge of basic spelling generalizations or rules is a problem associated with errors in spelling. He suggested that words should be grouped, and their applications stressed. Likewise, students should be encouraged to infer rules.

Marino (1981) identified constraints associated with orthography as another error pattern. He suggested that focus on writing-system classifications, word games, letter patterns, and predictive skills might alleviate the problem. Likewise, error patterns associated with morphemic nature of spelling can be corrected through the study of root words. He identified the need for the application of personal memory aids or an effort to develop spelling conscientiousness. He suggested that mnemonic devices and proofreading should be taught. Also, positive experiences in writing should be encouraged. Marino concluded by stating that considering errors qualitatively—uncovering the strategies used or omitted by developing spellers--teachers will be better prepared to provide instruction that is individualized, focused, and relevant.
Phoneme-Grapheme Approach

In examining strategies students use in spelling, Chomsky (1974) disputed the commonly held belief that English orthography is inconsistent and irregular. There is more regularity in American English spelling (orthography) than it is commonly thought and that phoneme-grapheme correspondence cannot account for all of it (Chomsky, 1974). There is much more relationship between the conventional English orthography and the sound structure of the language than is usually assumed. The conventional spelling of words corresponds more closely to an underlying abstract level of representation within the sound system of the language than it does to the surface phonetic form that the words assume in the spoken language.

English spelling corresponds more closely to these abstract underlying forms, rather than to their phonetic realizations. It is therefore the lexical (word) spelling not the phonetic spelling that reveals the similarity and consistency of orthography. For example, in considering the following pairs of words: critical/criticize, revise/revision, illustrate/illustrative, they contain common items (root words) and speakers recognize them as related. The common element in these words is their underlying form—their lexical spelling—which the orthography corresponds to quite closely not their surface form i.e., their phonetic representation.

Usually, good spellers recognize that related words are spelled alike even though they may be pronounced differently. They rely on the underlying picture of the word that is independent of its varying pronunciations. Better spelling is
not a matter of mastering larger numbers of individual words, but it will result from an understanding of the relationship between words. Chomsky (1974) suggested that teachers convey to their students the notion that spelling is not arbitrary, but corresponds to something real that the student already knows and can exploit. Chomsky (1974) stated that spelling often does make sense and that many spelling errors could be avoided if the writer developed the habit of looking for regularities that usually underlie related words when in doubt. She concluded that the best way to prepare a child to deal with new examples on his own is to provide him with a strategy based on the realities of the language. However, Chomsky conceded that English spelling has its less consistent aspects.

Hanna and Hanna (1974) discussed various approaches children use in learning how to spell. For instance, some children use the haptic (hand-learning) approach whereby the child writes a word several times until the fingers automatically produce the correct recording of the graphemes for that particular word. Also, some children master lists of words by using visual attack upon them. They use their eyes to fix a mental image of the graphemic representation of the word. Most normal children, however, use a combination of these strategies. Some spellers also make the spelling process easier by using mnemonic cues and associations.

Hanna and Hanna (1974), however, indicated that all these are haphazard crutches and they do not contribute much to the development of real spelling. Spelling for most people is a much more complicated process. It involves the analysis not only of the sounds and their letter representations, but
also the position of the phoneme in the word, and the stress of the syllable that influences the choice among options of the particular grapheme to be used.

In reviewing research related to the appropriateness of phonics instruction, Groff (1979) stated a commonly held belief that instruction in phonics helps children learn to spell. The latest comprehensive review of empirical findings on the influence of phonics on spelling concluded that some consistency exists in phoneme-grapheme correspondences. The spelling difficulty of an individual word should be related to the magnitude of the correspondences with the word (Groff, 1979). This means that if children are taught speech sounds and their spelling correspondences (phonics), they will master the orthography of the English language.

Ehri and Wilce (1987b) explained that teaching beginners to spell phonetically enhances their knowledge of the spelling system and this knowledge helps them to learn how to phonologically recode unfamiliar words and also in learning to read familiar words by sight. When the spelling system is learned it penetrates readers' phonological knowledge in a fundamental way and influences the sounds that they believe are in the words (Ehri, 1984, 1985, 1987; Ehri and Wilce, 1980, 1986; Ehri, Wilce and Taylor, 1987). The right type of instruction can exert a potent influence and counteract weakness in rudimentary phonological awareness existing prior to instruction (Williams, 1980; Wallach and Wallach, 1976).

It has been hypothesized that children suffering from dyslexia exhibit phonological deficits that are neurological in origin (Ehri, 1989). Ehri (1989) expressed a different view about the above premise in his article and
presented evidence from normal reading and spelling development and also from comparisons of dyslexic and nondyslexic readers. He argued that the phonological deficits observed in dyslexics stemmed from their experience and that it reflected the fact that they had not learned to read and spell because of inadequate instruction they received. As a result the dyslexic failed to develop knowledge of the spelling system which penetrated and finally symbolized their phonological knowledge.

To Ehri (1989) and others (Morais, Aleria & Content, 1987) inadequate instruction which gave rise to limited reading and spelling development and limited phonological awareness was the primary cause of dyslexics' reading disability. For phonological awareness may combine with spelling to promote reading.

Phonological awareness referred to capabilities that required people to consciously analyze and manipulate the sound structure of spoken words, for example dividing words into their constituent sounds. Measuring a child's phonological awareness and letter knowledge at the start of kindergarten was one of the best predictors of reading achievement (Ehri, 1989). However, teaching phonological awareness by itself did not facilitate learning to read and spell, because in order for phonological training to make a contribution, it had to be combined with spelling training that would teach learners how to symbolize sounds with letters (Bradley & Bryant 1983, 1985; Lundberg, Frost, & Petersen 1988).

People utilize three sources of information to spell. Their knowledge of letters, the spelling system and their memory for the spellings of specific words
(lexical knowledge). Knowing phoneme-grapheme relations and how to segment pronunciations into phonemes was a knowledge of the spelling system. On the other hand, lexical knowledge includes knowing the sequence of letters in specific words and knowing how these letters symbolize phonemes in the word. Children's spelling errors could be analyzed to draw inference about their knowledge of the spelling system and this could be grouped into stages.

The earliest stage is the precommunicative, the next stage semiphonetic, the third stage phonetic and the final stage morphemic or transitional. During the precommunicative stage children usually generated spellings that bore no correspondence to sounds in the words even though they resembled print globally, e.g., scribbles, or strings of randomly selected letters or numbers to represent words or sentences. The semi phonetic stage is characterized by the child learning names or sounds of letters and using this knowledge to spell. Only one or two letters may correspond to sounds at the beginning. However, as they gained more experience with print they were able to detect and spell more sounds in words.

During the phonetic stage children were able to produce spellings that contain letters for all of the sounds in words. Also, they learned how to spell vowels. At this stage they believed that every sound they detect in a pronunciation required a letter in the spelling. Children's phonological awareness and knowledge of the spelling system grow substantially during the last stage which is the phonetic stage. There is a relationship between phonetic spelling ability and memory for correct spelling. Phonetic stage spellers can remember the correct spellings of words much easier than semi-phonetic
spellers (Ehri, in press). Knowledge of the spelling system provides schemata that enable spellers to make phonetic sense of individual spellings and hence remember them.

Hillerich (1977) did not see the need for phonic instruction to aid in spelling acquisition and that the instruction of phonics has caused more harm than good. He stated that for approximately the last 40 years the schools have done an excellent job of creating phonetic misspellings. Some objectors to phonics instruction insist that spelling is best learned incidentally as children read and write. For instance, Beers, Beers and Grant (1977) stated that it is more important to allow children to explore words in their reading and writing than to have them write lists of spelling words. Students must become fluent writers before they can divert their attention to spelling.

Moreover, there are other ways of improving spelling (Gentry & Henderson, 1978). For instance the teacher can: (a) encourage creative writing, (b) prompt the child to spell as best as he or she can and not be held accountable for adult spelling standards, and (c) respond "appropriately" to children's "natural" nonstandard spellings. That is, the teacher must recognize the pupils' transition from one developmental strategy to the next.

Opponents of phonics in the teaching of spelling assert that children develop their own spelling strategies as they begin to write. For example, Beers, Beers and Grant (1977) found in Grades 1 through 4 that 93% of all errors children made in the spelling of vowels involved either the use of a letter-name strategy ("bed" spelled as "bad"); "wit" spelled as "wet") or the addition of an incorrect vowel after a correct vowel ("hat" spelled as "hait");
"sap" spelled as "sape"). These results indicate that a child learns to spell by reading and writing not by using phonic skills.

The second group of critics of phonics believe that English spelling is not predictable enough to make the application of phonics rules useful. Phoneme-grapheme correspondences do not ensure error free spelling. The third group of opponents of phonics for spelling point to two studies that have shown that teaching intensive phonics does not produce significantly greater gains in spelling than nonphonics approaches (Gottenthaler, 1970). Further, it has been discovered that children's knowledge of graphemes is slightly less related to their spelling achievement than it is to their oral reading (Cheek, 1972).

Arguments presented for and against phonics show that there is no easy solution to the problem of the appropriateness of phonics instruction in spelling programs. However, it is relatively easier to demonstrate that phonics helps more with word-recognition than for spelling mastery. The degree to which phonics positively affects spelling is not yet known. Groff (1979) suggested that children should be taught systematic phonics for spelling purposes and at the same time they should be encouraged to develop their own strategies that would prove useful to them.

Sequential Developmental Strategies

Several studies have concluded that spelling attempts can reveal how children learn about written words. Overall, studies indicate that children develop their own spelling strategies as they begin to write (Beers, Beers, & Grant, 1977).
Henderson, Estes, and Stonecash (1972) and Beers and Henderson (1977), and Beers (1974) conducted studies that indicate that many six-year olds use a letter-name strategy as they begin to write. However, they gradually use more advanced strategies such as seeking the letters that represent sounds closest to the sounds in words they attempt to spell as they progress through Grades 1 and 2. Sixty-eight percent of all errors in spelling vowels involved the use of a letter-name strategy for example ("bad" for "bed" or "wet" for "wit").

Beers and Henderson (1977) concluded by stating that children usually use three clearly defined spelling strategies when they try to spell words. The first spelling strategy is the letter name strategy. With the letter name strategy, there is a heavy reliance upon the physical characteristics of sounds. That is, the children rely heavily on pronunciation of letter names to represent vowel sounds. The second strategy is the insertion of an incorrect vowel after a correct vowel. The third strategy is the incorrect substitution of one short vowel for another short vowel. Also, the same children often spell the corresponding low frequency word incorrectly irrespective of the kind of classroom instruction.

In general, the studies by Beers and Henderson (1977), Henderson, Estes, and Stonecash (1972), and Beers (1974) provide insight into how children learn to spell. Children develop their ability to manipulate words. They use their increased knowledge about words and letters when they spell. In conclusion, children use both phonemic principles and visual memory of whole words to judge spelling correctness. On the other hand, teachers use error
pattern analysis to diagnose individual patterns and create instructional approaches based on phoneme-grapheme correspondence and sequential development.

Gentry (1977) studied the spelling strategies of kindergarteners, first and second graders and found that children at different levels of reading achievement used different spelling strategies. There are five strategies that are frequently observed. The child who is learning how to spell begins with deviant or prephonetic strategies and progresses through phonetic, transitional, and correct strategies. The child using the correct strategy recognizes and recalls the correct lexical representation. That means the entire word is spelled correctly. With the transitional strategy the child uses such conventions as digraphs, and vowels in every syllable.

Many of the orthographic rules of English are generalized and may not be applied precisely. The spelling may be phonetically acceptable and yet incorrect. Also the spelling may include the appropriate letters but two letters may be reversed.

The use of the phonetic strategy is characterized by the spellings that are phonetic. Letter names that best represent the sound elements of the word are used. That means letters are assigned on the basis of sound, regardless of acceptable English orthography or other conventions. The child using the prephonetic strategy leaves out essential sound features of the word, or some letters of the word might be omitted. Basically, a prephonetic spelling does represent a phonetic feature, for example "monster" will be spelled "MTR", or "swimming" can be spelled as "SM". With the deviant strategy the child's
spelling may range from well-marked units and approximations of real letters to true letters, words written from right to left or a mixture of Arabic numerals and letters of the alphabet.

**Teaching Strategies**

Much of the content of elementary instruction is based on commercial spelling textbooks so that there is the need to expand spelling instruction programs by teaching skills in problem solving, self-correction, spelling patterns, proofreading and dictionary usage (Beers, 1974). Even though some students may learn to apply various strategies to spell, many more students need specific methods to improve their spelling skill.

Several studies have been conducted to determine the effectiveness of various teaching strategies in spelling (Chomsky, 1974; Groff, 1979; Hanna & Hanna, 1974; Mercer & Mercer, 1989; Stanback, 1980). Hillerich (1982) postulated that before any effective teaching of spelling can take place adequate diagnosis of the individual's skill in spelling should be conducted. He described two types of diagnosis: diagnosis of level, which enables the teacher to select appropriate materials for instruction, and diagnosis of skill needs which enables the teacher to teach in the identified needs of the individual. However, he stressed that less attention is usually given to the diagnosis of spelling level and more emphasis is placed upon the diagnosis of skill needs that are carried out either to find specific words or skills to be taught.

Research offers little justification for attempting to diagnose in terms of skill needs, therefore the phonetic instructional systems representative of commercial spelling programs should not be used. He advocated a research
approach of supplying a word list, instructing on the study method, and keeping a record of student progress (Hillerich, 1982). In presenting an overview of research on the teaching of spelling, Hillerich (1987) emphasized that spelling should have two major objectives i.e., the automatic spelling of a list of words and the ability to apply correct spelling in written communication. Weisberg (1985) reviewed the history of spelling instruction in the United States. She examined the multisensory approach advocated in the colonial times, and the advent of the whole-word method in the 1840's. According to Weisberg (1985), current spelling performance for Individualized Education Programs focuses on four skills: (a) readiness for formal spelling instruction, (b) general spelling level, (c) types of spelling errors, and (d) abilities to proofread, use phonics and use the dictionary. Further, she discussed research based intervention methods such as the test-study-test method, self-correction, and spelling games as examples of effective techniques. Weekly instruction, peer tutoring, and parental involvement have also served as effective strategies for improving spelling skills.

Mihail (1986) compiled an annotated bibliography on the various methods of teaching spelling in the elementary school. The list of references included in the bibliography addressed to the problem of developing individualized, focused, and relevant methods for teaching spelling. Specific strategies children used to spell words and the instructional approaches those strategies suggest were examined. Also, the teaching strategies and the characteristics of an effective spelling program were discussed.
Mazzio (1987) indicated that spelling involves more than rote memorization. Hence, he recommended the use of the following strategies: (1) using self-corrected test and a study strategy, (2) providing word lists, (3) relating spelling instruction to writing activities, (4) keeping formal spelling lessons to optimum length, (5) employing typewriters and the "imagetics machine, (6) playing games for spelling instruction, (7) using computers for spelling improvement and (8) taking advantage of standardized test formats.

Mercer and Mercer (1989) also delineated five major teaching methods and strategies in spelling. These are rule-based approach, multisensory approach, study-test technique, fixed and flow word lists, and imitation methods. Also, they discussed various types of correctional procedures and training in dictionary usages.

**A TAXONOMY OF SPELLING APPROACHES**

A taxonomy of spelling approaches designed to provide a conceptual framework for the classification of the various methodologies associated with spelling is discussed below. The taxonomy includes the Traditional Approach, Remedial Approaches and Specialized Strategies and Tactics. These three broad approaches offer the major alternatives available to teach spelling (see Figure 1).
A Taxonomy of Spelling Approaches

Figure 1. A taxonomy of spelling approaches showing the major orientations and subdivisions to teach spelling.
Traditional Approach

The traditional approach to spelling usually comprises textbook programs that are commercially available. These spelling series generally use a linguistic approach that emphasize phonology, morphology, and syntactic rules or word patterns (Hammill & Bartel, 1987). The words used in these texts are usually selected from lists of words chosen from child or adult written language, or common words in written vocabulary. Generally, students learn basic word patterns, spelling similarities pertaining to sound sequence, and generalization patterns.

A traditional approach to learning spelling varies the instructional format daily. That is, on Mondays the students might be given a list of 10 to 15 words from the textbook. The words might be written three times. Then on Tuesdays, the words would be written in sentences. Students will alphabetize the words on Wednesdays, while Thursdays might be used for writing a story using the words. The teacher will then administer the end-of-the-week test on Fridays (McNeish, 1985).

Regardless of the students' performance on the weekly test, a new list is introduced for the following week and the cycle is repeated. With the linguistic approach, the speller concentrates on producing word spellings by taking into consideration one phoneme at a time and applying the knowledge of sound-symbol relationships (Wallace, Cohen & Polloway, 1987). Linguistic spelling (like rule-based instruction) facilitates spelling generalization.
**Rule-based Technique of Teaching Spelling.** The rule-based method of teaching spelling emphasizes teaching rules and generalizations. For example, after learning a general rule such as "i" comes before "e" except after "c", the individual uses the rule in unfamiliar spelling words. The linguistic spelling approach is therefore based on the notion that there is regularity in phoneme-grapheme correspondence (Mercer & Mercer, 1989). With this method, spelling rules, generalizations and patterns that apply to whole words are taught. The words are selected based on their linguistic pattern, for example, cool, fool, pool.

Even though spelling is one of the most thoroughly researched areas in the language arts it appears that methods of teaching spelling are based primarily on traditional practices (Graham, 1985). Instructional materials and contemporary classroom practices have been less than ideal, therefore Graham (1985) suggested that teachers should carefully evaluate both their own instructional practices and any spelling materials they intend to use. Teachers should use interesting, stimulating materials as they consider student goals. They can best achieve this by asking themselves questions on the scope of the proposed spelling materials or program, the skills emphasized, the opportunities to apply spelling skills and individual's spelling needs.

Graham (1985) further recommended a set of supplementary questions that should be posed about the suggested materials or content. These include the durability and attractiveness of the material, the audience, availability of complete and appropriate instructions, cost, and evidence of racial or ethnic biases. Answering these questions enables the teacher to determine whether a
particular mainstreamed handicapped student receives an appropriate spelling program.

**Research on Traditional Approach to Spelling.** Whiting and Jarrico (1980) conducted a study with normal readers to determine their spelling performance at grade level. Their study was based on two major research questions: (a) what percent of sight vocabulary words do normal readers spell correctly and (b) what kinds of errors do normal readers make in spelling words in their sight vocabularies? Whiting and Jarrico (1980) hypothesized that normal readers would achieve a higher percentage of correct spellings than dyslexics, and normal readers would be good phonetic equivalents of the dictated word in so far as nonphonetic components in the dictated word are not introduced into the written word.

The subjects were 45 boys and 59 girls from three elementary schools in the district. They were each given a list of 20 words at grade level to read. Half of the students had no difficulty reading the list, and three quarters of the students made only two errors. No student made more than five reading errors. Then, they were asked to spell the same words.

The results revealed an average of 80% to 91% of correctly spelled words at each grade level. No child fell below 65% correct responses. Therefore, these results were consistent with Boder's (1973) observation that normal readers can spell correctly between 70% and 100% of their sight word vocabulary. The word "believe" was misspelled by 18 of the 27 children in third grade. However, all but one of the misspellings (believie) were good phonetic equivalents, meaning that the phonemes of the spoken word were
represented by appropriate corresponding graphemes in the same sequence. The results of the study supported both hypotheses.

Not all students are able to learn spelling efficiently through the traditional commercial programs. For these students the remedial approaches to teaching spelling should be considered.

**Remedial Approaches**

There are at least five remedial approaches that can be recommended depending upon the particular needs of the student.

**Fernald and Gillingham-Stillman approaches.** The Fernald (1943) or the Gillingham-Stillman (1970) approaches are used with students who have severe reading and spelling problems because the two approaches integrate reading and spelling directly. The Fernald method stresses whole-word learning because the words are selected from stories the studentdictates, and the words are taught as a whole without phonic instruction. Fernald focuses on clear perception of word form, development of a distinct visual image of the word, and habit formation through repetition of writing until the motor pattern is automatic. Students hear, see and trace the word in the Fernald approach therefore four sensory modalities (auditory, visual, kinesthetic, tactile) are involved.

The Gillingham-Stillman method employs an alphabetic system and emphasizes sound blending, repetition, and drill. Correspondences between letters and sounds are taught using a multi-sensory approach (Mercer & Mercer, 1989). While both approaches assume that building vocabulary (reading and spelling) must proceed systematically from words that the student
knows to words that the student needs to learn, the Gillingham-Stillman method selects words carefully, and they are sequenced. Also, instruction focuses on individual letters and sounds rather than on words.

**Horn method.** The Horn method combines elements of word pronunciation, visualization, spelling recall, written orthography, and proofreading. Students proceed sequentially through each of these steps. If an error is made at any step, the entire process is repeated until the student spells the word correctly without any mistake. For example, if the student is to spell the word "middle", he or she would be directed to pronounce each part of the word, "mid-dle". Next, the student would look at each part of the word and say it again. The third step involves the students spelling the word orally letter by letter, visualizing it, and respelling the word orally. Finally, the student would write the word and check it for accuracy. If the student made an error spelling the word letter by letter [m-i-d-l-e] (step 3), he or she would return to the first step (i.e., pronunciation) and begin the process over.

**Cover and write technique.** In this approach, the student looks at the word and says it, writes the word twice while looking at it, covers the word and writes it again, and finally rechecks the spelling visually (Graham & Miller, 1979). This approach is usually used with students who have good short-term memory, but weak long-term memory. Emphasis is placed on practice, proofing and correcting errors quickly.

**Phonovisual approach.** The phonovisual approach emphasizes visual and auditory discrimination of letter sounds. Students are introduced to consonant and vowel sounds using pictures of familiar images (e.g., a for apple). This
method is a phonetically-based approach that stresses the association between the visual image and the letter sound (Schoolfield & Timberlake, 1960).

**The test-study-test and test-study approaches.** With the test study test approach a pretest is given at the beginning of each unit of study and the words that the child misspells become his study list. The main function of the test-study-test approach to spelling is to allow students to spend their time studying words they have not mastered (Allred, 1984). Studies before and after 1937 consistently favored the test-study-test over the study-test approach. With the study-test approach no pretest is given at the beginning of each unit.

Zylistra (1989) described a combined spelling program adapted basically from three spelling programs—namely, *Signs For Sounds* (Bechthold and Del, 1978), *Cloze* (Ketchum, 1982) and *Auditory Discrimination In-Depth* (Lindamood and Lindamood, 1975). She gave a day by day account of how this combined program worked. During the implementation of the first part of the spelling program, students were given a sheet from the Signs For Sounds-printed menu for each dictated word.

Students made a series of critical choices, by circling elements from each column, capturing the sounds they heard and freezing them in sequence. After circling the letters the student wrote the word. Then the word was written by the teacher on the board. The students compared their words with those on the board and then corrected their mistakes.

After the completion of the word list the students folded their papers so that there would be no visual cues, then the list of words was administered again. A simple rule was given for each list made of 10 words. For example, words
with the silent "e" was presented as a voiceless snake that crept up on the vowel and asked its name. The vowel had to say its "real" name a and not its "nickname" a. After selecting ten more words from the Cloze program the children drew pictures for as many words as possible to jog their memory. Finally, the Cloze sheets were given to the students, reinforcing the meaning of their words.

On the second day of the week, the tactile sense was used. According to Zylstra (1989), this part of the program was adapted from the Auditory discrimination in-Depth program. It was a multisensory program that developed auditory-perceptual skills used for reading and spelling. The program could be used with any age level, and proved to be very effective with children who had learning disabilities (1975). The students used colored blocks to spell the words. Two colors were used, one representing consonants and the other vowels. They manipulated and arranged the blocks according to the sounds they heard. A correctly arranged set of blocks was used as an example for words that would be spelled incorrectly.

The students used the letter tiles to arrange the letters into the spelling word they heard. Then, either the teacher or a student printed the correct spelling of the word on the board. Next, the students selected 5 to 10 words and wrote them in sentences using many adjectives and adverbs, as well as capitals and punctuation marks. On Wednesday, the sentences were dictated for the students to write. Point values were given for correct spelling of each word and correct placement of capitals and punctuation marks. On Thursdays, a Spelling Bee was organized for the students working in teams. The team that obtained 20
points first was the winner and a token was awarded to the whole team. On Fridays, the spelling test was given to the students who had by this time developed confidence and were eager to take the test. Zylstra concluded that the combined program had been very successful with her students. It had resulted in much improvement in spelling and also in language, math and above all in social relationships.

**Specialized Strategies and Tactics**

Several specialized strategies and tactics have proved effective in improving students spelling ability. Some of the tactics are the modification or the adaptation of the traditional spelling approach and they are effective in increasing students spelling scores (Smith, 1989). However, no clear guidelines exist concerning which of these strategies should be chosen over others. The decision to use any of these specialized approaches depends on the magnitude of the spelling difficulty, the time the teacher has to devote to spelling instruction, or whether a teacher-directed, peer-mediated, or semi-independent approach is desired. For instance, if the student possesses several spelling skills and can follow directions and the teacher prefers a teacher-directed approach, then, modeling, time-delay, spelling rules, or whole language might be employed (Smith, 1989).

On the other hand, if the teacher wants to integrate peers into the spelling program, error drill, distributed practice, positive practice over-correction, and flow lists can be arranged through tutoring formats. Finally, if the teacher prefers the student to work semi-independently, copy-cover-
compare, dictionary, self-questioning, or self-correction tactics could be instituted.

**Modeling and imitation.** Modeling involves showing the student how to perform a skill by actually performing that skill, and it has been proved to be very effective in the teaching of academic subjects (Cooper et al., 1987). For children who have failed to learn to spell through the traditional procedures modeling and the imitation methods have been designed. Basically, the teacher provides an oral and written model of the spelling word and the child is expected to imitate the model by spelling the word aloud and writing it (Mercer & Mercer, 1989; Smith, 1989). Immediate feedback is given to the student. The student receives retraining of the words that are not spelled correctly. This procedure is repeated until the student is able to spell and write the word without the modeling and prompting by the teacher.

The effectiveness of showing the student a correct model of a spelling word as opposed to providing a written imitation of the students spelling error first and then showing the correct model was tested by Kauffman, Hallahan, Haas, Brame, and Boren (1979). They found out that including the imitation of the child's errors was more effective, especially for non-phonetic words.

**Whole word.** Words are treated as whole units when learning to spell because they have a psychological unity in a culture dominated by print (Fitzsimmons & Loomer, 1977). Research shows that words that are broken into syllables are not learned any faster or more effectively (Humphrey, 1954; Horn, 1969). The chaining hypothesis is the learning theory that best accounts for the effectiveness of whole word teaching. When the beginning of the word is
being written, the necessary muscular movements and the visual image that results from that combine to produce a stimulus that triggers off the next response which in turn becomes a stimulus. Therefore any interference with this sequence, i.e., breaking words down into syllables, "writing words in the air", spelling words orally letter by letter, have harmful effect on learning (Fitzsimmons & Loomer, 1977).

**Error drill.** Drill can facilitate the mastery of many academic subject areas, for example sight words, arithmetic facts, spelling, or handwriting. Students who misspell words can use error drill to increase their accuracy in spelling. Error drill can be done through the use of flashcards, language master machines, or computer software programs (Smith, 1989).

**Distributed practice.** Spelling authorities have recommended distributed rather than mass practice to learn spelling words based on considerable evidence that students seem to remember more words when the number of words presented is increased each day (E. Horn, 1960; Smith, 1989). Reith, Axelrod, Anderson, Hathaway, Wood and Fitzgerald (1974) for instance, used behavior analysis methodology to determine the influence of distributed practice and daily testing on spelling scores. The results showed that students learned more words when they were given a few of the words each day, and tested. They concluded that poor spellers performed significantly better when they were presented with five or six words daily.

**Positive practice over-correction.** Positive practice over-correction can be used as an academic instruction strategy especially with skills that have not been acquired completely. For instance, with positive practice
overcorrection for spelling, words that are missed on a test might be required to be written correctly in five sentences, or the student might have to provide the correct spelling of the word several times. Correct phonetic spelling or dictionary work might also be required. Even though it is an intrusive procedure, it reduces the spelling errors of students when it is incorporated in assignments (Smith, 1989).

**Fixed and flow word lists.** Spelling words are usually presented in fixed word lists and these are assigned to students at the beginning of each week and a test is given at the end of the week, usually Friday. The words might not be very familiar to the students or completely unknown to them (Mercer & Mercer, 1989). Some students have difficulty learning large amounts of information.

However, they can remember items if these are presented in small groups. On a flow lists of spelling words any of the words that are mastered i.e., spelled correctly on two consecutive days is dropped from the list and a new word is added to the list. The student therefore does not spend time practicing words that have already been learned (Smith, 1989).

**Dictionary.** Training in dictionary usage should form a major component of any spelling program. The ability to use the dictionary to check one's spelling involves several skills that come together to foster independent problem solving (Mercer & Mercer, 1989; Wallace, Cohen & Polloway, 1987). The student's ability to use the dictionary enables him or her to become more independent in locating spellings. Moreover, information such as syllabication, meaning, pronunciation, synonyms, and homonyms are provided through the use of the dictionary.
Self-questioning. Self-questioning is an important component of cognitive training. In cognitive training, students are taught specific information and they are then taught a strategy that focuses their attention so that they can apply the information correctly (Smith, 1989). Wong (1986) described a cognitive strategy for spelling. In training students how to spell, they were taught to break words into syllables, to examine structure of words, and how spelling changes according to the word's part of speech.

The students were then taught the self-questioning strategy which basically enabled the student to ask questions about a word they were supposed to spell. For instance, questions such as "Do I know this word?" "How many syllables do I know in this word"? "I'll spell out the word". "Do I have the right number of syllables down"? Wong (1986) found out that the students' spelling performance improved considerably.

Gerber and Hall (1982) investigated the spelling performance of elementary learning disabled students who have severe attention problems using a self-questioning, self-monitoring technique. They discovered that LD students did not produce spelling errors that were deviant or aberrant. Instead, they tried to solve spelling problems with limited, but relevant, knowledge in the same way as younger normal peers. Their errors showed a developmental continuum of ad hoc decisions and judgments about how best to use their knowledge of alphabet, word structure, sound-symbol relationships spelling conventions to represent words (Gentry, Bookman, Lydiatt, & Hall, 1984). When follow up studies were conducted on the students it became apparent that many LD students were able to produce better, but not correct, spellings without
formal teaching of spelling rules and patterns. The above studies suggest that perhaps LD students are not so passive and inattentive or dyseidetic as was believed. When given approximately 20 minutes of training in a self-questioning, self-monitoring technique, the results seemed to indicate that LD students had considerably more knowledge than they generally demonstrated during task performance. Their knowledge, however, was poorly organized and not spontaneously accessed when required.

**Time delay.** The constant time delay procedure is an instructional method that transfers stimulus control from a controlling stimulus i.e., a prompt that signals the correct response to a new stimulus i.e., a target response. The controlling stimulus is paired with the new stimulus and the amount of time between their presentations is increased systematically. The interval between the presentations of the task request (new stimulus) and the teachers model/prompt (controlling stimulus) is systematically increased until the student emits the correct response before the controlling stimulus is presented.

Stevens and Schuster (1987) used a constant time procedure to teach written spelling to an 11-yr-old LD student who exhibited severe spelling deficits. The purpose of the study was to evaluate the effectiveness of a 5-second constant time delay procedure for teaching spelling words to an elementary student labeled LD. The study investigated the acquisition, maintenance, generalization of target words, and also an efficiency measure of the time delay procedure when used with an LD student (errors to criterion, trials to criterion and total training time).
Instruction on the first word set began after the initial screening and probe condition. One hour interval separated the two instructional sessions per tutoring period. The sessions consisted of 30 training trials divided into three blocks of 10 trials. In employing the constant time delay procedure, the first block of 10 trials was presented at a zero-second delay when a new set of words was introduced. Subsequent trials after the initial block of 10 trials for that word set were presented at a 5-second delay. A set of words were considered to be learned when the student was able to achieve 100% correct anticipations for five consecutive blocks of 10 trials on a CRF reinforcement schedule and five consecutive blocks of 10 trials on a VR3 reinforcement schedule.

For generalization scores the student's special education teacher probed the fifteen words during a testing session in the classroom, three weeks after the targeted words were trained. Then five sentences containing the 15 target words were individually dictated to the students. A multiple probe design was used to assess the effectiveness of the time delay procedure.

The results of the study indicated that the 5-second constant time delay procedure was effective in teaching the LD student. Specifically, the student spelled 14 out of 15 (93.3%) target words during the acquisition, and maintained these words without review trials or procedures over a two month instructional period. Moreover, words generalized across persons, settings and tasks.

The findings suggested that the constant time delay transfer of stimulus control procedure was a viable instructional method for LD students. Stevens and Schuster (1987) claimed that the use of the procedure with LD students
offers several advantages. First, it is an easy procedure for students to understand and implement. Second, the procedure has the potential for helping students to commit few or no errors. Third, the procedure is enjoyable for students because it occurs in a game format and students can compete with themselves. Finally, little teacher preparation is involved.

**Spelling rules.** The idea of teaching spelling rules is to enable the student to generalize their spelling of words with similar patterns. Educators have been interested in establishing the extent spelling rules should be taught (Wallace, Cohen, Polloway, 1987). The best approach is to select a few of the most frequently used rules and incorporate them into the spelling program. Previously learned rules and their application should be reviewed periodically to increase retention and generalization.

**Student-directed strategy.** Dangel (1989) carried out a pilot investigation to determine whether either of two student-directed spelling strategies (i.e., student-directed planning and monitoring) could be used successfully in classes for students with learning handicaps. During the first phase, the teachers used their usual procedures and activities which included writing the words, defining words, and doing activities from the spelling books.

However, during the second and third phases, modified student-directed strategies were used. During the second phase the teachers instructed the students to plan how much they would practice their spelling words by writing each spelling word on an index card and sorting the spelling words into hard and easy stacks. During the third phase--the self-recording phase--the teachers
taught the students to use a trace-copy-cover-write procedure to study the words, and also to record the accuracy of the words practiced.

The results of the study indicated that the students improved their spelling scores from day to day and also improved their spelling performance with each new intervention. Students who had been placed in various study schedules could spell more words correctly when they used the planning and self-recording strategies as compared to teacher-directed strategies. Therefore, teachers may be able to improve the spelling performance of students by having them decide and record their spelling words.

Dangel (1989) however, stated that looking at the pattern of improvement among the subjects the intervention clearly showed that the impact of each was not uniformly positive for each student. Therefore, Dangel (1989) suggested that these student directed strategies should be used in combination with an instructional management plan such as curriculum-based evaluation in which the teacher monitors and charts the daily responses of students to the instructional program. The teacher will be able to identify the strategy or strategies that are effective with each student.

Self-correction. Self-correction has been heralded as the most important single factor contributing to achievement in spelling (Allred, 1984; Christine & Hollingsworth, 1966; Ganschow, 1983; Horn, 1947; Schoephoerster, 1962; Wallace, Cohen, & Polloway, 1987)). Research has established the value of the self-correction as a learning device.

Self-correction for spelling is a teaching procedure in which students learn to spell by (a) comparing their misspelled words to a model (match-to-
sample), (b) identifying specific types of spelling mistakes (e.g., omissions, repetitions, transpositions), (c) correcting their mistakes by themselves using proofreading marks, and (d) writing the correct sequence of letters for the word. Self-correction enables students to focus specifically on letter sequence. Students have a lot of opportunities to respond (Greenwood, Delquadri, & Hall, 1984) since they make their own corrections and have immediate feedback on their spelling efforts by comparing their word to the model (Van Houten, 1980). Both opportunity to respond and feedback have been shown to be effective in improving a wide range of behaviors and could easily be adapted to chart self-correction trials during spelling instruction.

One of the first studies of self-correction was conducted by T. Horn (1947). He used a population of 268 sixth-graders divided into three groups. Group 1 (N=85) took a test over words in their regular spelling series, then corrected their work, and immediately retook the test. Students engaged in this sequence three times per week. Students in group 2 (N= 87) also took a test over words of comparable difficulty, but they did not correct their work until the next session. The third group (N= 96) was administered the same procedures as group 2, except that a pronunciation exercise was included during the first session of each week.

The results of the study showed that the students in Group 1, the immediate self-correct group, outperformed the members of the other groups on both weekly and delayed spelling tests. T. Horn (1947) recommended “Since the corrected test has been shown to be such a potent factor in learning to spell,
it should be utilized during the spelling period in such ways as to insure its maximum effect" (p. 285).

A self-correction format to improve spelling performance that was demonstrated to be successful with children in a clinical situation was described by Ganschow (1983). Students used three proofreading marks as the primary method by which to compare their spelling with the correct spelling of a word. Students were presented with the target words orally or from a language master. The correct spellings of the words were recorded in the first column of a 5-column page. Students folded back column 1 hiding the correct spellings while the language master or tape dictated the words to them. Then they folded back column 1 to expose the words and self-correct. Ganschow (1983) suggested that the self-correction procedure set the occasion for students to work independently in the regular classroom while simultaneously improving their performance.

In an experimental test of Ganschow's self-correction format, McNeish (1985) conducted a study with five learning disabled, seventh grade students in a rural middle school setting. Using an alternating treatment design, students used either a traditional or a self-correction approach for 20-minute periods of instruction 4 days per week. During traditional instruction, students wrote their spelling list of words three times each on Mondays, wrote each word in a sentence on Tuesdays, wrote the words in alphabetical order as many times as possible within 20-minutes on Wednesdays, and generated a story using as many words as possible on Thursdays. Fridays were reserved for posttesting.
During the self-correction procedure, students received a sheet of paper with 5 columns that contained their spelling words written in the first column. They folded this column back so that they could not see the words. Then, they listened to a dictation of their spelling words from an older student. Once dictation was completed, they unfolded their paper exposing the previously written spelling words, and used a series of 4 proofreading marks (^
, 0, /, ~) to self-correct each of their responses in the second column of the sheet. For instance, if the stimulus word was occasion, and they wrote "ocasion", the caret mark (^) would be inserted between the c and the a (occasion) to indicate that the letter (c) had to be added. The student would write the letter to be added above the caret mark, and then rewrite the complete word in the third column.

This "proof plus write" the complete word sequence was repeated for all of the words on the list. If the student spelled the word correctly on the first trial, they simply placed a check mark (/) in the second column. If the word list was completed before the end of the 20-minute session, students were directed to repeat the process until time ran out using columns four and five for this purpose.

McNeish's results indicated that students learned more words under the self-correction procedure than they did under the traditional approach. When the self-correction was in effect, students learned an average of 24 more words per 5-weeks of instruction (4.8 words/week) than under the traditional approach. Extrapolated over a 36-week school year, McNeish speculated that students had the potential to learn 173 more words per year with this approach. Additionally, on delayed posttests designed to measure maintenance of learned
words, four of the five students maintained an average of 2.8 more words during self-correction than the traditional approach with no increase in time allocation for the lesson. When generality of behavior was evaluated, all five students improved, averaging correct spellings for 5.2 more words in generalized settings (science, social studies, reading, and language arts) under the self-correction method as opposed to the traditional approach.

Finally, all five students indicated that they preferred the self-correction procedure to the traditional approach. In their view, "The time went faster when we did it [self-correction] this way", and "It [self-correction] wasn't as boring."

Some type of test-self-correction retest method of spelling instruction was repeatedly validated as effective in the empirical literature (Fitzsimmons & Loomer 1977). For example simple, contingent imitation of a spelling error, followed by correct modeling of a spelling, was effective in increasing both current performance as well as recall for LD and mentally retarded children (Jobes, 1975; Kauffman, Hallahan, Haas, Brame & Boren, 1978).

In conclusion, strict instructional pragmatism has dominated research on spelling instruction (Gerber, 1986). For example test- self-correction retest procedures are best supported by empirical evidence. The importance of various contingency arrangements to increase levels of spelling performance has been emphasized by behavioral technologists (Neef, Iwata, & Page, 1980; Kauffman, Hallahan, Haas, Brame, & Boren, 1978). One factor about all effective instructional techniques appears to be an inclusion of some corrective feedback condition which permits students to compare and contrast their
spelling attempts with correct models (Gerber, 1986). Corrective feedback strengthens particular targeted responses. It also controls attention to important information within a "problem space". By influencing selective attention to salient portions of spellings, corrective feedback may also assist the individual to accommodate existing knowledge structures and spelling operations to new information or in reorganizing knowledge and related processes.

Vallecorsa, Zigmond and Henderson (1985) conducted a descriptive study to address the following questions: (a) are special education teachers knowledgeable of empirically supported methods of spelling instruction? (b) How often do special education teachers report that they employ empirically supported instructional methods in teaching spelling? (c) How often do special education teachers report that they employ instructional methods which lack adequate empirical support in teaching? Twenty-three special education teachers of learning disabled or educable mentally handicapped children participated in the study. A Knowledge Index Questionnaire and an Instructional Practices Questionnaire were developed for the study. Results of the analysis indicated that significantly greater use of methods considered supported by teachers are used than methods considered nonsupported.

In discussing the results of their study Vallecorsa et al (1985) indicated that outcomes from the Knowledge Index pretest suggested that subjects were well informed about empirically supported and nonsupported methods of spelling instruction. However, as a group they could better identify supported methods than nonsupported practices i.e., nonsupported methods were mistakenly identified as supported techniques. Special education teachers may therefore
have some misconceptions concerning appropriate methods of spelling instruction especially those that are not empirically supported.

Some of the nonsupported techniques were, presenting words initially in a sentence or paragraph format, writing words several times to help retention, following a study test cycle, studying "hard spots" in words, and permitting students to devise their own word study methods. On the other hand only one empirically supported method was consistently identified by the teachers as nonsupported i.e., limiting the emphasis placed on phonics in spelling instruction.

The second purpose of the study was to examine how often special educators used supported and nonsupported methods in their teaching. Results of the study indicated that most of the validated methods were used on a regular basis. The only exceptions were daily testing and use of a test-study test cycle. However, the teachers indicated that they also used many of the nonsupported methods as well.

Also the teachers reported that their instructional practices were generally consistent with their beliefs i.e., methods identified on the Knowledge Index as supported practices were consistent with those they regularly used. Finally, many interesting inconsistencies were found between the Knowledge Index outcomes and results from the Instructional Practices Questionnaires. For example, most of the teachers described daily testing and use of test-study-test cycle as supported methods and yet very few of them indicated that they used them in their teaching. These inconsistencies may be due to classroom organization and management practices.
The results of this study implies that special education teachers may believe that a variety of methods which do not have adequate empirical support are effective for spelling instruction. Therefore there is the need to improve their knowledge of methods that have been validated as effective for teaching spelling. However, the authors cautioned that the results of the study should be interpreted with care since a small sample of teachers was involved and therefore they might not be representative of special educators. Secondly, the teachers might have given the wrong picture of what really occurred. Thirdly, other studies are needed in order to generalize the findings.

GENERALITY OF BEHAVIOR CHANGE

Over the past years professionals in the field of Applied Behavior Analysis have faced the challenge of designing intervention teaching techniques that can be maintained and generalized to other settings or behaviors. Generality of behavior change occurs when the behavior being considered is produced in non-training conditions involving different subjects, settings, behaviors, or time without scheduling for the same events in those conditions found in the training conditions (Stokes & Baer, 1977).

Since training conditions for behavior change cannot be scheduled for all the environment and situations, it is imperative that serious consideration and actual planning be carried out to achieve generality (Cooper, Heron & Heward, 1987; Stokes & Baer, 1977).

Different forms of generality have been discussed in the literature. Stimulus generality occurs when a target behavior is emitted in the presence of stimulus conditions that are different from training conditions. Stimulus
generality is the extent to which the target behavior is improved upon in different environments other than the training conditions (Cooper et al., 1987). Response generality is the extent to which the learner is able to emit other responses in addition to the target response for which training has occurred. In other words, if the learner is able to perform other responses as a result of the training the individual received for the target response, then response generality has occurred.

Both forms of generality (stimulus and response) must be assessed to determine the effectiveness of behavior change programs. However, generality does not always occur automatically. There is the need to plan actively for generality. The rest of the literature review for this section will focus on strategies that could be used to promote generality, and some studies that included either the assessment or the programming for generality.

Strategies

Cooper et al. (1987) discussed six general strategies that could be used to achieve generality of behavior change: aim for natural contingencies of reinforcement, teach enough examples, program common stimuli, train loosely, use indiscriminable contingencies, and teach self-management techniques.

Aim for natural contingencies of reinforcement. The maintenance of any behavior depends on the availability of reinforcement. Therefore, as Ayllon and Azrin (1968) suggest, only behaviors that will produce reinforcers naturally during postintervention should be chosen. Also the behavior analyst should ensure that the natural contingencies existing in the environment are operating and are available to the learner (Cooper et al., 1987).
Teach enough examples. Teaching several examples of a particular behavior change that pertains in a wide variety of settings and situations could increase the likelihood that the behavior is generalized. For example, a subset of stimulus and response examples could be selected and taught and then checked for generality.

Program common stimuli. Usually, a target response is emitted in the presence of stimuli that are similar to the stimulus conditions under which it was previously reinforced. It is necessary to examine the settings and situations in which the generality of the behavior is expected, and to identify and incorporate stimuli that are important into the training program (Cooper et al., 1987).

Train loosely. One strategy that can be used to facilitate generality is to vary the teaching procedures and accept a wide range of responses as correct (Cooper, Heron, & Heward, 1987). When a wide variety of stimuli is incorporated during the training of a new response, it is more likely that a large group of stimuli will acquire control over the behavior. Thus, generality will be easier to acquire since some of the stimuli in the settings where generality is desired will be present during the training.

Use indiscriminable contingencies. Usually, behaviors that are acquired under intermittent schedules of reinforcement are maintained long after reinforcement is no longer administered. Not being able to discriminate when reinforcement will be presented actually accounts for the continuous emittance of the behavior in different settings.
**Teach self-management skills.** Teaching self-management or self-control skills is one way of ensuring that a target response is emitted by the individual in different settings. The idea is to teach a controlling behavior that will prompt and reinforce the target response in all the necessary settings and at all appropriate times (Cooper et al., 1987).

Numerous authors have investigated generality across many subject areas, for example social skills training with retarded individuals, social interactions of autistic children and question asking of mildly handicapped students. With all these investigations, the subjects did not only learn the new behaviors but they were able to generalize them in different settings and with individuals other than the investigators (Fox, Mc Morrow, Brittle, & Ness, 1986; Secan, Egel, & Tiley, 1989; Stokes, Baer & Jackson, 1974).

**Generality of the Spelling Skill.**

The main purpose of learning is to bring about a change in the individual's behavior that will enable the person to function in an acceptable manner in his or her community or society. Correct spelling is a skill that is expected to be learned in order to function appropriately in both the writing and the reading community. Therefore, the child who has learned to spell words correctly in the classroom is expected to do the same in other environments and situations, and be able to spell other related words. Otherwise, it can be assumed that the child had not acquired the spelling skill to a competent level.

In spelling, the question of generalization has attracted a long standing controversy, concerning the use of organizing spelling instruction to take
advantage of the regularity of the English spelling system. Those in favor of
teaching generalization maintain that the English orthography is regular enough
for generalizations to help in the spelling of related words. Those against the
teaching of generalization argue that the English orthography has overwhelming
irregularity which requires that the spelling of each word has to be mastered
individually.

In any case, teaching methods that enable students to acquire the correct
spelling of words and be able to spell those words and related ones in other
situations and settings should be encouraged. More capable learners are able to
infer generalizations and transfer them to new words without the assistance of a
teacher. However, one needs to incorporate orthographic regularities in a
focused and systematic manner when training poor spellers to generalize.

Gettinger, Bryant and Fayne (1982) described an intervention that was
designed to enhance the spelling achievement for learning-disabled elementary
school children. The purpose of the investigation was two-fold: (1) to
determine the extent to which LD children can learn and apply encoding skills
when they are taught with lessons incorporating those instructional principles,
and (2) to compare spelling under experimental conditions with performance
under control conditions that teach the same material without the systematic
application of the basic remedial principles outlined above.

A total of 39 children with learning disabilities were taught for 8
sessions over a period of 3 weeks. The experimental group was taught eight
lessons that incorporated reduced unit size, distributed practice and review, and
training for transfer, and a comparison group as taught using methods typically
used in the teaching of spelling. The experimental teaching procedures were designed to optimize the learning of phonemically regular and irregular spelling words for LD children. The lessons were conducted to provide an opportunity to achieve mastery in the spelling of nine phonemically irregular words and eight phonemically regular words.

Practice for application was provided to teach for transfer of specific orthographic patterns to new words and transfer of learned words to sentence contexts. Results indicated that while both the experimental and control group could spell less than 10% of the words on the pretest, the experimental group achieved 80% accuracy on the words taught and 75% accuracy on transfer words on a delayed posttest. The comparison group achieved 60% accuracy on training items and 50% accuracy on transfer items. Gettinger et al., (1986) concluded that LD children can improve their spelling skills if sound remedial principles are applied consistently.

Hesse, Robinson, and Rankin (1983) conducted a study in which morphographic spelling instruction that is, Corrective Spelling Through Morphographs by Dixon (1979) was used. The objective behind the Corrective Spelling Through Morphographs is to provide a reliable, structural set of principles that allow generalization to a significant number of words. The program offers a smooth sequence of rule introduction delivered through direct instruction techniques. The authors of the program designed it in such a way that a small set of building blocks with a large number of applications are taught. The design is made up of the specification of objectives, analysis of
objectives into teachable components, identification of preskills, selection and sequencing of examples.

The main purpose of the study was to investigate the retention of learned spelling words by 7th grade subjects and to investigate the subjects' abilities to transfer their learning to a non-program specific situation (i.e., conventional standardized posttest). After the pretest using the Morphographic Spelling Test and the Stanford Achievement Test, the subjects were given a year's instruction and then posttests at the end of the year. The results indicated that what was taught in morphographic spelling was retained but no transfer of learning from morphographic training to performance on a conventional standardized test was demonstrated.

In a series of studies with 11 students ranging from first to sixth grade identified as learning disabled, Gerber (1984) administered two lists of words, that is a dictation test with imitation-modeling feedback was repeatedly given to the students. The second list of words was administered only after the first list had been mastered. Students were not given cues to use any information they may have gathered from spelling list 1 repeatedly. The results revealed that the spelling attempts on the first trial of list 2 were better than attempts on the first trial of list 1. Second, all the students reached mastery in fewer trials on the second list than they did for the first list.

Third, the students produced better spelling attempts when they were prompted to use what they learned from the previous list. These experiments indicate that LD students can learn transferrable information about spelling if given (a) sufficient time or opportunity to learn a set of target words, and (b)
clear, efficient feedback that allows them to compare their errors with correct spelling and to practice correct spelling.

Gettinger (1984) described three learning principles relevant for teaching spelling to LD children and their application to remedial teaching. The three learning principles were Reduced Unit Size, Sufficient and Distributed Practice, and Training for Transfer. Assigning a large number of spelling words to be learned at one time can overload the processing abilities of the LD child (Gettinger, 1984). Research studies have revealed that poor spellers perform better on weekly posttests when given only a portion of the week's words each day (Rieth et al., 1974; Briant et al., 1981).

Professionals in the field of remedial education agree that sufficient practice is required if an individual is to reach the goal of mastery (Bloom, 1976; Haring and Bateman 1977; Otto and Smith 1980). The practice should be spaced across various practice sessions with breaks built into the schedule (Gettinger, 1984). Also there should be constant reviews of what have been learned, otherwise the learning disabled child finds it difficult to remember what have been learned.

In sum, spelling practice should be distributed and cumulative across days. It should also involve actual writing of words in isolation and in sentences, with systematic review of words over time. Concerning training for transfer, Gettinger (1984) reiterates that there are practical considerations that should be taken account when designing remedial instruction. The learner should be helped to discover phonic generalizations that can be applied to a large number of words. However, since the effectiveness of teaching spelling via phonic
generalizations is highly questionable (Johnson et al., 1981), spelling of words should be learned through multiple encounters with their examplars, that is complete words. For example, teachers of disabled children should encourage children to observe that the spelling of a word (e.g., "meat") is like that in another word (e.g., "heat" or "beat"). Also, LD children should practice transferring spelling skills within the context of connected prose.

Spelling instruction should include opportunities for children to use their spelling skills within a sentence context to ensure generalization to fluent writing. A spelling program that is effective should provide practice that will enable learners to transfer words they have learned to spell in isolation during writing. Gettinger advocated that an effective spelling program should incorporate all the three learning principles i.e., reduced size, sufficient and distributed practice, and training for transfer.

Students with learning disabilities usually acquire basic academic skills at a slower rate than their normally achieving peers. Even though cognitively and behaviorally oriented researchers have offered explanations to account for this phenomenon, relatively few data have demonstrated the power of any intervention to promote automaticity of basic skills or generalizable knowledge about their effective use in solving academic problems (Gerber, 1986).

Gerber (1986) conducted a research study the purpose of which was to determine the relationship between LD students' response attempts on a simple, applied task and changes in cognitive organization that promote generalization of basic skills. The research assumed that error making in spelling by LD students which are usually similar to that of younger, normally achieving children,
reveals neither cognitive disorganization nor deviance. Instead, errors can be interpreted as logical, systematic and active attempts by students to solve problems encountered in trying to spell (Gerber, 1986). In an earlier study, Gerber and Hall, (1979) used a modification of error classification schemes developed by Gentry (1977) and Zutell (1978). They described the types of errors they analyzed as the following.

**Preliterate.** These words represented the unintelligible symbols, mixed letters and non-letters. The preliterate attempts were interpreted as an evidence of lack of basic knowledge of the alphabet or an insufficient concept of writing in general, or written words as units in particular.

**Prephonetic.** The second category was characterized by an alphabetic representation of one or more but not all phonemes which indicated an uncertainty in (a) deciding where to "place" phoneme boundaries, (b) possible alphabetic representation, and (c) maintaining acoustical stimulus in memory long enough to extract relevant information, for example UM or UN for "human".

**Phonetic.** These spellings represented every phoneme in the stimulus. However, they were representations which systematically used articulation of letter names as a basis for deciding upon grapheme-phoneme relationships. They were interpreted as an evidence of students' compensatory decisions when they had limited knowledge about conventional rules of sound-symbol relationships in English orthography.

**Transitional.** These spellings can be read, pronounced and recognized by adults as approximations to conventional spelling. They do not violate orthographic rules, use legal but incorrect letter combinations to represent
phonemes, and demonstrate consistent use of orthographic marking conventions. Transitional spellings show a systematic knowledge of simple phonics and orthographic rules related to syntax, but also reveal lack of abstract knowledge concerning semantic information, and the inability to recognize semantic analogies from a body of known words, for example, "peaked" for "peeked" "elavator" for "elevator".

Correct. These attempts showed a conventional spelling for the words. They included subclassifications due to differences in spelling speed, spelling behaviors such as verbalization and self-correction.

The analysis of data revealed that Learning Disabled students' spelling attempts varied depending on the age of the student. Older students produced mistakes which were orthographically and phonetically more similar to correct spellings than mistakes produced by younger Learning Disabled students. Also the superiority of errors produced by Learning Disabled students were similar to those expected of normally achieving children between the ages 3 to 5. The errors usually revealed evidence of a "phonetic" strategy. Gerber and Hall (1979) concluded that in all cases without exceptions Learning Disabled spellers applied logical, but limited knowledge and strategies for solving spelling "problems".

The second study (Gerber, 1986) was a replication of the earlier study (Gerber and Hall, 1979) but it also examined longitudinal changes in errors on the same words within a subsample of subjects. The analysis of the longitudinal data revealed that the subjects developed qualitatively better spelling attempts over a 7-month interval when specific spelling instruction was not received.
When the LD students were permitted sufficient exposure to minimal correction procedures, they were able to spontaneously generalize what had been learned about spelling features of one list to another.

SOCIAL VALIDITY

In applied behavior analysis, behaviors selected for study are those that have some social significance. Such target behaviors are important to the clients as well as to the community in which they live (Cooper et al., 1987). Therefore behavior analysts have sought to evaluate their efforts as well as the behavior change that occur in the client. Those efforts that are effective in changing a client's behavior in a socially important manner have social validity.

The social validity of any treatment package should not only be on the outcome but also should be on the goals and the procedures as well (Kazdin, 1977; Wolf, 1978). In response to the report of the applied behavior analysis Task force on the right to effective treatment and particularly on the issue of aversive intrusive procedures, Bernstein (1989) suggested a more complete approach to the issue of social validity. She suggested the combination of Wolf's (1978) definition of social validity and Strupp and Hadley's (1979) tripartite model of therapeutic outcome.

Wolf's (1978) definition emphasizes the social acceptability of treatment goals, (i.e., what society really want) procedures (i.e., clients and others agree that the end justifies the means) and outcomes or effects (are satisfactory to consumers). Strupp and Hadley (1977), however, emphasized treatment, i.e., the treatment should be judged from three perspectives: the
consumer's, the therapist's, and the society's at large. Considering social validity from the two approaches will ensure a thorough treatment of the issue.

Methodology for Evaluating Social Validity

Two defining features of applied behavioral research are an emphasis on socially important behavior, and the insistence that the treatment changes be of practical value (Cooper et al., 1987). However, a methodology by which these criteria can be evaluated has developed slowly.

Kazdin (1977) and Wolf's (1978) strategies for evaluating the methods and outcomes of applied behavioral research emphasize on the role of the following: individuals who pay for the services, public policy makers, significant others whose reaction to the subject defines the problem, experts in some aspect of the behavior targeted for change, and persons presumed to represent community standards.

Validation of Treatment Goals

Identifying behavioral treatment goals may appear to be an easy task, but careful examination reveals at least three problems that contribute to the interest in social validation of treatment goals. An agreement on the topography of the behavior does not necessarily mean agreement concerning the level of behavior to be achieved before ending therapy. In fact, agreement on treatment goals does not exist even for simple treatment goals. For example, a low level of unprovoked aggression is typical of a certain age therefore suppression to zero is an unnecessary and unrealistic goal. Not considering the stimulus conditions under which the target behaviors occurred when identifying goals can also be a problem (Fuqua & Schwade, 1986).
Questionnaires and interviews. Wolf (1978) described two methods for selecting treatment objectives: questionnaires and informal interviews with experts or significant others who interact with the subject. At times, experts are invited to provide an opinion to guide the selection of target behaviors.

Social comparison method. The collection of normative data on a group of prospective clients and a group of peers that differ on a global dimension relevant to the target behavior is the essential feature of the social comparison or "known groups method". Behaviors that are typical, normal, or successful suggests the target behaviors for clients who need assistance.

The adoption of treatment objectives based on so-called "normal" peer groups is one of the problems with social comparison method. Kazdin (1977) notes that normative or standard levels used as criteria against which to evaluate change may be inappropriate for many programs. The goal might be to change the normative level itself. Van Houten (1979) has suggested a variation of the social comparison procedure. The variation requires that individuals who are acknowledged widely for their competence at a given behavior should be identified. Then, the treatment objectives and standards should be based on the performance of individuals who have not received treatment and who may or may not display good modeling. This method is not widely used.

Experimentally-Based Procedures

Van Houten (1979) suggests two experimentally-based procedures for determining the optimal level of a behavior. The level of the target behavior in one of the procedures is systematically changed to determine the level at which the relevant treatment effect is most closely approximated. Experimentally,
validated treatment objectives are scarce. The primary focus of those that are available is on the optimal level of an identified target behavior, rather than the identification of the target behavior itself.

One of the problems concerned with the social validation of treatment objectives is the need to establish the psychometric characteristics of the procedure that are used for its' assessment. The problems with predictive validity are not eliminated with the social comparison methods of selecting treatment objectives. It is necessary that judges be selected randomly from the population if treatment objectives that society demands are to be identified. This means that the judges should be a representative sample of the larger population. However, the degree to which the judges are a representative sample of a larger population has yet to be ascertained. Moreover, the manner in which questionnaires are phrased and target behaviors adopted are still not clear (Fuqua & Schwade, 1986).

Another serious flaw in the methods by which treatment objectives are socially validated relates to the topography of the target response. This is done excluding the discriminative stimuli and response consequences. The complete specification of a treatment objective should include: (a) the antecedent stimuli, and (b) response consequences that control the target behavior after the conclusion of formal treatment. When the controlling variables are not specified that define an operant response class then a formalistic fallacy can be claimed. The selection of treatment goals at certain situations is based on legal and ethical grounds. This renders social validation of treatment goals useless, irrespective of the procedure used.
Social Validation of Treatment Procedures

The acceptability of behavioral treatment procedures has also been subjected to social-validation research. Examples of unobtrusive measures of consumer satisfaction are unsolicited comments, referrals of friends for treatment, institutional adoption of treatment procedures (Fuqua & Schwade, 1986). The most commonly reported measure of consumer satisfaction with treatment procedures is self-report to informal or formal questions regarding treatment procedures (Kazdin, 1980a).

Some of the factors that appear to influence the acceptability ratings are severity of the problem, the manner in which treatments are presented and implemented, and the presence of undesirable side effects. The evaluation of the acceptability of treatment is usually based on the ratings of consumers who have experienced the procedure. Efforts to socially validate treatment procedures have been plagued by a number of weaknesses such as unreliable questionnaires, lack of anonymity of those who answer the questionnaires, subject selection, interpretation of problems, and other variables apart from the treatment procedures (e.g., the therapists' social skills and also physical appearance).

Apart from the methodological issues, there are also conceptual issues in connection with the appropriate use of treatment acceptability data (Fuqua & Schwade, 1986).

Social Validation of Treatment Effects

The most extensive body of social validation research has been done on the social importance of treatment outcomes. It is also the one that closely approximates the focus of consumer-satisfaction. Social validation of treatment
effects is a method that has been proposed for assessing the clinical significance of a treatment effect. It relies on two basic procedures: social comparison and subjective evaluation (Kazdin, 1977).

**Social comparison.** This method requires the identification of peers who differ from the client only with respect to the presence of the target behavior. The behavior changes that bring the client's behavior within the range of behaviors exemplified by the peers should be judged as clinically important since the behavior of the peer group is considered adequate.

**Subjective evaluation.** Clients, experts, or consumers of services, can assess the social importance of treatment effects subjectively. They can offer global rating for questions about the resolution of the problem, their satisfaction with the therapist, or the treatment outcome.

Subjective judgments are appropriate for evaluating the clinical or social impact of a behavior change. However, their sensitivity and validity poses a problem, even with their limited use. Additional methodological concerns involve the isolation of particular behavior changes that are responsible for subjective evaluations of clinical importance, disagreements between judges with respect to treatment efficacy, the focus on the topography of the response or the criterion level to the exclusion of the controlling variables, and concerns about locating an appropriate comparison group to establish therapy outcome standards (Fuqua and Schwade, 1986).

Although social validation of treatment effects has been researched widely in other areas (Neef, Parish, Egel, & Sloan, 1986; Stevenson & Fantuzzo, 1986) it has not been widely investigated in spelling. The rest of the
literature review will discuss two studies in other areas and two on spelling that evaluated the social validity of the treatment procedures and effects.

Stevenson and Fantuzzo (1986) evaluated the effectiveness, the generality and the social validity of a modified version of a competency based self-control package which they developed in 1984. The subjects were three underachieving fifth grade students who were trained to use the intervention to increase their arithmetic proficiency. The significance of the effect was determined by comparing the arithmetic performance of the treated and the control pair of underachieving students with the mean performance of the remaining untreated children in the class.

Teachers were also asked to fill out a 5-item questionnaire designed to elicit their evaluations on the appropriateness and acceptability of the strategy (effectiveness of the procedures, amount of teacher time in the classroom, and the likelihood that the teachers would use the intervention again and recommend its' use to other teachers.

The results showed that the intervention improved the subjects arithmetic performance. Generalization was achieved for the participants and the social validity data showed that the subjects arithmetic performance was either above or approached the mean performance of their high achieving classmates. Also, the teachers reported that the intervention was effective and appropriate for classroom use, and it was easy to implement.

Four experiments were conducted by Neef, Parish, Egel, and Sloan (1986) to evaluate a respite care training package. Experiment 1 involved the assessment of the effectiveness of an instructional manual on the acquisition of
respite care skills, and the relative effects of three different manual
presentation formats were compared. The results revealed that the performance
during simulated (role-played) respite care situations improved for all six
trainees following presentation of the instructional manual.

In experiment 2 the effects of the manual presented was evaluated as a
whole with a larger group of trainees and compared to a workshop training
approach. The results indicated that both the instructional manual and workshop
training approaches were effective, however the instructional manual was more
cost effective. Correct responding generalized to a respite care situation with a
multiply handicapped child.

Several measures of social validity were obtained. First, the target
respite care behaviors were derived from a survey of parents of handicapped
children, a task analysis of a child care situation, and input from an advisory
board which consisted of a speech therapist, pediatrician, psychiatrist
psychologist, physical therapist, occupational therapist, two special educators,
two parents of handicapped children, and two directors of county respite care
agencies. Then measures of trainee satisfaction with the training program were
obtained through a questionnaire, adapted from one developed by Larsen,

For the evaluation of the overall quality of trainee performance in each
target skill area, parents of handicapped children and the coordinator of a county
respite care agency participated in it. Consumer satisfaction was assessed by
parents who engaged the respite care services provided by the individuals who
completed the program versus those who had not participated.
In experiment 3 a simplified training and assessment package that could be conducted using the resources available to respite care agencies was evaluated. The results supported the experimental findings of the first two experiments regarding the effectiveness of the training package, and the effectiveness of the training manual relative to traditional workshops. In experiment 4 Neef et al. (1986) demonstrated that respite care agency personnel could successfully implement the instructional package.

Harper and Mallette (1989) conducted a study to ascertain if a classwide peer tutoring technique could be used to improve the spelling performance of a class for mild to moderate mentally retarded children. There were 6 males and 6 females with a mean age of 100.76 months. The students were assigned to dyads and to one of two teams. One student tutored first. The tutor read one of the five spelling words. The tutee orally spelled and simultaneously wrote the word. If the word was written correctly the tutor said "correct" and awarded the tutee 2 points. If the word was incorrect the tutor provided the correct spelling and the tutee wrote and spelled the word 3 times and earned 1 point.

The next word was then presented and the list was repeated until 5 minutes elapsed. Roles were reversed and the procedure was repeated. The class-wide peer tutoring was done four days per week. Then on the last day of the week a spelling test was administered. The total points earned by the team was calculated and the winning team was announced.

The results of the study indicated that the subjects improved their spelling performance. During baseline they achieved an average of 36.7% correct of their spelling words. After the intervention they achieved an average
of 96.79%. The social validity ratings by both the subjects and their teachers were high. The classwide peer tutoring was improved the social interactions of the group.

The final study to be cited was conducted by Maheady and Harper (1987). They examined the effects of a class-wide peer tutoring program on the weekly spelling test performance of 70 regular 3rd and 4th graders the majority of whom were enrolled in special education programs. The peer tutoring program consisted of active student response, weekly competition between teams, systematic tutoring formats, daily point earnings and public posting of individual and team points.

The results showed that students' scores on weekly spelling tests increased by an average of 12 points and subsequent decreases in test performance occurred when peer tutoring was discontinued. Also, approximately 80% of all students received A grades on their spelling tests during the intervention and only 4% of the subjects failed the tests. The social validity data revealed that both teachers and students found the class-wide peer tutoring to be effective and acceptable.
CHAPTER III
METHOD

The students, setting, experimenter, dependent and independent variables and procedures used in the study are described in detail in this section. Further, a description of student training and the experimental design are addressed.

Students

Six elementary school children, one male and five females, ages 7 to 13 years old whose spelling skills were below the 50th percentile and who had registered for remedial tutoring with Huelmans-Peters Psychoeducational Clinic on the campus of The Ohio State University served as subjects for the study. The children were selected randomly from a pool of students registered as waiting list applicants to the Clinic. That is, beginning with the first name on the waiting list, the six children were selected because they exhibited spelling and written language deficits and their parents and teachers had indicated they needed help. Table 1 shows a description of the students, i.e., their gender, age, ethnic background and their spelling achievement scores on the Test of Written Spelling-2 (Larsen & Hammill, 1986). Student 3 withdrew from the study suddenly because she had to travel out of town.
Table 1

**Description of the six students employed in the study**

<table>
<thead>
<tr>
<th>Student</th>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity</th>
<th>Spelling 1 (%iles)</th>
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</thead>
<tbody>
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<td>13</td>
<td>black</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
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<td>21</td>
</tr>
<tr>
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<td>F</td>
<td>9</td>
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<tr>
<td>6</td>
<td>F</td>
<td>7</td>
<td>white</td>
<td>22</td>
</tr>
</tbody>
</table>

Setting

The study was conducted at the Huelman-Peters Psychoeducational Clinic on the campus of The Ohio State University. The Clinic offers tutoring for students in the basic academic skill areas (reading, math, spelling). The instructional procedure was conducted in an interview room measuring 3 meters by 5 meters. The room was furnished with a table and five chairs (see appendix A for a schematic).

Experimenter

The experimenter was a third year doctoral candidate majoring in special education and applied behavior analysis. The experimenter was an international student from Ghana, West Africa and was certified in teacher education. Also, she was working towards her certification in supervision and braille transcription. The candidate had college-level teaching experience and additional experiences with college-level students with visual impairment as well as elementary school children with mental handicaps, emotional disturbances, and learning disabilities.

Definition and Measurement of Dependent Variables

The dependent variables measured in the study were written spelling accuracy on weekly spelling posttests, delayed posttests, and generalization spelling scores. Each of these variables is described in more detail below. The Test of Written Spelling-2 (Larsen & Hammill, 1986), a norm-referenced test was administered as a pre and posttest measure to determine overall spelling achievement.
**Session posttest scores.** Spelling accuracy referred to the correct
writing of the sequence of letters in isolation—otherwise known as the
orthography of the letters—on the first trial of the word dictated on a spelling
test. For example, if the word "stranger" was dictated, the student was expected
to write s-t-r-a-n-g-e-r. Any other arrangement of the letters or the
addition, omission, or transposition of other letters was counted as incorrect.
Also, homonyms of the word were counted as an incorrect response.

The words were dictated by the experimenter who first said the word,
waited 5- seconds, used the word in a sentence, again waited 5-seconds, and then
repeated the word. The posttest was administered at the end of every session
during the intervention period. A checkmark (/) was placed next to words
spelled correctly, and an "x" was placed next to words incorrectly spelled. In
effect, a direct measure of the permanent product (written spelling) was
recorded.

**Delayed posttest score-maintenance.** Maintenance of achievement was
measured by dictating all the learned words to each student 2 weeks following
the administration of the weekly post-test and then at the end of every week
following the first delayed posttest. The number of words spelled correctly was
calculated by marking the student's paper for correct orthography in the same
manner as the weekly posttest. The number of words maintained were totalled.

**Generalization measure.** For a generalization measure, the students were
given a pre- and posttest before and after the intervention on the words they
learned during the intervention. These tests were administered at home by their
parents and at school by their teachers (the teachers administered only the pre-
test; see appendices D, E, F, G and H for letters to teachers and parents and samples of lists of words for the pre- and posttests). Then the students wrote sentences containing a sample of the words previously learned. Those number of words from the students individual list that had been learned previously and were now spelled correctly were totalled for each student. Also, the students wrote variations of a sample of the target words learned (e.g., perceive/perceiving; attain/attainment).

Social validity. Questionnaires on the social validity of the study were administered to the students, their classroom teachers and their parents after the 14th week of the intervention (see Appendices I, J, and K for samples). These measures were taken as an additional index of the effectiveness of the intervention. Through interviewing, the students responded to questions such as: (1) Did the self-correction method help you to improve your spelling?, (2) To what extent did the self-correction method help you to improve your spelling?, and (3) Would you like to use the self-correction method to help you study spelling on your own in future?

Their parents and teachers responded to the following questions in their questionnaires and returned them to the experimenter by mail: (1) Did you notice that (student's name) spelled more words correctly in his written work during the past weeks?, (2) Was there any change in (student's name) spelling performance?, (3) Did you notice any change in (student's name) attitude towards school work in general during the past weeks?, and (4) Did the student spell the words correctly he learned to spell in other subjects i.e., social science, science and written expression (story writing)?
Testing. The Test of Written Spelling-2 (Larsen & Hammill, 1986) was administered to determine pre- and posttest measures of spelling achievement using predictable and unpredictable word lists. Predictable words were those words that conformed to standard rules and generalizations. Unpredictable words were those that did not conform to rules. The Test of Written Spelling-2 (Larsen & Hammill, 1986) was selected because of its reliability and validity, and its procedural ease of experimentation.

Reliability is the consistency with which the test measures the spelling ability. The reliability coefficients for the predictable words, unpredictable words and the total exceeded .80 which is the acceptable reliable coefficients for tests. Validity of the test refers to the degree to which it measures what it is supposed to measure. The coefficients of the concurrent and construct validity of the Test of Written Spelling-2 were significant at beyond the .01 and .001 level of confidence respectively.

The pretest was administered one week before the data collection began, and the posttest was administered during the last week of the intervention. The tests were administered individually by the experimenter at the Heusman-Peters Psychoeducational Clinic.

To identify words that had not been learned by the students, a pretest was administered to each of them during the first week of the study using a standard spelling series (Houghton Mifflin Spelling Series). Also teachers and parents administered a pretest on the pool of words the students could not spell correctly at school and at home respectively. A similar test was repeated on each occasion that students received "new" words ensuring that the students were not able to
spell the words _a priori_. In short, the repetition of the assessment procedure increased the probability that only unlearned words were chosen, thereby reducing the probability of the words being known before the intervention began. Fifteen words were chosen to be learned each week.

**Procedures**

**Accuracy of Recording.** Accuracy of recording checks were conducted by a trained colleague each week by randomly scoring approximately 20% of the permanent products. The basis for accuracy was _The Random House Dictionary of the English Language_ (College Edition). Recorder training occurred in advance of data collection. The percent agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements multiplied by one hundred.

\[
\text{Agreements} \times 100 \over \text{Agreements} + \text{Disagreements}
\]

**Independent Variable**

Self-correction constituted the independent variable. The students learned how to use four proofreading marks which they needed to perform the self-correction activities (see appendix O for the proofreading marks). Specifically, after learning how to apply the proofreading marks to their spelling words, the students proofed and corrected each orthographic mistake they made. After correcting all the mistakes they made on a list, the students wrote the correct orthography of the spelling words at least two times using the self-correction activity sheets (see appendix N for a sample self-correction...
form) during each session. The students could write in either manuscript or cursive.

The words to be learned were selected based on each student's performance on the weekly pretest. During each visit to the clinic, the students were required to complete a 30-minute self-correction activity. That is, students first listened to their individual spelling words recorded on tapes using ear phones and wrote the words on the second column of their self-correction sheets. The first column which contained the words was usually folded back so that the students could not see the words as they listened and wrote them on the second column. Then they flipped back the first column to compare their spelling words with the model in the first column and made corrections using the four proofreading marks. Looking at the first and the second columns the correct sequence of letters was written in the third column. The process was then repeated either two or three times. A written spelling test on the words they worked on was administered by the experimenter at the end of every session.

Interobserver agreement was conducted on the independent variable by two colleagues who observed at least 20% of the intervention sessions randomly and independently. The purpose of the interobserver agreement on the independent variable was to ensure that the experimental procedure was implemented as intended (see appendix L for checklist).

Using an independent variability measure (a questionnaire, made up of closed-ended questions), the independent observers viewed at least 20% of the intervention sessions. The intervention was the self-correction spelling
activity which comprised of six steps carried out by the experimenter and the students. Specifically, the independent observers observed to see whether the experimenter set a timer at the beginning of the session (the session lasted for 30 minutes) and gave students their word lists. Also, the independent observers observed students to see whether they self-corrected their misspelled words and wrote their corrected words after the corrections were made, and whether the experimenter collected students' word lists to check on correct self-correction activity of the students.

Training Procedure for Students

The training procedure took place in the experimental setting prior to the intervention sessions. Three of the students were trained in a small group, the other three were trained individually. In all, three training sessions were needed. The first training session was used to teach the proofreading marks. Then during the second and third training sessions the students were taught the use of the self-correction sheets and were provided with opportunities for practice.

Overall, the training procedure followed the direct instruction format of model, lead, and test. The following five steps were used to teach the proofreading marks and the self-correction procedure to the students: (a) explanation of the proofreading marks and the self-correction procedure, (b) experimenter illustrated and modelled the various steps associated with the procedure, (c) student repeated the steps after the experimenter, (d) student practiced the entire procedure (Refer to appendix M for training script).
Explanation of the proofreading marks and the self-correction procedure. The experimenter prepared overhead transparencies showing the four proofreading marks and the self-correction activity form. Then, the experimenter introduced the four proofreading marks to the students, explaining what they are and when to use them. Using flashcards, the experimenter drilled the students on the use of the proofreading marks. The experimenter praised the students after every third correct response. After that, the experimenter explained the self-correction sheet pointing out the five columns and what was done with each column.

Illustration and modelling of various steps. With blank transparencies, the experimenter provided several examples of the types of spelling mistakes spellers are likely to make and the proofreading marks that could be used to correct the spelling mistakes. Then, the experimenter modelled the various steps of the self-correction procedure, that is listening to 10 words on a tape the experimenter wrote the words in the appropriate column making sure to write some of the words incorrectly. Then, using the proofreading marks, she corrected the mistakes in the words that were written incorrectly. She also rewrote the whole word correctly in the appropriate column, looking at the corrections made on each wrong word.

Students repeat steps after the experimenter. Taking the students step-by-step the students repeated each step of the self-correction procedure after the experimenter. That is, the students listened to words on tapes and wrote the words in the second column, with the first column flipped back to conceal the spelling words. Then, comparing their spelling words with those in the first
column, they self-corrected their mistakes and wrote the corrected words in the third column.

Students practice. Using a sample of words the students practiced the entire self-correction procedure for one session. After every self-correction activity the experimenter checked the students' work, making sure that the proofreading marks were used appropriately.

Daily Self-Correction Procedure.

The following procedural steps were followed during each Clinic visit.

1. The students were given a list of their words for the week.
2. The sheet on which the words were written contained five columns. Column 1 contained the written words. The columns A-1 (self-correct), A-2 (write it right), and B-1 (self-correct), B-2 (write it right) were blank.
3. Column 1 was folded back so that the students could not see the words written in that column.
4. The students listened to their individual words on tapes using ear phones and wrote the dictated words in column A-1.
5. Upon completion the students exposed column 1 and self-corrected each word by using the following proofreading marks.

   ^ = insert a letter—letter to be inserted written above
   o = to omit a letter—-the circled letters must be left out
   / = wrong letter (correct letter marked above it)
   ~ = reverse the two letters

6. Students placed a check mark in column A-1 for all words spelled correctly
on the first trial in column 1. After self-correction of all the words, each word was written correctly in column A-2 while looking at column A-1.

7. The experimenter checked for proper correction and also folded the paper back again in order for the students to write in column B-1.

8. Then the students listened to their words again while they wrote in column B-1. Afterward they self-corrected. If they correctly spelled a word they placed a check mark in column B-2.

The students listened to the words on tapes, and did the self-correction activities during the 30-minute session, three times in a week (see appendix N for self-correction activity form). When students spelled all 15 words correctly at least three consecutive times, during the three sessions in the week, criterion for the particular list of words was reached. Sessions for the students were not held on July 4th due to the Independence Day holiday.

Experimental Design

This study was conducted in a delayed multiple baseline fashion. A true delayed baseline cannot be claimed because the exigencies of data collection did not permit obtaining sequential baseline points in each of the successive tiers. Still two data points per tier were collected that provide assurance that the students’ performance was low (zero) during sessions when baseline data were not corrected.

The experimenter’s criterion referenced assessments served as pretest and baseline data respectively. Then as a steady state was achieved, the independent variable was applied to one of the students while baseline conditions remained in effect for the other students. When a change in performance and a
steady state was observed in the first subject, the independent variable was applied to the second subject, and so on. This design was chosen because it enabled the effect of the independent variable to be analyzed with the students without withdrawing the treatment variable (Cooper, Heron, & Heward, 1987).

Experimental control in the delayed multiple baseline design was demonstrated when the predictions in one subject's behavior was verified by the behavior of other students within the successive baseline (baseline 1) tiers. That is, when the treatment was applied to student 1 and change took place, the experimenter could verify the prediction of no changes in student 2's behavior until the treatment had been applied to him also. Meanwhile, the changes in student 1's behavior was replicated when the independent variable was applied to student 2, 3, 4, and so forth and changes took place respectively.
CHAPTER IV
RESULTS

This chapter presents the results of the self-correction intervention on the acquisition, maintenance and generalization of written spelling. First, interobserver agreement and accuracy results are described. Then, results of spelling words acquisition are presented, followed by the data on spelling words maintenance and generalization. Finally, the responses from the questionnaires administered to the students, their parents, and the teachers on the social validity of the independent variable are addressed.

Interobserver Agreement Accuracy

Dependent variable. As stated in Chapter 3, accuracy checks were conducted by an independent observer trained to score approximately 20% of the students' permanent products. The data indicate that of the 270 possible checks, agreements occurred 269 times, yielding an accuracy coefficient of 99.6%. For the delayed posttest, agreements occurred 178 of 180 times, yielding a coefficient of 98.8%. On the generalization measure, accuracy checks were conducted on approximately 20% of the target words administered by parents at home, and words in sentences, data yielded a perfect coefficient of 100%. Agreement occurred 180 of 180 times for the posttests by parents, and 100 of 100 times for the variation of target words and target words in sentences.
**Independent variable.** Interobserver agreement was conducted on the independent variable by an independent observer. As stated earlier, the purpose of the interobserver agreement on the independent variable was to ensure that the experimental procedure was implemented as intended. Using an independent variability measure (a questionnaire, made up of closed-ended questions), the independent observer viewed at least 20% of the intervention sessions. The intervention was the self-correction spelling activity which comprised the six steps carried out by the experimenter and the students.

A perfect coefficient of reliability that is 100% reliability, was obtained for the independent variable. That is, the data showed that when the experimenter employed the self-correction procedure, the independent observer recorded the procedural implementation of the requisite 6 steps 100% of the time.

**Acquisition Scores**

**Student 1.** After the 30-minute self-correction program, a posttest was administered to the students. Figure 2 shows acquisition data for student 1 across 10 word lists during all phases of the experiment, including maintenance checks. Baseline data across all tiers show that 0 words were spelled correctly. As stated earlier, when students spelled all 15 words correctly at least three consecutive times, during the three sessions in a week, criterion for the particular list of words was reached. During self-correction for list 1, student 1 mastered the 15 spelling words in three sessions. Posttest performance for
Figure 2. Number of target words spelled correctly on session tests. All baselines were zero for each word list.
Figure 2 continued)
list 1 ranged from 13 to 15. During the self-correction for list 2, she reached criterion by session 8, spelling all 15 words correctly twice during session 8. During the self-correction for list 3, the student correctly spelled all 15 words on two consecutive sessions, spelling all 15 words correctly twice during session 12. Posttest performance ranged from 14 to 15 for list 3. During self-correction for list 4, the student reached criterion on the practice words at session 15 and there was a range from 9 to 15 for the posttests.

During session 16, student 1 started working on her 5th list using the self-correction activity. She reached criterion at the end of session 18, spelling all 15 words correctly twice before the posttest. However, she scored 14 out of the 15 words on the posttest. Her posttest performance ranged from 1 to 15. During the self-correction for list 6, the student reached criterion by the end of session 21 with posttest performance ranging from 10 to 15.

For the self-correction for list 7, student 1 correctly spelled 14 words out of 15 on two consecutive posttests during sessions 23 and 24. She reached criterion during session 24. For list 8, the student reached criterion by the 27th session during the self-correction activity. The range for her posttest performance for list 8 was from 10 to 14. The self-correction for list 9 shows that student 1 reached criterion, spelling all the 15 words correctly during session 30 with a range from 9 to 15 for the posttest performance. During the self-correction for list 10 the student reached criterion at the beginning of session 33 and spelled all 15 words correctly on the posttest, achieving a posttest performance range from 8 to 15.
By the end of the study, student 1 had spelled correctly 146 words out of 150 words using the self-correction procedure of spelling instruction.

**Student 2.** Figure 3 shows acquisition data for student 2 across 10 word lists during all phases of the experiment including maintenance checks. Baseline data across all tiers show that 0 words were spelled correctly. During self-correction for list 1, student 2 mastered the 15 spelling words in three sessions, spelling all 15 words correctly twice during session 16. Posttest performance for list 1 ranged from 14 to 15. During the self-correction for list 2 the student reached criterion by session 19, again spelling all 15 words correctly twice during session 19 and his posttest performance ranged from 12 to 15. During the self-correction for list 3, the student correctly spelled all 15 words on two consecutive sessions.

Posttest performance ranged from 12 to 15 for list 3. During self-correction for list 4, the student reached criterion on the practice words at session 25, and there was a range from 13 to 15 for the posttests. During session 26, student 2 started working on his 5th list using the self-correction activity. He reached criterion during session 27, and scored all 15 words correct on the three posttests.

During the self-correction for list 6, student 2 reached criterion by the end of session 31 spelling all 15 words correctly twice, and his posttest performance ranged from 14 to 15. For the self-correction for list 7, student 2 correctly spelled all 15 words during session 34 achieving criterion. His posttest performance ranged from 13 to 15. For list 8, the student reached
Student 2

List 1

List 2

List 3

Figure 3. Number of target words spelled correctly on session tests. All baselines were zero for each word list.
Figure 3 (continued)

List 4

List 5

List 6

Number correct

Sessions

20  25  30  35  40  45  50
Figure 3 (continued)
criterion by the 36th session during the self-correction activity. He correctly spelled all 15 words for his posttests during the sessions he worked on list 8.

The self-correction for list 9 shows that student 2 reached criterion, spelling all the 15 words correctly during session 40 with a range from 12 to 15 for the posttest performance. During the self-correction for list 10, student 2 reached criterion at the beginning of session 43 and spelled all 15 words correctly on the posttest achieving a posttest performance range from 14 to 15. By the end of the study, student 2 had correctly spelled 150 words using the self-correction procedure.

**Student 3.** Figure 4 shows acquisition data for student 3 across 4 word lists during all phases of the experiment including maintenance checks. Baseline data across all tiers show that 0 words were spelled correctly. During self-correction for list 1, student 3 mastered the 15 spelling words in two sessions spelling all 15 words correctly twice during session 17. She achieved perfect scores for all the posttests. During the self-correction for list 2, the student reached criterion at the end of the 20th session, spelling all 15 words correctly twice during the session.

During the self-correction for list 3, the student correctly spelled all 15 words on three consecutive sessions. She achieved criterion during session 22. During self-correction for list 4, the student reached criterion during session 25. She again spelled all 15 words correctly on three consecutive sessions. By the end of the study, student 3 had spelled correctly 146 words out of 150 words using the self-correction procedure of spelling instruction.
Figure 4. Number of target words spelled correctly on session tests. All baselines were zero for each word list.
Student 3 had only four weeks of intervention since she abruptly stopped attending the spelling sessions. She had to travel out of town during the whole of the summer even though this was not the original plan for her. Therefore, she could work on only four lists of 15 words for each list starting the intervention during the 5th session. In all, she correctly spelled all the 60 target words using the self-correction procedure.

Student 4. Figure 5 shows acquisition data for student 4 across 6 word lists during all phases of the experiment including maintenance checks. Baseline data across all tiers show that 0 words were spelled correctly. During self-correction for list 1, student 4 mastered the 15 spelling words in three sessions, spelling all 15 words correctly twice during the session 21. Posttest performance for list 1 ranged from 9 to 15. During the self-correction for list 2 the student reached criterion by the end of session 24. During the self-correction for list 3, the student correctly spelled all 15 words and achieved criterion during session 27 spelling all 15 words correctly twice during session 27.

However, posttest performance ranged from 13 to 14 for list 3. During self-correction for list 4, the student reached criterion at session 31, and her posttest performance ranged from 4 to 15. During session 32, student 4 started working on her 5th list using the self-correction activity. She reached criterion at the end of session 35. Her posttest performance ranged from 4 to 15. During the self-correction for list 6, the student reached criterion by the end of session 38 with posttest performance ranging from 11 to 15.
Figure 5. Number of target words spelled correctly on session tests. All baselines were zero for each word list.
She used the self-correction procedure during four sessions for two of the word lists and not more than three sessions for the four remaining word lists. In all, student 4 spelled correctly 89 out of 90 target words using the self-correction procedure of spelling instruction.

**Student 5.** Figure 6 shows acquisition data for student 5 across 6 word lists during all phases of the experiment including maintenance checks. Baseline data across all tiers show that 0 words were spelled correctly. During self-correction for list 1, student 5 mastered the 15 spelling words in two sessions. She correctly spelled all 15 words on the posttests and practice tests during the three sessions that she worked on her first list of words. During the self-correction for list 2, the student reached criterion during session 10 spelling all 15 words correctly twice during the session. Her posttest performance ranged from 14 to 15. During the self-correction for list 3, student 5 correctly spelled all 15 words and achieved criterion during session 13. Posttest performance ranged from 13 to 14 for list 3.

During self-correction for list 4, the student reached criterion at session 16 spelling all 15 words correctly twice during session 16 and her posttest performance once again ranged from 14 to 15. During session 17, student 5 started working on her 5th list of words using the self-correction activity. She reached criterion at the end of session 19. Her posttest performance ranged from 10 to 15 for list 5. During the self-correction for list 6, the student reached criterion by the end of session 22, spelling all 15
Figure 6. Number of target words spelled correctly on session tests. All baselines were zero for each word list.
words correctly twice during session 44 with posttest performance ranging from 7 to 15.

Student 5 had a total of six weeks of intervention due to frequent absences from sessions. She used a minimum of three sessions to learn how to spell each word list. She spelled correctly all the 90 unlearned words using the self-correction procedure by the end of the six weeks.

**Student 6.** Figure 7 shows acquisition data for student 6 across 6 word lists during all phases of the experiment, including maintenance checks. Baseline data across all tiers show that 0 words were spelled correctly. During self-correction for list 1, student 6 mastered the 15 target words in three sessions spelling all 15 words correctly twice during session 9. Posttest performance for list 1 ranged from 10 to 15. During the self-correction for list 2, the student reached criterion by the end of session 12 spelling all 15 words correctly twice during the session. Her posttest performance ranged from 10 to 15. During the self-correction for list 3, student 6 reached criterion during session 15 and correctly spelled all 15 words on the posttest at the end of the session. Posttest performance for list 3 ranged from 8 to 15 words spelled correctly.

During self-correction for list 4, the student reached criterion at session 18 spelling all 15 words correctly twice during the session, and her posttest performance ranged from 14 to 15 words spelled correctly.
Figure 7. Number of target words spelled correctly on session tests. All baselines were zero for each word list.
During session 19, student 6 started working on her 5th list using the self-correction activity. She reached criterion at the end of session 21. Her posttest performance ranged from 10 to 15 words spelled correctly. During the self-correction for list 6, student 6 reached criterion by the end of session 24 spelling all 15 words correctly twice during the session. Her posttest performance ranged from 10 to 15 words spelled correctly.

Student 6 also had six weeks of intervention because she had to travel out of town with her parents on vacation and also had a few absences from sessions due to ill health. However, she managed to spell correctly 6 lists of words with each list made up of 15 words, using the self-correction procedure of spelling instruction. In all, she spelled correctly 89 out of 90 target words.

**Delayed Posttest Scores (Maintenance Scores)***

In order to ascertain that target words correctly spelled through the self-correction procedure were maintained, delayed posttests were administered on each word list. The first delayed posttest for any student was administered during the sixth session following the last posttest on each list during the intervention. Then at least two--and in some cases three--additional posttests were administered on each list at the end of every third session after the first delayed posttests. Figures 2 to 7 and Tables 2 to 8 show the delayed posttest scores for each student.

**Student 1.** Figure 2 and Table 2 show the maintenance data for student 1 for all the 10 word lists she spelled correctly using the self-correction procedure. After achieving criterion for the various word lists, three delayed
Table 2

*Spelling Words Maintained by Student 1*

<table>
<thead>
<tr>
<th>List</th>
<th># of words</th>
<th>Maintenance</th>
<th>Mean Maintenance</th>
<th>Percentage of words maint.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
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<td>15</td>
</tr>
<tr>
<td>3</td>
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<td>15</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly during session tests = 146

Total Number Maintained = 139

Total percentage Maintained = 95%
posttests were administered. The first was administered during session 12 after the last posttest on list 1. The second delayed posttest was administered during session 15, and the final delayed posttest was conducted during the session 18.

For list 2, the first delayed posttest was administered during session 15, the second delayed posttests during session 26, and the third during session 31. The first delayed posttest for list 3 was administered during session 18, the second during session 21, the third during session 24. Delayed posttests for lists 4 through 10 for student 1 followed the same pattern. That is, 6 sessions after the last posttest on a particular list, the first delayed posttest was administered. Then, the rest of the delayed posttests were administered during every third session after the first delayed posttest.

Student 1 was able to spell correctly at least 12 target words out of 15 for each word list, achieving a mean maintenance score of not less than 13.7 for all the words spelled correctly. Specifically, student 1 spelled correctly 146 words out of 150 using the self-correction procedure. Of the 146 words, student 1 maintained a total of 139 words. The student could therefore maintain at least 80% of the words on every list and 94.5% of the total number of words spelled correctly during the intervention.

Student 2. Figure 3 and Table 3 show the maintenance data for student 1 for all the 10 word lists he spelled correctly using the self-correction procedure. After achieving criterion for the various word lists, four delayed posttests were administered. The first one was administered during session 22 after the last posttest on list 1. The second delayed posttest was administered
Table 3

**Spelling Words Maintained by Student 2**

<table>
<thead>
<tr>
<th>List</th>
<th># of words</th>
<th>Maintenance</th>
<th>Mean Maintenance</th>
<th>Percentage of words maintd.</th>
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</thead>
<tbody>
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<td>15</td>
<td>15 15 15 15</td>
<td>15.0</td>
<td>100</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly During Session Tests = 150

Total Number Maintained = 144

Total percentage Maintained = 96
during session 25 and the third delayed posttest was conducted during session 28. The final delayed posttest was administered during session 31.

For list 2, the first delayed posttest was administered during session 25, the second delayed posttest during session 28, and the third during session 31, and the final delayed posttest was administered during session 34. The first delayed posttest for list 3 was administered during session 28, the second during session 31, the third during session 34, and the final delayed posttest was administered during session 37. Delayed posttests for lists 4 through 10 for student 2 followed the same pattern. That is, 6 sessions after the last posttest on a particular list, the first delayed posttest was administered. Then, the rest of the delayed posttests were administered during every third session after the first delayed posttest.

Student 2 was able to spell correctly at least 13 target words out of 15 for each word list, achieving a mean maintenance score of not less than 14.3 for all the words spelled correctly. Specifically, student 2 spelled correctly all the 150 words using the self-correction procedure. Of the 150 words, student 2 spelled correctly a total of 144 words. The student could therefore maintain at least 80% of the words on every list and 94.5% of the total number of words spelled correctly during the intervention.

Student 3. Figure 4 and Table 4 show the maintenance data for student 3 for all the 4 word lists she spelled correctly using the self-correction procedure. After achieving criterion for the various word lists, three delayed posttests were administered. The first one was administered during session 23 after the last posttest on list 1. The second delayed posttest was administered
during session 26 and the third delayed posttest was conducted during session 29.

For list 2, the first delayed posttest was administered during session 26, the second delayed posttests during session 29, and the third delayed posttest was administered during session 32. Delayed posttests on lists 3 and 4 were not administered due to student 3's sudden withdrawal from the study.

Student 3 was able to spell correctly at least 14 target words out of 15 for each word list, achieving a mean maintenance score of not less than 14.6 for all the words spelled correctly. Specifically, student 3 spelled correctly all the 60 words using the self-correction procedure. Of the 4 word lists, delayed posttests were administered on only two lists of 30 words due to her sudden withdrawal from the study. However, she correctly spelled a total of 29 out of the 30 words. This means that student 3 maintained 96% of the 30 words on which delayed posttests were administered.

Student 4. Figure 5 and Table 5 show the maintenance data for student 4 for all the 6 word lists she spelled correctly using the self-correction procedure. After achieving criterion for the various word lists, three delayed posttests were administered. The first one was administered during session 27 after the last posttest on list 1. The second delayed posttest was administered during session 30 and the final delayed posttest was conducted during session 33. For list 2, the first delayed posttest was administered during session 30, the second delayed posttest during session 33, and the third during session 36. The delayed posttests for lists 3 through 6 for student 4 followed the same pattern.
Table 4

Spelling Words Maintained by Student 3

<table>
<thead>
<tr>
<th>List</th>
<th># of Words</th>
<th>Maintenance</th>
<th>Mean Maintenance</th>
<th>Percentage of Words Maintd.</th>
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</thead>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly During Session Tests = 60
Total Number of Words Delayed Posttests Administered on = 30
Total Number of Words Maintained = 29
Total percentage Maintained = 96
Table 5

Spelling Words Maintained by Student 4

<table>
<thead>
<tr>
<th>List</th>
<th># of Words</th>
<th>Maintenance 1</th>
<th>Maintenance 2</th>
<th>Maintenance 3</th>
<th>Mean Maintenance</th>
<th>Percentage of Words Maintd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>14</td>
<td>13</td>
<td>15</td>
<td>1.4</td>
<td>93</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>15</td>
<td>12</td>
<td>13</td>
<td>1.3</td>
<td>86</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>14</td>
<td>14</td>
<td>15</td>
<td>1.4</td>
<td>93</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>12</td>
<td>15</td>
<td>14</td>
<td>1.36</td>
<td>90</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>13</td>
<td>12</td>
<td>14</td>
<td>1.3</td>
<td>86</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>1.4</td>
<td>93</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly During Session Tests = 89
Total Number of Maintained = 81
Total percentage Maintained = 91
That is, 6 sessions after the last posttest on a particular list, the first delayed posttest was administered. Then, the rest of the delayed posttests were administered during every third session after the first posttest. Student 4 was able to spell correctly at least 12 target words out of 15 for each word list, achieving a mean maintenance score of 13.6 for all the words spelled correctly.

Specifically, student 4 spelled correctly 89 words out of 90 using the self-correction procedure. Of the 89 words, student 4 spelled correctly a total of 81 words. The student could therefore maintain at least 80% of the words on every list and 91% of the total number of words spelled correctly during the intervention.

**Student 5.** Figure 6 and Table 6 show the maintenance data for student 5 for all the 6 word lists she spelled correctly using the self-correction procedure. After achieving criterion for the various word lists, four delayed posttests were administered. The first delayed posttest was administered during session 35 after the last posttest on list 1. The second delayed posttest on list 1 was administered during session 38 and the third delayed posttest was conducted during session 41. The final delayed posttest for list 1 was administered during session 44.

For list 2, the first delayed posttest was administered during session 38, the second delayed posttest during session 41, the third during session 44 and the final delayed posttest for list 2 for student 5 was administered during the 47th session. The delayed posttests for lists 3 through 6 for student 5 followed the same pattern. That is, 6 sessions after the last posttest on a particular list, the first delayed posttest was administered. Then, the rest of the delayed
Table 6

Spelling Words Maintained by Student 5

<table>
<thead>
<tr>
<th>List</th>
<th># of Words</th>
<th>Maintenance</th>
<th>Mean Maintenance</th>
<th>Percentage of Words Maintd.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>15</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>14</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>13</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>14</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>14</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly During Session Tests = 90

Total Number of Maintained = 87

Total Percentage Maintained = 97
Table 7

Spelling Words Maintained by Student 6

<table>
<thead>
<tr>
<th>List Maintained</th>
<th># of Words</th>
<th>Maintenance 1</th>
<th>Maintenance 2</th>
<th>Maintenance 3</th>
<th>Mean Maintenance</th>
<th>Percentage of Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
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<td>12</td>
<td>12</td>
<td>12</td>
<td>80</td>
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<td>15</td>
<td>13</td>
<td>12</td>
<td>13</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>13</td>
<td>14</td>
<td>12</td>
<td>13</td>
<td>86</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>15</td>
<td>12</td>
<td>14</td>
<td>13</td>
<td>86</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>13</td>
<td>14</td>
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<td>14</td>
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<td>15</td>
<td>14</td>
<td>15</td>
<td>13</td>
<td>14</td>
<td>93</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly During Session Tests = 89

Total Number Maintained = 78

Total Percentage Maintained = 88
Table 8

Spelling Words Maintained By All Students

<table>
<thead>
<tr>
<th>Students</th>
<th>Criterion</th>
<th>Mean Maint.</th>
<th>Total# Spelled Correctly During Session Tests</th>
<th>Total # Maint.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>139</td>
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<tr>
<td>2</td>
<td>15</td>
<td>14.4</td>
<td>150</td>
<td>144</td>
<td>96</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>14.6</td>
<td>60</td>
<td>58</td>
<td>96</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>13.6</td>
<td>89</td>
<td>81</td>
<td>91</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>14.6</td>
<td>90</td>
<td>87</td>
<td>96</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>13.0</td>
<td>89</td>
<td>78</td>
<td>87</td>
</tr>
</tbody>
</table>
posttests were administered during every third session after the first delayed posttest.

Student 5 was able to spell correctly at least 13 target words out of 15 for each word list, achieving a mean maintenance score of 14.6 for all the words spelled correctly. Specifically, student 5 spelled correctly all the 90 words using the self-correction procedure. The student therefore maintained at least 86% of the words on every list, and 96% of the total number of words spelled correctly during the intervention.

Student 6. Figure 7 and Table 7 show the maintenance data for student 6 for all the 6 word lists she spelled correctly using the self-correction procedure. After achieving criterion for the various word lists, three delayed posttests were administered. The first delayed posttest was administered during session 15 after the last posttest on list 1. The second delayed posttest on list 1 was administered during session 18 and the third delayed posttest was conducted during the session 21.

For list 2, the first delayed posttest was administered during session 18, the second delayed posttests during session 21, and the third during session 24. The delayed posttests for lists 3 through 6 for student 6 followed the same pattern. That is, 6 sessions after the last posttest on a particular list, the first delayed posttest was administered. Then, the rest of the delayed posttests were administered during every third session after the first posttest.

Student 6 was able to spell correctly at least 12 target words out of 15 for each word list, achieving a mean maintenance score of 14.6 for all the words spelled correctly. Specifically, student 6 spelled correctly 89 words using the
self-correction procedure. Of the 89 words spelled correctly, she maintained a total of 78 words. The student therefore maintained at least 80% of the words on each list and 87% of the total number of words spelled correctly during the intervention.

Table 8 summarizes the words maintained by all the students. In all, the students maintained at least 87% of the words they spelled correctly during the self-correction activity.

Generalization Measures

Three additional measures were taken to determine whether the students were able to spell the words they had previously spelled correctly during the self-correction program in other settings and situations. First, after the intervention, they were given a posttest by their parents in their homes. In this scenario, stimulus generalization is suggested if the students were not able to spell their unlearned words at home prior to the self-correction, but they were able to do so after the intervention.

Second, the students wrote whole sentences containing a sample of the target words they had spelled correctly at the clinic. Finally, they wrote variations of a sample of the correctly spelled words, for example "affectionate" for "affection", "receiving" for "receive". Generalization results on every student are shown below.

Posttests At Home

Student 1. Table 9 shows the data for the posttests administered to student 1 by her parents at home for all the word lists. After learning to spell list 1, student 1 was able to spell 14 of the words correctly at home. Of the 15
spelling words learned for lists 2 and 3 she was able to spell correctly all 15 and 12 words from list 2 and 3 respectively. For the rest of the word lists, the data indicate that student 1 was able to spell 7 out of 15 words learned correctly at home for list 5 and not less than 11 words for the other lists. In all, student 1 learned to spell 146 words. Of the 146 words she was able to spell 126 words, correctly at home.

**Student 2.** Table 10 shows the data for the posttests administered to student 2 by his parents at home for all the word lists. After learning to spell list 1 student 2 was able to spell 14 of the words correctly at home. Of the 15 spelling words learned for lists 2 and 3 she was able to correctly spell all 15 words for both lists. For the rest of the word lists, the data indicate that student 2 was able to spell all 15 words for the rest of the lists except lists 5 and 7, where he correctly spelled 14 words for each list at home. In all, student 2 learned to spell 150 words. Of the 150 words he was able to spell 147 words correctly at home.

**Student 3.** No generalization measures were taken for student 3 due to her sudden withdrawal from the study.

**Student 4.** Table 11 shows the data for the posttests administered to student 4 by her parents at home for all the word lists. After learning to spell list 1, student 4 was able to spell 12 of the words correctly at home. Of the 15 spelling words learned for lists 2 and 3 she was able to correctly spell 11 and
Table 9

Posttests At Home For Generalization Measure - Student 1

<table>
<thead>
<tr>
<th>List</th>
<th>Criterion</th>
<th>Generalization Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>15</td>
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<tr>
<td>3</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>15</td>
<td>14</td>
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<tr>
<td>9</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly = 146

Total Number Generalized = 126
<table>
<thead>
<tr>
<th>List</th>
<th>Criterion</th>
<th>Generalization Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
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<td>15</td>
<td>15</td>
</tr>
<tr>
<td>10</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly = 150
Total Number Generalized = 147
Table 11

Posttests At Home For Generalization Measure-Student 4

<table>
<thead>
<tr>
<th>List</th>
<th>Criterion</th>
<th>Generalization Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>14</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly = 89

Total Number Generalized = 73
Table 12

Posttests At Home For Generalization Measure-Student 5

<table>
<thead>
<tr>
<th>List</th>
<th>Criterion</th>
<th>Generalization Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
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<td>15</td>
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<td>15</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
<td>15</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly = 90

Total Number Generalized = 90
Table 13

Posttests At Home For Generalization Measure-Student 6

<table>
<thead>
<tr>
<th>List</th>
<th>Criterion</th>
<th>Generalization Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

Total Number Spelled Correctly=89

Total Number Generalized =79
12 words from list 2 and 3 respectively. For the rest of the word lists, the data indicate that student 4 was able to spell at least 12 out of 15 for them. In all, student 4 learned to spell 89 words. Of the 89 words she was able to spell 73 words correctly at home.

Student 5. Table 12 shows the data for the posttests administered to student 5 by her parents at home for all the word lists. After learning to spell list 1 student 5 was able to spell all the 15 of the words correctly at home. Of the 15 spelling words learned for lists 2 and 3 she was able to correctly spell all 15 words for both lists. For the rest of the word lists, the data indicate that student 5 was able to spell all 15 words for the rest of the lists at home. In all, student 5 learned to spell 90 words. Of the 90 words, she was able to spell all of them correctly at home.

Student 6. Table 13 shows the data for the posttests administered to student 6 by her parents at home for all the word lists. After learning to spell list 1, student 6 was able to spell 12 out of 15 words correctly at home. Of the 15 spelling words learned for lists 2 and 3 she was able to correctly spell all 15 and 13 for lists 2 and 3 respectively. For the rest of the word lists, the data indicate that student 6 was able to spell at least 13 out of 15 words for them at home. In all, student 6 learned to spell 89 words. Of the 89 words she was able to spell 79 at home.
**Words in Sentences**

Table 14 shows the data on whole sentences written by the students.

**Student 1.** Student 1 wrote a total of 40 sentences containing 40 of the target words she learned to spell during the intervention. The 40 sentences were made up of a total of 191 words. Of the 191 words, 15 target and non-target words were spelled incorrectly. Therefore, student 1 spelled 176 of the words correctly. However, the ratio of target words spelled correctly in sentences was 0.90. Of the 40 words she spelled correctly in isolation, she spelled 36 correctly in sentences (90%).

**Student 2.** Student 2 wrote a total of 40 sentences containing 40 of the target words he learned to spell using the self-correction procedure. The 40 sentences were made up of a total of 194 words. Of the 194 words, only 1 which was a target word was spelled incorrectly. Therefore, student 2 spelled 193 of the words correctly. He achieved 0.96 as the ratio of target words spelled correctly in sentences. In other words, he spelled 39 target words correctly in sentences out of the 40 he spelled correctly in isolation (98%).

**Student 3.** Due to the sudden withdrawal of Student 3 from the study, no generalization measures were taken on the words she spelled correctly.

**Student 4.** Student 4 wrote a total of 30 sentences containing 30 of the target words she spelled correctly using the self-correction procedure. The 30 sentences were made up of a total of 121 words. Of the 121 words, 10 which comprised of 1 target word and 9 non-target words were spelled incorrectly. Therefore, student 4 spelled 111 of the
Table 14

**Target Words in Sentences**

<table>
<thead>
<tr>
<th>Student</th>
<th>Total # of target wds</th>
<th>Total # of words in sentences</th>
<th>Total # of target wds spelled correctly</th>
<th>Total # of all words spelled correctly</th>
<th>Ratio of target words spelled correctly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>40</td>
<td>191</td>
<td>36</td>
<td>176</td>
<td>0.90</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>194</td>
<td>39</td>
<td>193</td>
<td>0.97</td>
</tr>
<tr>
<td>3</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>30</td>
<td>121</td>
<td>29</td>
<td>111</td>
<td>0.97</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>129</td>
<td>30</td>
<td>126</td>
<td>1.00</td>
</tr>
<tr>
<td>6</td>
<td>40</td>
<td>165</td>
<td>39</td>
<td>155</td>
<td>0.97</td>
</tr>
</tbody>
</table>

Total= 180  800  173  761  0.96

Mean= 36  160  34.6  152  0.96

Student 3 was not available for the target words in sentences.
words correctly. Her ratio of target words spelled correctly in sentences was 0.96. In other words, she spelled correctly 29 target words in sentences out of the 30 she spelled in isolation (97%).

**Student 5.** Student 5 wrote a total of 30 sentences containing 30 of the target words she learned to spell during the intervention. The 30 sentences were made up of 129 words. Of the 129 words, 3 which were not target words were misspelled. Therefore student 5 spelled 126 of the words correctly. Her ratio of target words spelled correctly in sentences was 1.00. This means that of the 30 words she learned to spell in isolation, she spelled all of them correctly in sentences (100%).

**Student 6.** Student 6 wrote a total of 40 sentences containing 40 of the target words she spelled correctly using the self-correction procedure. The 40 sentences were made up of 165 words. Of the 165 words, 10 which comprised of 1 target word and nine non-target words were misspelled. Therefore student 6 spelled 155 of the words correctly. However, her ratio of target words spelled correctly in sentences was 0.97. This means that of the 40 words she learned to spell in isolation, she could spell 39 of them correctly in sentences (98%).

Over all, the students wrote a total of 180 sentences made up of 800 words. Of the 800 words, there were 39 misspellings, meaning 761 of the words were spelled correctly. However, the 800 words contained 180 target words. Out of the 180 target words, 173 were spelled correctly, indicating a mean score of 34.6 words spelled correctly in all.
Variation of words

Student 1. Table 15 shows the data of all the students on the variations of the target words. The data indicate that student 1 wrote the variations of a sample of 30 target words. Out of the 30 variations of the target words, she spelled 22 of them correctly and misspelled 8 of the variations. Therefore, the ratio of the variation of words spelled correctly to the total number of variations was 0.73 for student 1 (73%).

Student 2. Table 15 shows the data of all the students on the variations of the target words. The data indicate that student 2 wrote the variations of a sample of 40 target words. Out of the 40 variations of the target words, he spelled 33 of them correctly and misspelled 7 of the variations. Therefore, the ratio of the variation of words spelled correctly to the total number of variations was 0.82 for student 2 (82%).

Student 3. As stated above, student 3 withdrew suddenly from the study, therefore no generalization measures were taken on the words she spelled correctly.

Student 4. The data indicate that student 4 wrote the variations of a sample of 30 target words. Out of the 30 variations of the target words, she spelled 24 of them correctly and misspelled 6 of the variations. Therefore, the ratio of the variation of words spelled correctly to the total number of variations was 0.8 for student 4 (80%).

Student 5. The data indicate that student 5 wrote a total of 30 variations of 30 target words. Of the 30 variations, she spelled 27 of them correctly and
Table 15

Variation of Target Words

<table>
<thead>
<tr>
<th>Student</th>
<th>Total # of target words</th>
<th>Total # of variations</th>
<th>Total # of misspelled variations</th>
<th>Total # of correctly spelled wds</th>
<th>Ratio of target wds spelled correctly to total # of variations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>30</td>
<td>8</td>
<td>22</td>
<td>0.73</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>40</td>
<td>7</td>
<td>33</td>
<td>0.82</td>
</tr>
<tr>
<td>3</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
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<td>30</td>
<td>6</td>
<td>24</td>
<td>0.80</td>
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<td>25</td>
<td>25</td>
<td>4</td>
<td>21</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Total= 155 155 28 127 0.82
Mean= 31 31 5.6 25.4 0.82

Student 3 was not available for the variation of words
misspelled 3 variations. Therefore, the ratio of the variation of words spelled correctly to the total number of variations was 0.9 for student 5 (90%)

**Student 6.** The data show that student 6 wrote a total of 25 variations of 25 target words. Of the 25 variations of target words, she spelled 21 of them correctly and misspelled 4 variations. Therefore, the ratio of the variation of words spelled correctly to the total number of variations was 0.84 for student 6 (84%).

In all, a total of 155 variations of target words were spelled by the students. Of the 155 words, the students spelled 127 correctly and misspelled 28 variations. Therefore, the students wrote an average of 31 variations of words. Of the 31 variations, 25.4 were spelled correctly and 5.6 were misspelled by the students.

Figure 8 sums up the data on the posttests administered at home by parents on the word lists. Apart from list 5 for student 1 which she spelled 7 of the words correctly, all the students were able to spell at least 11 of the words correctly at home. With the variation of words, Figure 9 indicate that each student was able to spell at least 6 of the variations out of 10 for each probe. Similarly, figure 10 sums up the data for the target words in sentences. The students spelled correctly at least 9 out of 10 of the target words in sentences.

**Pre- and posttest measures**

The *Test of Written Spelling-2* (Larsen & Harmint, 1986) was administered one week before data collection began, and the posttest was administered during the last week of the intervention. Due to the sudden
Note: Student 3 not available

Figure 8. Posttests administered by parents at home
Figure 9: Word variations spelled correctly by students.

Note: Student 9 not available.
Figure 10. Target words in sentences spelled correctly by students.

Note: Student 3 not available.

Number of target words in experimental generated sentences.
withdrawal of student 3, she had no posttest scores. With the remaining 5 students, four showed gains in their spelling over the 14 week period. Table 16 shows the summary of the results from the testing. Students 2 and 5 had the most gains increasing their pretest percentile rank from 21 and 34 respectively, to a posttest rank of 30 and 42 respectively.

Student 1 and 6 also gained from 6th and 22nd to 10th and 24th percentile respectively. However, student 4 did not make any gains in her spelling performance as indicated by the pre-test and posttest scores.

**Social Validity**

**Students' responses to questionnaire.** Table 17 summarizes the responses of the students to the questions read to them at the end of the study. All the students indicated that the procedure helped them to improve their spelling. While two of the students indicated that the method was extremely helpful, the remaining three students said it was very helpful. All of them also indicated they liked the method and they would like to use it on their own in future to help them learn their spelling words. When asked whether they could use the method on their own, all of them answered in the affirmative.

The students also revealed that they noticed improvement in other subjects such as science, social science and their story writing, and that the self-correction procedure was very helpful in other subjects. When asked to indicate the extent of the improvement they noticed in those subjects, two of them said it was extremely helpful and two others indicated it was very helpful. However, one revealed that it was just helpful. Finally, all of them indicated that it was helpful to the extent that they would use it in other subjects.
Table 16

Spelling percentile indicated by pre- and posttest results for each student.

<table>
<thead>
<tr>
<th>Test</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>S5</th>
<th>S6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(TWS-2, 1986)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
<td>6</td>
<td>21</td>
<td>17</td>
<td>21</td>
<td>34</td>
<td>22</td>
</tr>
<tr>
<td>Posttest</td>
<td>10</td>
<td>30</td>
<td>-</td>
<td>21</td>
<td>42</td>
<td>24</td>
</tr>
<tr>
<td>Gain</td>
<td>4</td>
<td>9</td>
<td>-</td>
<td>0</td>
<td>8</td>
<td>2</td>
</tr>
</tbody>
</table>

Student 3 was not available for the posttest.
# Table 17

**Student responses to questionnaire**

<table>
<thead>
<tr>
<th>Summary of Questions</th>
<th>Yes</th>
<th>No</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did self-correction help?</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2. Extent of help</td>
<td></td>
<td></td>
<td>3 2</td>
</tr>
<tr>
<td>3. Like self-correction</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4. Want to use self-correction on their own</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>5. Can they use it on their own</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6. Improvement in other subjects (e.g., story writing)</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>7. Extent of improvement</td>
<td>1 2 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Like to use self-correction in other subjects</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
Table 18

Parents responses to questionnaire.

<table>
<thead>
<tr>
<th>Summary of Questions</th>
<th>Yes</th>
<th>No</th>
<th>Maybe/Didn’t notice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Notice more words spelled correctly by child?</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2. Any change in child's spelling performance?</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3. Any change in attitude towards school work?</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4. Spelled correctly target words in other subjects (story writing)?</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Parents responses to questionnaire. Questionnaires were administered to the parents whose children took part in the study. Table 18 visually displays the responses given by the parents. When asked to indicate whether they noticed if their child spelled more words correctly in their written work, the parents indicated that they noticed or seemed to notice that their child's performance had improved after intervention. Specifically, three of the parents pointed out that they had noticed a change in their child's spelling performance while two indicated that maybe there was a change.

With respect to student attitude towards school work in general, four of the parents answered that they had noticed a change in their child's attitude. One parent said she did not notice a change, and explained that her child had positive attitude toward school all along. Finally, concerning whether the children could spell target words correctly in other subjects, three of the parents indicated that they had noticed their child spelled target words especially in their story writing. However, two of them said they did not notice.

Teachers' responses. Four teachers responded to the teachers questionnaire. As Table 19 shows, two of the teachers indicated they had noticed that their students spelled more words correctly during the study, one was not sure, and the last teacher indicated that she could have done better.

Concerning change in students' spelling performance one teacher said "maybe", but three of the teachers indicated that they did not notice
Table 19

Teachers' responses to questionnaire

<table>
<thead>
<tr>
<th>Summary of Questions</th>
<th>Yes</th>
<th>No</th>
<th>Maybe/Didn't notice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Notice more words spelled correctly by student?</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2. Any change in student's spelling performance?</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3. Any change in attitude towards school work?</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. Spelled correctly target words in other subjects (story writing)?</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
any change in their students' performance. However, while one teacher pointed out that she noticed a change in the students' attitude towards school work, another teacher said he did not notice any change, and two said maybe there was a change in the students' attitude toward school work in general.

Finally, two of the teachers indicated that they noticed their students spelled correctly the target words in other subjects such as written expression, but another teacher said he did not notice while the fourth teacher said maybe she did.
CHAPTER V
DISCUSSION

This chapter discusses the findings of the study in relation to the research questions and the relevant body of literature. The limitations of the study as well as implications for practitioners are provided. Finally, suggestions for future research are presented.

As stated earlier, this study examined the effect of a self-correction procedure on the spelling performance of elementary school students. The study attempted to determine whether self-correction would improve the performance of spelling in isolation (i.e., spelling single words) and spelling in context (spelling words in sentences). Also, the study examined whether self-correction affected the spelling of the word variations that students spelled correctly (e.g., attend/attendance).

Through empirical investigations, self-correction has been found to be an effective method of teaching spelling. In fact, it has been heralded as the most important single factor contributing to achievement in spelling (Allred, 1984; Christine & Hollingsworth, 1966; Ganschow, 1983; Horn, 1947; Schoephoerster, 1962; Wallace, Cohen, & Polloway, 1967). This means that students are able to spell words correctly after using the self-correction
procedure to learn how the words are spelled. The findings of this study confirmed the results of earlier studies, that children who correct their own spelling words learn to spell those words correctly (Ganschow, 1983; T. Horn, 1947; McNeish, 1985). Further, they are able to maintain at least 85% of the words spelled correctly, and also spell the words in other situations or contexts. Finally, the students, and their parents realized improvement in their spelling skill and the students indicated they preferred using the self-correction procedure to learn spelling as compared to the traditional approach of learning to spell.

Verification of Research Questions

Question one. Did a self-correction procedure on spelling assignments affect the accuracy of performance of elementary school students in spelling?

The effect of self-correction on the spelling performance of the six students who participated in the study was clearly demonstrated. While the students could not spell any of the words on the word lists correctly during baseline, each of the students spelled a minimum of 14 out of 15 words correctly on each word list on the end-of-session posttests.

Further, the self-correction procedure produced an immediate effect on students performance. For instance with student 1, posttest performance for list 1 ranged from 13 to 15. With list 2, she spelled all the 15 words correctly, and with list 3, the range of words spelled correctly was 14 to 15. This high performance profile was replicated for the rest of the students in the study. So on the average, each student learned to spell correctly at least 14
words each week. In all, the students learned to spell correctly a total average of 104 words over a period of four months.

Of all the research studies that used self-correction as the independent variable, only one study (McNeish, 1985) evaluated directly whether the words spelled correctly during the intervention were maintained over a period of time. Previous studies only examined the students' immediate responses in terms of the behavior change i.e., students' ability to spell target words on weekly posttests. Administering delayed posttests on the words spelled correctly by students to find out whether they would still be able to spell those words correctly was a further methodological enhancement to determine the effectiveness of the self-correction procedure.

In this present study, delayed posttests were administered as a maintenance measure of target words. As has already been indicated, all six students were able to maintain at least 85% of the words spelled correctly as a function of the intervention. These data confirm McNeish's (1985) results with respect to maintenance of words subsequent to self-correction intervention.

This author speculates that the opportunity to examine closely one's own written word with the aim of detecting mistakes made in spelling actually helped the students to learn the correct orthography of the target words. This was evident especially when the students just copied the correct spelling of the words, as compared to first detecting the types of mistakes they made, and then correcting those mistakes. Although not directly measured, it appeared that the students spent more time learning orthography when they merely copied the words, and spent less time when they tried to first identify the mistakes and
correct those mistakes. This observation confirms Hanna and Hanna's (1974) assertion that the use of a haptic approach—whereby a child writes a word several times until the fingers automatically produce the correct recording of the word—is not an effective way to learn how to spell. They described the haptic method and the use of mnemonic cues and associations as haphazard crutches that do not contribute much to the development of real spelling.

This author further speculates that students correcting their own mistakes made them more "comfortable" in learning how to spell the words. In effect, the self-correction activity was like a game in which the students had to compete with themselves. After each self-correction activity the students were determined to improve upon their own previous performance. The experimenter heard expressions like "Oh, this word beat me because I forgot to write the "e" after the "c". "I will never beat me again ever". "I am going to beat it next time". Therefore, with self-determination the students learned to spell their target words.

Student 1 had been identified as learning disabled and had problems with reversal of letters throughout the study. Student 6 had similar problems with reversals even though she had not yet been identified as learning disabled. She was a cancer patient in remission. In spite of the above problems, both students 1 and 6 were able to learn the correct spelling of their target words. However, in terms of the average number of words maintained by the students, students 1 and 6 maintained the least average number of their target words. One can deduce that their perceptual problems, coupled with their memory deficits for both auditory and visual stimuli (Bryan, 1974a; Hallahan & Kauffman 1982;
Torgeson & Goldman, 1977) might have interfered with acquisition and maintenance of the target words.

**Question 2. Did the self-correction have a differential effect on student spelling performance of words in isolation and words in context?** As discussed previously, the students were able to learn to spell correctly almost all the target words in isolation subsequent to the self-correction procedure. They were also able to maintain at least 85% of the words they spelled correctly on the delayed posttests. As a generalization measure, posttests on at least 20% of the target words in sentences were administered to each student. This measure was taken to ascertain that the students could still spell their target words in other situations or contexts.

Five students achieved a ratio of at least .96 target words spelled correctly per sentence. Student 1 achieved the least ratio of words spelled correctly per sentence, i.e., 90. Over all, the students spelled their target words in sentences with an average of 96% correct most of the time.

Apart from spelling most of the target words in context correctly, the students also were able to spell most of the other words in the sentences correctly. In effect, the students wrote a total average of 36 sentences made up of 160 words. Out of 160 words, the students spelled correctly an average of 152 words and incorrectly an average of 5.8 words. Even though it cannot be argued that the use of the self-correction procedure had a direct effect on the correct spelling of the other words in the sentences, the gained skill in orthography might have indirectly influenced the correct writing of the other words in the sentences. This confirms what the parents' and the teachers'
anecdotal reports about noticing an improvement in the students' other subjects, especially in written expression or story writing. It further confirms McNeish's (1985) study in which students were able to spell more self-correction words in their written work than words spelled correctly during the use of the traditional method of teaching spelling.

In summary, one can conclude that self-correction did not have differential effect on students' spelling performance of words in isolation and words in context since the students were able to spell most of the words in isolation and also in context. However, of the target words selected for the sentences, student 1 performed lower than she did on both the acquisition and maintenance scores. While the other students could spell at least 95% of the words in sentences correctly—with student 5 achieving a perfect score—student 1 could only spell 67% of the words. Students 1's perceptual and memory problems might have had a negative effect on her spelling performance on target words.

**Question 3. Did self-correction during spelling acquisition affect the students' ability to spell varied forms of words?** McNeish (1985) indicated that the performance of her students seemed to improve as the study progressed because the number of pretest words that needed to be administered each week increased. She speculated that students were learning to spell words "along the way" and were, perhaps generalizing skills learned to other similar words (i.e., if night is spelled n-i-g-h-t, then the students reasoned that bright must be spelled b-r-i-g-h-t).
The present study sought to verify McNeish's (1985) speculations empirically by actually administering posttests of the variations of target words. Approximately 20% of the target words spelled correctly by the students during the intervention were selected, and variations of the words administered as posttests for the students. This was to ensure that the use of self-correction affected the spelling of the variations of words students learned to spell correctly. If students were able to spell the variations of words, then it can be argued that response generality had taken place. As already stated, the students were able to spell correctly at least 73% of the variation of words. Specifically, five students spelled at least 80% of the words, with student 1 once again spelling the least percentage (i.e., 73%).

Therefore it can be stated that the present results confirmed McNeish's speculations in so far as that students were able to generalize the correct spelling of target words to words that were similar i.e., words that had the same roots. However, one can argue that since pretests were not administered on the variation of words to ensure that students could not spell already the words correctly before the self-correction activities, it cannot be firmly claimed that response generality took place.

Still, one can strongly argue that response generality took place since a counter argument could be raised that if students could spell the variations of the target words before the self-correction activities, then they should have been able to spell the actual words. Since two pretests were administered on target words and the students were not able to spell them correctly during the two pretests, chances are that they did not know the correct spelling of the
variation of the words. Therefore, the self-correction procedure had a pronounced effect on the correct spelling of the target words, and it generalized to the correct spelling of the variation of the words.

In sum, one can answer the third question by stating that the self-correction procedure during spelling acquisition affected the students' ability to spell varied forms of the target words. Moreover, the experimenter also noticed that more pretest words needed to be administered to locate the unlearned words for each word list. This led the experimenter to start pretesting on words that belonged to the next grade level, even though before the study the students' words were selected from a lower grade level. This means that they were able to learn to spell correctly words for their grade level, and further moved on to words for the next grade level in the spelling series.

Question 4. Did self-correction improve the students' overall spelling performance on pre- and post normative? As stated earlier, The Test of Written Spelling-2 (Larsen & Hammill, 1986) was administered to determine pre-and posttest measures of spelling achievement using predictable and unpredictable word lists. Whereas no posttest measures of spelling achievement was administered to student 3 due to her sudden withdrawal from the study, four of the students increased the percentile rank of their spelling achievement. They made gains of at least 2 percentile points over the period of the study. Student 2 and 5 made greater gains of 7 and 8 percentile respectively. It should also be noted that these students also performed better on the practice and posttests during the intervention.
Student 1 and 6 achieved the least gain, but it should be pointed out that these students had problems with letter reversals that interfered with their correct spelling throughout the study. Also, as pointed out earlier, student 1 had been identified as learning disabled, and she also suffered from cerebral palsy. Learning disabled students have been known to need much longer time to learn than normal students. They seem to be less able to maintain attention during instruction or to remember what they have learned (Gerber, 1984). It should also be noted that student 6 suffered from childhood cancer that was in remission during the period of the study.

Children with cancer have been found to have several characteristics that could cause problems in school performance i.e., memory loss, distractibility, perceptual disorders, and attention deficits most probably caused by radiation and/or chemotherapy. In a study investigating the special educational needs of students affected by childhood cancer, Heron and Orleansky (1989) reported that all of the 10 children who took part in the study exhibited problems with short-term and long-term memory, organizational skills, as well as deficits in selected academic areas, such as reading, spelling, and mathematics.

Despite the above mentioned learning problems, students 1 and 6 improved their overall spelling performance through the use of the self-correction procedure, even though the improvement was minimal. Student 4's score on the posttest remained the same as the pretest score. She did not improve her overall spelling performance as revealed on the pre-and post normative tests. Her classroom teacher indicated in her responses to the
teacher questionnaire, that even though she changed a little in her spelling performance, she did not improve as much as she should have. The teacher believed she could have done better, but she did not want to. It seems that student 4 had a relaxed attitude towards school work in general, and this had created some concern on the part of her teacher. Even though the self-correction did not improve student 4’s overall spelling performance on the pre- and post normative tests, it helped her to correctly spell her target words, and she maintained and even generalized those words in other settings and situations. Therefore, it can be concluded that even though generally, there were gains most of them were not substantial gains.

However, it must be remembered that standardized tests are not always sensitive to small gains made by students. Norm-referenced tests compare a student’s performance to that of a normative group, while criterion referenced tests emphasize an individual’s strengths and weaknesses. Therefore, the use of criterion referenced tests should be preferred for students with learning problems (McGoughlin & Lewis, 1986). Also, children with learning problems are known to present difficult diagnostic and assessment problems (Satler, 1982). These factors could have affected the students performance on the Test of Written Spelling-2.

In sum, four students showed improvement in terms of overall spelling performance as indicated by scores on the Test of Written Spelling-2 (Larsen & Hammill, 1986).
Question 5. Did the students prefer self-correction over other spelling procedures they have experienced in the past? Teachers of all the students who participated in the study indicated that before the intervention started, they used various spelling series for their spelling instruction. The spelling series usually emphasized the traditional method of teaching spelling. As earlier stated, spelling series generally use a linguistic approach that emphasize phonology, morphology and syntactic rules or word patterns (Hammill & Bartel, 1987).

The students were asked a series of questions at the end of the study on whether they liked the self-correction method of spelling. All the students indicated that they preferred self-correction over the traditional method their teachers had been using in the classroom. This preference might be due to the fact that with self-correction, students were in direct control of their learning. Also, they saw the progress they made as they used the self-correction. Finally, they believed the self-correction was fun because it gave them the opportunity to challenge themselves, i.e., learn and still have fun.

Three kinds of difficulties that children with learning problems experience when using the traditional spelling series are difficulty in reading directions, task variability, and the absence of individualized content (Haring, Lovitt, Eaton, Hansen, 1978). According to Haring et al. (1978) these inadequacies increase the students' dependence on their teachers to provide appropriate directions and instructions. Students usually end up being bored and frustrated. In the present study, the students preferred self-correction,
and they indicated they would use it on their own to learn the correct spelling of new words.

**Question 6. Did the students recognize a change in their spelling skill and did their teachers and parents also think so?** One of the techniques of determining whether a treatment package is valid or acceptable is the judgment of the clients, i.e., whether they see it as effective and appropriate. Apart from the clients, individuals who play major roles in the clients' life i.e., significant others such as parents, and teachers also have to determine the effectiveness of the treatment.

Questionnaires were administered to the students who took part in the study, their parents, and teachers to determine whether they recognized any positive changes in spelling performance after intervention. As stated earlier, responses from the students showed that they recognized a change in their spelling skill as a result of the self-correction intervention. The effectiveness of the self-correction procedure was demonstrated repeatedly as the students observed the positive effect the procedure had on their spelling skill. They could spell correctly, target words that they could not spell previously.

This confirms the results of earlier research that showed that self-correction was the most important single factor contributing to achievement in spelling (Allred, 1984; Cristine & Hollingsworth, 1962; McNeish, 1985; Wallace, Cohen, & Polloway, 1987). From the students' point of view, there was no question about the effectiveness of the self-correction procedure. Moreover, they enjoyed the self-correction activities.
Responses from the parents showed that they also recognized a change in the spelling skill of their child. Since the parents played a major role in the study, i.e., administering pre-tests and posttests on the target words to their child, it was not difficult for them to recognize the change that took place. The advantages of parental involvement in various aspect of children's education have been extensively researched and heavily documented in the literature (Heward, Dardig, & Rossett, 1979; Kroth, 1975; Kroth, Whelan, & Stables, 1970). When directed or briefed on the role they are to play, parents are effective in their contribution towards their child's educational achievement (Strenachy, McLoughlin, & Edge, 1979).

Direct involvement of parents gives them first-hand information on their child's academic progress, and it lessens the demand on teachers to keep parents informed about their children. The parents of the children in the present study not only recognized a change in their child's spelling skill, but also they noticed a change in their attitude towards school work in general. This change in attitude can be attributed to the fact that the children had several opportunities to respond during instruction and received immediate feedback on their spelling performance. Greenwood, Delquadri, and Hall (1984), define opportunity to respond as the interaction between teacher formulated instructional antecedent stimuli and their success in establishing the academic responding desired or implied by the materials.

Van Houten (1980) on the other hand, provides evidence that when students receive immediate, precise, and differential feedback on their responses, their performance improves. These two teaching procedures not only
improve academic performance, but also can improve the attitude of those who experience success with their school work. The student's self-concept and self-esteem as suggested by their verbal statements during and after the intervention seemed to be enhanced. Improved self-esteem and self-concept might be among the several collateral advantages of the self-correction procedure.

Finally, responses from the teachers indicated they did not notice any change in their students' spelling performance. While one teacher pointed out that she noticed a change in her student's attitude towards school work, another teacher said he did not notice any robust change in spelling. Still others were not sure whether there was a change in their students' attitude toward school work in general. The teachers' responses about lack of observed change might be attributed to the fact that they did not have the opportunity to observe their students throughout the total study as they had to break for the summer vacation. They were able to observe the students only during the first three to four weeks of the intervention.

Limitations of the study

This study was limited by the following factors: setting and times, subject characteristics, absences, withdrawal, time of school year.

Setting and times for the sessions. The study was conducted at the Huelzman-Peters Psychoeducational Clinic which offers remedial tutoring to students with problems in the academic skills. This meant that the students received the tutoring after regular school hours. While the setting itself was an ideal environment for tutoring, the late afternoon time slot was not very conducive, for conducting additional academic activity. Also, the children
attended only three times per week. Thus, there were long breaks between sessions which obviously affected task continuity.

Subject characteristics. The age range of the students was between seven and twelve years of age. Correspondingly, each child's spelling ability was on a different grade level, meaning that each lesson required unique preparation. Moreover, some of the children had other problems which tended to interfere with their spelling. For example, students 1 and 6 had problems with letter reversals, and student 3 exhibited behavior problems. It was beyond the scope of the present study to ascertain how these factors affected the results.

Absences. The students' attendance at the sessions depended on their parents' ability to transport them to the clinic. Two of the students had a number of absences and since the clinic sessions were not held every day, their absences might have further affected the continuity of the learning progress. Specifically, student 4's absences were due to the parents' inability to bring her consistently to the sessions, and student 6's absences were due to ill health (student 6 was a cancer patient on remission).

Withdrawal. The full effect of the self-correction method on student 3's spelling performance could not be determined since she withdrew from the study before generalization measures could be recorded.

Time of school year. The study began during the last 5 weeks of the spring quarter. This meant that teachers who were to be actively involved in the study (i.e., administering pre-tests for target words identification and posttests as a generalization measure and also, observing the students during other subjects) could not carry through with these tasks to the end of the study.
Length of study. For effective recording of maintenance and
generalization scores, the study was extended to 14 weeks instead of 10.
Students, especially student 1, showed signs of fatigue towards the end of the
study and this might have affected her performance.

Accent of experimenter. As stated earlier, the experimenter is an
international student from Ghana, West Africa and therefore speaks with a
foreign accent. The study results might have been more pronounced if students
heard instructions and the dictation of target words on tape from a native
speaker. Despite this limitation, the intervention produced an effect on the
spelling performance of the target words.

Implications for Practitioners

Self-correction has been found to be effective in helping students
acquire improved spelling skill. There are a number of implications that
practitioners can consider about self-correction. First, the procedure can be
used with large groups, small clusters, and individuals. Second, student
mastery is linked to specific words, not a passage of time. The self-correction
procedure enables the student to practice words until they are mastered, unlike
the traditional approach where regardless of the students performance with
former words, new sets of words are issued each week.

Third, with self-correction, students practice the correct spelling for a
word, i.e., the specific orthography for spelling the word, and not tasks that are
assumed to be related to correct spelling, for example visualizing the word,
writing words in alphabetical order, copying sentences that contain the word,
etc. Stated differently, direct instruction on specific words is provided during the self-correction procedure, improving the spelling performance of students.

Fourth, students receive immediate feedback with self-correction. Immediate, precise, and differential feedback on responses improves performance (Van Houten, 1980). Each of these essential components of feedback is incorporated in the self-correction procedure. Students correct their own spelling mistakes immediately, providing letters that are either omitted, substituted, or transposed, then they receive praise for correct spelling.

Fifth, self-correction is easy to use. It is a manageable and flexible spelling procedure that can be incorporated in any classroom. Moreover, it can be used in the context of a traditional approach. Students who need supplemental help with spelling can use the procedure. Sixth, self-correction can be combined with other subjects or skill areas or approaches, for example written expression. Also it can be combined with other spelling strategies such as self-questioning tactic (Wong, 1986), directed spelling tactic (Frank, 1987), cognitive-behavioral training (Gerber & Hall, 1989), strategy training (Graham & Freeman, 1986) or whole language approach (Norris, 1989).

Finally, self-correction can also be implemented in home-based programs where parents serve as monitors for spelling performance. Well-designed home-based education programs help students improve their academic performance (Heron & Harris, 1987; Heward, Dardig, & Rossett, 1979).

Another important programmatic implication is that students prefer self-correction to other spelling methods. The likelihood of students
experiencing success in academic tasks is increased when they engage in activities they enjoy (McNeish, 1985). It is therefore appropriate for practitioners to structure programs students like. Practitioners' efforts to motivate or maintain students' interests in tasks are greatly enhanced when students are engaged in tasks they enjoy. Finally, self-correction enables students to be responsible for their own work, giving the teacher time for coordinating, and monitoring implementation of the learning tasks. Also, the teacher is freed to attend to peculiar problems of individual students, resulting in an effective learning environment.

**Suggestion for Future Research**

A replication of the self-correction procedure can be used in other subject areas to enhance its' generality. First, samples of student essays, science and social science reports can be randomly collected and checked for correct spelling of target words and their variations. Second, apart from students writing the correct spelling of target words in sentences, they could be encouraged to form sentences and create stories with target words, still checking the correct orthography of the words and their variations. This would enable the students to further think about the target words as they use them in different contexts. Thus, as the students' written expression skills are enhanced, the generality of the self-correction procedure would be further determined.

The experimenter also recommends that a more structured observation instrument be devised for the teachers who will observe students for a generalization measure, in future research. Weekly checklists containing target words spelled correctly by students, could be prepared for teachers to use in
identifying target words used and spelled correctly by students. Using event recording, the frequency of the usage of the words in other subject areas such as science, social science, and written expression can be recorded.

The study should be replicated in the school setting to eliminate some of the limitations encountered in the clinic setting (i.e., students receiving tutoring after regular school hours, late afternoon time slot not very conducive for conducting additional academic activity, children attending only three times per week therefore having long breaks between sessions).

Another study using self-correction might focus on particular populations of students who are known to be poor spellers but who have presumably different causal problems. For example the study can compare the effect of self-correction on the spelling performance of students with visual perception problems, those with short-term memory, and those with reversals.

Also, apart from observing students, teachers can be encouraged to administer pre-tests for identification of target words, and posttests for maintenance and generalization scores. Active involvement of teachers in future research will enable them to easily notice the effect of the self-correction procedure on the students and thus enhance the procedure's social validity. Further, realizing the effectiveness of the self-correction, the teachers might want to use it with their students during their regular spelling classes.

**Summary**

The purpose of this study was to examine the effect of self-correction on the acquisition, maintenance, and generalization of written spelling of
elementary school students. Six students participated in the study which was conducted in a clinic setting.

Results indicated that self-correction had a functional effect on the correct spelling of target words for the students. When self-correction was introduced across word lists, student performance improved. The students were able to spell at least 93% of the target words using the self-correction procedure. Also, the students maintained approximately 80% of the target words spelled correctly. On the generalization measures, the students spelled at least 70% of the target words at home, at least 85% of the words in sentences and at least 73% of the variations of target words. In spite of other academic problems experienced by student 1 and 6 they were still able to benefit from the self-correction activities.

At the end of the study, questionnaires were administered to the students, their parents, and the teachers to determine the social validity of the self-correction procedure. All the students indicated that self-correction helped them to improve their spelling skill, and they preferred the procedure to the traditional method of spelling instruction. The parents of the children also indicated that they not only noticed improvement in their child's spelling performance, but also they noticed a positive change in their general attitude toward school. On the other hand, most of the teachers did not notice any change in the students' spelling performance or their attitude toward school work in general.
Accuracy of recording checks for the dependent variables were conducted by an independent observer trained to score approximately 20% of the students' permanent products. The data yielded an accuracy coefficient of 99.6%. For the delayed posttests, agreements yielded a coefficient of 98.8%. On the generalization measure, accuracy checks were conducted on approximately 20% of the target words administered by parents at home, words in sentences, and variation of target words. The data yielded a perfect coefficient of 100%.

For the independent variable, an independent observer viewed at least 20% of the intervention sessions using an independent variability measure (a questionnaire, made up of closed-ended questions). A perfect coefficient of reliability, that is 100% reliability, was obtained for the independent variable meaning that the six steps of the self-correction procedure were actually in effect when they were intended to be in effect.
REFERENCES


Horn, E. A. (1926). *Basic writing vocabulary: 10,000 most commonly used in writing.* Iowa City: University of Iowa.


Mihail, B. A. (1986). *An annotated bibliography of the literature dealing with the methods of teaching spelling in the elementary school*. Exit Project, Indiana University at South Bend.


APPENDIX A
EXPERIMENTAL SETTING
Experimental Setting
APPENDIX B

LETTER TO PARENTS ON THE STUDY
May 3, 1989,

Dear Mr. & Mrs. ..................

Thank you for agreeing to have your child participate in the spelling project. As we discussed earlier the purpose of the project is to employ a method of teaching spelling that has proven beneficial to children who need to improve upon their spelling skills. Instruction will be given on individual basis taking your child's needs into consideration. The evaluation of the instruction will require your child to spell words that will be presented to him at the Huelman-Peters Psychoeducational Clinic, in his classroom, at home, and also in other subject areas.

Sessions will be held three times per week for your child between 3.00 p.m and 6.00 p.m. Arrangements can be made if your child needs to be brought in earlier. Regular attendance of your child to the sessions is necessary in order for him to fully benefit from the project. If he is ill, please give me a call or leave a message at 292-8787. Again thank you for your participation and cooperation. Feel free to call me if you have any questions.

Sincerely,

Beatrice A. Okyere
Doctoral Candidate

cc. Dr. Timothy E. Heron
Professor
APPENDIX C

PARENTAL CONSENT FORM
Parent Consent Form for Child’s
Participation in Educational Research

I agree to allow my child to participate in a research study investigating a teaching method for spelling instruction. This research will be conducted in the Huelsmann-Peters Psychoeducational Clinic by Beatrice Okyere under the direction of Dr. Timothy Heron. I understand that the research will be carried out three times a week within the hours of 3:00 p.m. and 6:00 p.m., with each session lasting for one hour. The research will be conducted from April 24 to the end of summer quarter. I will do my best to have my child arrive on-time for each session.

I understand that my child’s identity will not be revealed to anyone not directly involved in conducting the research by means of publication, document, video tape, photograph, computer storage, or any other form of report developed from this research, unless I give specific written permission that he/she may be personally identified. Additionally, I understand that I may withdraw my consent for my child’s participation at any time.

__________________________
Name of child

__________________________   __________
Signature of Parent or Guardian  Date

__________________________
Beatrice Okyere, Doctoral Candidate

cc. Dr. Timothy E. Heron
APPENDIX D

LETTER TO TEACHERS ON PRETESTING
May 3, 1989

Dear Mrs. ..................

Thank you for the information you provided on ..................who is currently participating in a spelling project at the Huelsman-Peters Psychoeducational Clinic on The Ohio State University campus, and for your willingness to test her on words that she will work on during the project. Attached is a list of words. Please administer a spelling test on the words at your earliest convenience and send her results to me through her. Please use a "say the word, use the word in a sentence, say the word again" format. You need not score her work.

Once again thank you for your cooperation.

Sincerely,

Beatrice A. Okyere

Doctoral Candidate

cc: Dr. Timothy E. Heron, Professor

Mr. & Mrs. ........
APPENDIX E

LETTER TO PARENTS ON PRETESTING
May 3, 1989

Dear Mr. & Mrs. ................:

Attached is a list of words for ............. Please administer a spelling test on the words at your earliest convenience and send the results to me through him. Please use a "say the word, use the word in a sentence, say the word again" format. You need not score his work. Thank you for your cooperation.

Sincerely,

Beatrice A. Okyere

Doctoral Candidate
APPENDIX F

LETTER TO PARENTS ON POSTTESTING
July 17, 1989

Dear Mr. & Mrs. ...............:

Attached are two short lists of words for ............ Please administer a spelling test on the words at your earliest convenience and send the results to me through him.

Please use a "say the word, use the word in a sentence, say the word again" format. You need not score his work. Thank you for your cooperation.

Sincerely,

Beatrice A. Okyere

Doctoral Candidate

cc: Dr. Timothy E. Heron, Professor
APPENDIX G

SAMPLE OF LISTS OF WORDS FOR THE PRE-TESTING
| 1. left | He left the room crying | left |
| 2. gift | He had a book as a gift | gift |
| 3. chip | There was a pink chip on the floor | chip |
| 4. breath | He ate mint to help his breath | breath |
| 5. death | The president's death was announced | death |
| 6. heavy | His luggage was heavy | heavy |
| 7. frost | There was frost on my window | frost |
| 8. cloth | The dish cloth is dirty | cloth |
| 9. sneak | The kids will sneak into your house | sneak |
| 10. treat | Treat the boy kindly please | treat |
| 11. neighbor | Mr. Jones is my neighbor | neighbor |
| 12. weigh | I weigh one hundred pounds | weigh |
| 13. great | You did a great job on your test | great |
| 14. coach | John Cooper is O.S.U coach | coach |
| 15. roast | I like roast chicken | roast |
| 16. soap | Use the soap to clean your hand | soap |
| 17. fold | Fold the paper into two parts | fold |
| 18. colt | The horse is so young it is still a colt | colt |
| 19. bowl | Give me a bowl of soup, please | bowl |
| 20. blow | He gave him a big blow on his head | blow |
21. snow  There is snow on the ground
22. ghost  A ghost is in the haunted house
23. though  Though he tried very hard he was not successful
24. stream  Let's take a walk by the stream
25. string  He was playing with a string
26. street  We both live on the same street
27. strong  He is a strong man
28. spray  Spray the insect with raid
29. screen  She saw a picture on a movie screen
30. scream  I heard a scream from the house
31. throw  Throw the ball into the basket
32. thrill  He felt a thrill when his team won the game
33. throat  He cleared his throat in order to speak
34. spread  Spread the good news
35. straight  He drew a straight line
36. stone  He threw a stone in the window
37. bright  The lights in this room are very bright
38. fight  Did you get into a fight today?
39. child  She is a wonderful child
40. wild  The lion is a wild animal
41. island  I live on a small island
42. cloud  There was cloud in the sky
43. count  Count one to ten  count
44. club  He joined the wholesale club  club
45. plus  One plus one equals two  plus
46. trust  You can trust me  trust
47. front  The front yard was dirty  front
48. snake  That is a big snake  snake
49. trade  I will trade you my pop for your sandwiches  trade
50. note  Send me a note  note
51. smoke  I saw smoke coming out of the house  smoke
52. rule  She broke the school rule  rule
52. tray  Here is the tray to put his food on  tray
53. fail  Do not fail to show up  fail
54. paint  I have to paint my house  paint
55. found  I found the lost bag under the seat  found
56. round  He sat near the round table  round
57. sound  I heard a loud sound from the room  sound
58. crowd  The big crowd watched the game  crowd
59. double  I hit a double in the baseball game  double
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>mat</strong></td>
<td>Spread the mat on the floor</td>
</tr>
<tr>
<td>2.</td>
<td><strong>left</strong></td>
<td>He left the room crying</td>
</tr>
<tr>
<td>3.</td>
<td><strong>bit</strong></td>
<td>The dog bit the cat</td>
</tr>
<tr>
<td>4.</td>
<td><strong>chip</strong></td>
<td>There was a pink chip on the floor</td>
</tr>
<tr>
<td>5.</td>
<td><strong>breath</strong></td>
<td>He ate mint to help his breath</td>
</tr>
<tr>
<td>6.</td>
<td><strong>death</strong></td>
<td>The president's death was announced</td>
</tr>
<tr>
<td>7.</td>
<td><strong>frost</strong></td>
<td>There was frost on my window</td>
</tr>
<tr>
<td>8.</td>
<td><strong>pop</strong></td>
<td>He drank some pop in the living room</td>
</tr>
<tr>
<td>9.</td>
<td><strong>heavy</strong></td>
<td>His luggage was heavy</td>
</tr>
<tr>
<td>10.</td>
<td><strong>luck</strong></td>
<td>I wish you luck in your class</td>
</tr>
<tr>
<td>11.</td>
<td><strong>won</strong></td>
<td>He won the baseball game</td>
</tr>
<tr>
<td>12.</td>
<td><strong>snake</strong></td>
<td>That is a big snake</td>
</tr>
<tr>
<td>13.</td>
<td><strong>trade</strong></td>
<td>I will trade you my pop for your sandwich</td>
</tr>
<tr>
<td>14.</td>
<td><strong>smoke</strong></td>
<td>I saw smoke coming out of the house</td>
</tr>
<tr>
<td>15.</td>
<td><strong>hay</strong></td>
<td>He loves to play in the hay</td>
</tr>
<tr>
<td>16.</td>
<td><strong>tray</strong></td>
<td>Here is the tray to put his food on</td>
</tr>
<tr>
<td>17.</td>
<td><strong>chair</strong></td>
<td>The person is sitting in the chair</td>
</tr>
<tr>
<td>18.</td>
<td><strong>paint</strong></td>
<td>I have to paint my house</td>
</tr>
<tr>
<td>19.</td>
<td><strong>feel</strong></td>
<td>I feel sick</td>
</tr>
<tr>
<td>20.</td>
<td><strong>sneak</strong></td>
<td>The kids will sneak into your house</td>
</tr>
</tbody>
</table>
21. treat  I will love to have an ice cream treat  treat
22. neighbor  Mr. Jones is my neighbor  neighbor
23. weigh  I weigh one hundred pounds  weigh
24. great  You did a great job on your test  great
25. coach  John Cooper is O.S.U coach  coach
26. roast  I like roast chicken  roast
27. soap  Use the soap to clean your hands  soap
28. fold  Fold the paper into two parts  fold
29. sold  I sold three shirts yesterday  sold
30. bowl  Give me a bowl of soup, please  bowl
31. ghost  A ghost is in the haunted house  ghost
32. though  Though he tried very hard he was not successful  though
33. stream  Let's take a walk by the stream  stream
34. string  He was playing with a string in class  string
35. street  We both live on the same street  street
36. strength  He will use a lot of strength to lift the weight  strength
37. strong  He is a strong man  strong
38. spray  Spray the insect with raid  spray
39. screen  She saw a picture on a movie screen  screen
40. scream  I heard a scream from the house  scream
41. throw  Throw the ball into the basket  throw
42. thrill  He felt a thrill when his team
43. throat
   He cleared his throat in order to speak.

44. spread
   Spread the good news.

45. straight
   He drew a straight line.

46. stone
   He threw a stone in the window.

47. bright
   The lights in this room are very bright.

48. might
   I might go skating tomorrow.

49. tight
   His pants are too tight.

50. die
   That plant will die.

51. tie
   He wore a brown tie.

52. child
   She is a wonderful child.

53. wild
   The lion is a wild animal.

54. kind
   She is so kind.

55. mind
   You have a great mind.

56. island
   I live on a small island.

57. high
   The roller coaster took me up too high.

58. crowd
   The big crowd watch the Bingos win the game.

59. double
   I hit a double in the baseball game.

60. touch
   Please do not touch me on my sore.

61. young
   He is a very young man.
**STUDENT 3 - WORDS**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>rest</td>
<td>I will sit down and take a short rest</td>
</tr>
<tr>
<td>2.</td>
<td>breath</td>
<td>He ate mint to help his breath</td>
</tr>
<tr>
<td>3.</td>
<td>death</td>
<td>The President's death was announced</td>
</tr>
<tr>
<td>4.</td>
<td>cloth</td>
<td>The dish cloth is dirty</td>
</tr>
<tr>
<td>5.</td>
<td>plus</td>
<td>One plus one equals two</td>
</tr>
<tr>
<td>6.</td>
<td>son</td>
<td>He is the only son of his parents</td>
</tr>
<tr>
<td>7.</td>
<td>won</td>
<td>He won the baseball game</td>
</tr>
<tr>
<td>8.</td>
<td>none</td>
<td>None of the people was there</td>
</tr>
<tr>
<td>9.</td>
<td>rule</td>
<td>She broke the school rule</td>
</tr>
<tr>
<td>10.</td>
<td>hay</td>
<td>He loves to play in the hay</td>
</tr>
<tr>
<td>11.</td>
<td>fail</td>
<td>Do not fail to show up for class</td>
</tr>
<tr>
<td>12.</td>
<td>seem</td>
<td>It may seem like a long time to you</td>
</tr>
<tr>
<td>13.</td>
<td>real</td>
<td>This is a real apple</td>
</tr>
<tr>
<td>14.</td>
<td>sneak</td>
<td>The kids will sneak into your house</td>
</tr>
<tr>
<td>15.</td>
<td>neighbor</td>
<td>Mr. Jones is my neighbor</td>
</tr>
<tr>
<td>16.</td>
<td>weigh</td>
<td>I weigh one hundred pounds</td>
</tr>
<tr>
<td>17.</td>
<td>coach</td>
<td>John Cooper is O.S.U. football coach</td>
</tr>
<tr>
<td>18.</td>
<td>fold</td>
<td>Fold the paper into two parts</td>
</tr>
<tr>
<td>19.</td>
<td>sold</td>
<td>I sold three shirts yesterday</td>
</tr>
<tr>
<td>20.</td>
<td>colt</td>
<td>The horse is so young it is still a colt</td>
</tr>
<tr>
<td>21.</td>
<td>post</td>
<td>Please remember to post my letter</td>
</tr>
</tbody>
</table>
22. most She is the most beautiful girl I have ever seen most
23. ghost A ghost is in the haunted house ghost
24. though Though he tried very hard he was not successful though
25. stream Let's take a walk by the stream stream
26. string He was playing with a string in class string
27. strength He will use a lot of strength to lift the weight strength
28. strong He is a strong man strong
29. spray Spray the insect with raid spray
30. screen She saw a picture on a movie screen screen
31. scream I heard a scream from the house scream
32. throw Throw the ball into the basket throw
33. thrill He felt a thrill when his team won the game thrill
34. throat He cleared his throat in order to speak throat
35. spread Spread the good news spread
36. straight He drew a straight line straight
37. bright The lights in this room are very bright bright
38. fight Did you get into a fight today? fight
39. might I might go skating tomorrow might
40. sight The mountains are a beautiful sight to see sight
<table>
<thead>
<tr>
<th></th>
<th>Word</th>
<th>Sentence</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>tight</td>
<td>His pants are too tight</td>
</tr>
<tr>
<td>42</td>
<td>island</td>
<td>I live on a small island</td>
</tr>
<tr>
<td>43</td>
<td>crowd</td>
<td>The big crowd watch the Bingos win the game</td>
</tr>
<tr>
<td>1. bag</td>
<td>Please put my groceries in the bag</td>
<td>bag</td>
</tr>
<tr>
<td>2. ran</td>
<td>I ran all the way home</td>
<td>ran</td>
</tr>
<tr>
<td>3. bat</td>
<td>I saw a bat flying at night</td>
<td>bat</td>
</tr>
<tr>
<td>4. half</td>
<td>I will like half of your sandwich please</td>
<td>half</td>
</tr>
<tr>
<td>5. laugh</td>
<td>Why did you laugh at me</td>
<td>laugh</td>
</tr>
<tr>
<td>6. pet</td>
<td>I have a pet dog</td>
<td>pet</td>
</tr>
<tr>
<td>7. met</td>
<td>I met a very nice person at school today</td>
<td>met</td>
</tr>
<tr>
<td>8. leg</td>
<td>Did you hurt your leg?</td>
<td>leg</td>
</tr>
<tr>
<td>9. help</td>
<td>Please help me with my school work</td>
<td>help</td>
</tr>
<tr>
<td>10. any</td>
<td>Do you have any money?</td>
<td>any</td>
</tr>
<tr>
<td>11. said</td>
<td>He said that he will be here soon</td>
<td>said</td>
</tr>
<tr>
<td>12. head</td>
<td>He fell and hit his head</td>
<td>head</td>
</tr>
<tr>
<td>13. hen</td>
<td>The hen laid an egg</td>
<td>hen</td>
</tr>
<tr>
<td>14. hid</td>
<td>He hid behind the bushes</td>
<td>hid</td>
</tr>
<tr>
<td>15. sit</td>
<td>Please sit down now</td>
<td>sit</td>
</tr>
<tr>
<td>16. been</td>
<td>I have been to Cincinnati</td>
<td>been</td>
</tr>
<tr>
<td>17. job</td>
<td>My job is to take the trash out</td>
<td>job</td>
</tr>
<tr>
<td>18. top</td>
<td>I will put this on the top shelf</td>
<td>top</td>
</tr>
<tr>
<td>19. hop</td>
<td>Did you see the rabbit hop?</td>
<td>hop</td>
</tr>
<tr>
<td>20. got</td>
<td>I got a beautiful coat for my birthday</td>
<td>got</td>
</tr>
<tr>
<td>21. log</td>
<td>Did you see the log floating</td>
<td>log</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>22.</td>
<td>was</td>
<td>That was a great time we had at King's Island was</td>
</tr>
<tr>
<td>23.</td>
<td>want</td>
<td>I want to have a big party on my birthday want</td>
</tr>
<tr>
<td>24.</td>
<td>mud</td>
<td>I fell into the mud mud</td>
</tr>
<tr>
<td>25.</td>
<td>hug</td>
<td>Did you give your parents a hug? hug</td>
</tr>
<tr>
<td>26.</td>
<td>bun</td>
<td>Here is your hamburger bun bun</td>
</tr>
<tr>
<td>27.</td>
<td>Us</td>
<td>I will like us to sit down and talk us</td>
</tr>
<tr>
<td>28.</td>
<td>nut</td>
<td>I ate a cashew nut nut</td>
</tr>
<tr>
<td>29.</td>
<td>but</td>
<td>But you can't go out in the rain but</td>
</tr>
<tr>
<td>30.</td>
<td>rug</td>
<td>I will sit on a new rug rug</td>
</tr>
<tr>
<td>31.</td>
<td>does</td>
<td>Does your family have two cars? does</td>
</tr>
<tr>
<td>32.</td>
<td>sad</td>
<td>Why are you so sad? sad</td>
</tr>
<tr>
<td>33.</td>
<td>size</td>
<td>Is that the right size size</td>
</tr>
<tr>
<td>34.</td>
<td>nine</td>
<td>I am nine years old nine</td>
</tr>
<tr>
<td>35.</td>
<td>wise</td>
<td>My father is very wise wise</td>
</tr>
<tr>
<td>36.</td>
<td>give</td>
<td>Please give me the paper give</td>
</tr>
<tr>
<td>37.</td>
<td>cute</td>
<td>The girl is very cute cute</td>
</tr>
<tr>
<td>38.</td>
<td>use</td>
<td>Please use this pencil use</td>
</tr>
</tbody>
</table>
STUDENT 5 - WORDS

1. hang
   Hang the coat in the closet

2. smash
   Smash the flower vase

3. safe
   He is safe

4. sale
   The nice blouse is on sale

5. skate
   Can you skate?

6. maid
   She is a bar maid at the liquor store

7. saint
   Saint Anthony pray for us

8. steak
   Do you enjoy eating steak at Holiday Inn restaurant?

9. desk
   Put the book on the desk

10. fresh
    Eat fresh vegetables every day

11. kept
    He kept the money in his pocket

12. spent
    I spent the night at Dayton

13. greed
    Greed means strong desire for gain

14. cheap
    The shirt he bought at Sears was cheap

15. least
    The loaf of bread costs at least one dollar

16. tease
    Don't tease me, please

17. either
    Choose either of the two

18. receive
    I receive letters from home everyday
19. brick The house was built with brick brick
20. grip He had a firm grip on the baseball bat grip
21. pinch I need a pinch of salt pinch
22. block He lived on the next block block
23. stock J. C. Penny stores took stock of their goods stock
24. cross They will cross the bridge cross
25. broke The man broke his promise broke
26. wrote I wrote a letter to the president wrote
27. globe She showed him the map of India on the globe globe
28. crow Have you heard the rooster crow every night? crow
29. glow There was a bright glow from the lamp glow
30. bold She could confront the man because she was bold bold
31. bolt He locked the door with a bolt bolt
32. folk He is an old folk of the town folk
33. coast Mr. Jones traveled all over the west coast last year coast
34. goal Her goal in life was to become a teacher goal
35. weight  This is a heavy weight
36. creek  John caught a fish in the creek last saturday
37. led  The footprints led us right to the rabbit hole
38. lead  A pencil is made of lead
39. steel  Many knives are made of stainless steel
40. steal  The boys steal pens from the cupboard
41. wear  Wear this shirt, it looks nice on you
42. pear  Put an apple or pear in my lunch bag
43. pair  I lost my last pair of gloves
44. bare  He fought the lion with his bare hands
45. pail  A pail of salt water kept our fish fresh
46. pale  The dog was a pale shade of brown
47. trunk  We packed the trunk of the car with food for the picnic
48. useful  A long string is useful when you wrap packages
49. January  The first month of the year is January
### STUDENT 6---WORDS

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. again</td>
<td>It rained yesterday and it is raining again today again</td>
<td></td>
</tr>
<tr>
<td>2. already</td>
<td>He is already awake when the sun rises already</td>
<td></td>
</tr>
<tr>
<td>3. angry</td>
<td>John was mad at Rita, he was angry with her angry</td>
<td></td>
</tr>
<tr>
<td>4. any</td>
<td>I keep any stamp I get, I collect stamps any</td>
<td></td>
</tr>
<tr>
<td>5. anyone</td>
<td>Anyone can visit the zoo anyone</td>
<td></td>
</tr>
<tr>
<td>6. are</td>
<td>Alex and Jim are on the hockey team are</td>
<td></td>
</tr>
<tr>
<td>7. art</td>
<td>Painting, poems and music are all kinds of art art</td>
<td></td>
</tr>
<tr>
<td>8. ate</td>
<td>Chris ate a big supper last night ate</td>
<td></td>
</tr>
<tr>
<td>9. baby</td>
<td>A baby is a very young child baby</td>
<td></td>
</tr>
<tr>
<td>10. bad</td>
<td>Cold weather is bad for plants bad</td>
<td></td>
</tr>
<tr>
<td>11. bag</td>
<td>A bag is like a soft box bag</td>
<td></td>
</tr>
<tr>
<td>12. barn</td>
<td>A barn is a building used on farms barn</td>
<td></td>
</tr>
<tr>
<td>13. bat</td>
<td>A bat is a round piece of wood used to hit baseball bat</td>
<td></td>
</tr>
<tr>
<td>14. be</td>
<td>It is impossible to be in two places at the same time be</td>
<td></td>
</tr>
<tr>
<td>15. been</td>
<td>Nobody has been in two places at the same time been</td>
<td></td>
</tr>
<tr>
<td>16. believe</td>
<td>Do you believe in dragons believe</td>
<td></td>
</tr>
<tr>
<td>17. big</td>
<td>Big is the opposite of small big</td>
<td></td>
</tr>
<tr>
<td>18. blue</td>
<td>The sky is blue when no clouds cover it blue</td>
<td></td>
</tr>
<tr>
<td>19. bring</td>
<td>Bring Carol's present to her bring</td>
<td></td>
</tr>
<tr>
<td>20. brother</td>
<td>A boy is a brother to the other children</td>
<td></td>
</tr>
</tbody>
</table>
21. bus  We travel in a bus at times  brother
22. can  Can I borrow your pencil for tonight?  can
23. cannot  A dog cannot fly  cannot
24. carry  Cindy and Meg carry their lunches in brown bags  carry
25. cat  A cat is a small animal with soft fur  cat
26. coat  A coat is long and heavy jacket  coat
27. come  Did he come as he promised?  come
28. crack  After the earthquake the sidewalk had a crack  crack
29. cry  Babies cry when they are hungry  cry
30. cute  That kitten is pretty, it is cute  cute
31. dish  A dish is flat and usually round  dish
32. does  Our dog does not eat potatoes  does
33. each  Nancy picked each berry  each
34. easy  The test was easy for Jill  easy
35. eight  Eight is a number  eight
36. electric  Anything that uses electricity is electric  electric
37. eye  An eye is a part of the head that helps you see  eye
38. fall  Fall is the season that follows summer  fall
39. far  Far is the opposite of near  far
40. father  A father is a man with children  father
41. fell  An apple fell from the tree  fell
42. first  The letter A is the first letter of the alphabet  first
43. fit  The shirts fit him so well  fit
44. float  Boats float on top of the water  float
45. fork  A fork is a kind of tool to eat with  fork
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>46. gave</td>
<td>I gave Peter a book last week</td>
<td>gave</td>
</tr>
<tr>
<td>47. give</td>
<td>Can you give me a piece of paper</td>
<td>give</td>
</tr>
<tr>
<td>48. hand</td>
<td>A hand is the part of the body at the end of the arm</td>
<td>hand</td>
</tr>
<tr>
<td>49. happy</td>
<td>Were you happy at the party?</td>
<td>happy</td>
</tr>
<tr>
<td>50. mail</td>
<td>We use the mail to send letters</td>
<td>mail</td>
</tr>
</tbody>
</table>
APPENDIX H

SAMPLE OF LISTS OF WORDS FOR THE POSTTESTS
STUDENT 1--Lists 7 & 8

1. inspire  
The choir sings hymns that inspire the congregation

2. indirect  
The senator gave an indirect answer to the question

3. furious  
There was a furious fight between the two dogs

4. frighten  
Why did you frighten that child?

5. foreign  
I come from a foreign country

6. extreme  
She suffered from the extreme cold

7. xylophone  
He plays his xylophone all night

8. yardage  
The yardage John gained helped in the final touchdown

9. wilderness  
A wild place that is not lived in by people is a wilderness

10. whipped  
He was whipped for stealing from the school

11. weave  
Did you weave the strawberry basket yourself

12. wasp  
A wasp can give a painful sting

13. visit  
When will you visit your parents?

14. vacation  
Are you going on vacation this summer?
15. tornado
Everybody took cover when the
tornado struck
tornado

LIST 8

1. throughout
We travelled throughout the
country
throughout

2. suitable
These clothes are suitable for
the occasion
suitable

3. surgeon
A surgeon is a doctor who
performs operations
surgeon

4. suffer
Did you suffer from the
extreme heat?
suffer

5. soccer
Do you play soccer every Saturday?
soccer

6. shortage
The drought caused a shortage
of food
shortage

7. sensitive
She is a very sensitive person
sensitive

8. savage
Did you hear the savage roar of a lion
at the zoo?
savage

9. scowl
To scowl is to frown at something
scowl

10. ruin
The flood caused the ruin of all
the houses
ruin

11. regular
The regular price for the boots
is $20
regular
12. remarkable

   This book is remarkable

13. prowl

   City cats prowl through the alleys

14. noisy

   There was a noisy crowd on High Street

15. mixture

   A mixture of sleet and rain fell last night
### 2nd-5th List

1. **tease**
   - Don't tease me, please

2. **either**
   - Choose either of the two

3. **receive**
   - I receive letters from home everyday

4. **chose**
   - He chose the red jacket

5. **block**
   - He lived on the next block

6. **stock**
   - J. C. Penny stores took stock of their goods

7. **host**
   - Mr. Green was the host

8. **coast**
   - Mr. Jones travelled all over the west coast last year

9. **goal**
   - Her goal in life was to become a teacher

10. **weight**
    - This is a heavy weight

11. **wait**
    - Wait for your turn please

12. **beet**
    - Sal was as red as a beet

13. **lead**
    - A pencil is made of lead

14. **pair**
    - I lost my last pair of gloves

15. **pear**
    - Put an apple or pear in my lunch bag

### 6th List

1. **volleyball**
   - Eric plays volleyball at the pool

2. **penny**
   - He finds penny at the bottom of the pool

3. **explore**
   - Did you explore the bottom of the pool?

4. **bottom**
   - Eric explores the bottom of the pool

5. **try**
   - Try to eat all your food
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. because</td>
<td>Eric likes the pool because it keeps him cool</td>
<td>because</td>
</tr>
<tr>
<td>7. keep</td>
<td>Does the pool keep you cool?</td>
<td>keep</td>
</tr>
<tr>
<td>8. vapor</td>
<td>Fog is made of water vapor</td>
<td>vapor</td>
</tr>
<tr>
<td>9. vacant</td>
<td>The seats in the theater were vacant</td>
<td>vacant</td>
</tr>
<tr>
<td>10. tunnel</td>
<td>A tunnel is a long underground passage</td>
<td>tunnel</td>
</tr>
<tr>
<td>11. suggest</td>
<td>Suggest a plan for our trip</td>
<td>suggest</td>
</tr>
<tr>
<td>12. stalk</td>
<td>A stalk is the main stem of a plant</td>
<td>stalk</td>
</tr>
<tr>
<td>13. slept</td>
<td>I slept until noon</td>
<td>slept</td>
</tr>
<tr>
<td>14. slope</td>
<td>The hills slope down to the edge of the river</td>
<td>slope</td>
</tr>
<tr>
<td>15. slight</td>
<td>We will have a slight change in temperature</td>
<td>slight</td>
</tr>
</tbody>
</table>
1. pop
   He drank some pop in the living room
   pop

2. sock
   He was wearing only one sock
   sock

3. frost
   He was frost bitten in the snow
   frost

4. cloth
   The dish cloth is dirty
   cloth

5. cost
   The soda cost him 50 cents
   cost

6. soft
   I enjoy eating soft bread
   soft

7. club
   He joined the wholesale club
   club

8. luck
   I wish you luck in your class
   luck

9. plus
   One plus one equals two
   plus

10. trust
    You can trust me
    trust

11. son
    He is the only son of his parents
    son

12. won
    He won the baseball game
    won

13. front
    The front yard was dirty
    front

14. same
    It was the same person
    same

15. snake
    That is a big snake
    snake

List 4

1. trade
   I will trade you my pop for your
   sandwich
   trade

2. smoke
   I saw smoke coming out of the house
   smoke

3. hay
   He loves to play in the hay
   hay
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td>chair</td>
<td>The person is sitting in the chair</td>
</tr>
<tr>
<td>5.</td>
<td>paint</td>
<td>I have to paint my house</td>
</tr>
<tr>
<td>6.</td>
<td>feel</td>
<td>I feel sick</td>
</tr>
<tr>
<td>7.</td>
<td>sneak</td>
<td>The kids will sneak into your house</td>
</tr>
<tr>
<td>8.</td>
<td>treat</td>
<td>I will love to have an ice cream treat</td>
</tr>
<tr>
<td>9.</td>
<td>neighbor</td>
<td>Mr. Jones is my neighbor</td>
</tr>
<tr>
<td>10.</td>
<td>weigh</td>
<td>I weigh one hundred pounds</td>
</tr>
<tr>
<td>11.</td>
<td>great</td>
<td>You did a great job on your test</td>
</tr>
<tr>
<td>12.</td>
<td>coach</td>
<td>John Cooper is O.S.U coach</td>
</tr>
<tr>
<td>13.</td>
<td>roast</td>
<td>I like roast chicken</td>
</tr>
<tr>
<td>14.</td>
<td>soap</td>
<td>Use the soap to clean your hands</td>
</tr>
<tr>
<td>15.</td>
<td>fold</td>
<td>Fold the paper into two parts</td>
</tr>
</tbody>
</table>
STUDENT 5--List 3 & 4

1. youth
   The early time of life before one becomes an adult is youth
   youth

2. yell
   The spectators yell anytime the team scores
   yell

3. yarn
   My skirt is woven from hand-spun yarn
   yarn

4. yank
   The bell rings when I yank the rope
   yank

5. wrap
   Can you wrap the parcel for me, please?
   wrap

6. work
   Did you work yesterday?
   work

7. wave
   The flags wave in the breeze
   wave

8. unusual
   It is unusual for Renee not to eat
   unusual

9. unlike
   The two people are unlike in many ways
   unlike

10. sudden
    There was a sudden rain
    sudden

11. straw
    May I have a straw for my drink?
    straw

12. stamp
    Please put a stamp on my letter before mailing
    stamp

13. squeeze
    Squeeze an orange to get the juice out
    squeeze

14. quite
    I'm not quite finished
    quite

15. quick
    Come quick, we can't wait any longer
    quick
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>The first month of the year is January</th>
<th>January</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>January</td>
<td>bare</td>
<td>bare</td>
</tr>
<tr>
<td>2.</td>
<td>bare</td>
<td>Trees that are bare have lost their leaves</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>pair</td>
<td>I lost my last pair of gloves</td>
<td>pair</td>
</tr>
<tr>
<td>4.</td>
<td>meet</td>
<td>We meet every evening for practice</td>
<td>meet</td>
</tr>
<tr>
<td>5.</td>
<td>wear</td>
<td>Wear this shirt, it looks nice</td>
<td>wear</td>
</tr>
<tr>
<td>6.</td>
<td>beet</td>
<td>Sal was as red as a beet</td>
<td>beet</td>
</tr>
<tr>
<td>7.</td>
<td>steel</td>
<td>Many knives are made of stainless steel</td>
<td>steel</td>
</tr>
<tr>
<td>8.</td>
<td>steal</td>
<td>They steal cars from people's houses</td>
<td>steal</td>
</tr>
<tr>
<td>9.</td>
<td>led</td>
<td>The footprints led us right to the rabbit hole</td>
<td>led</td>
</tr>
<tr>
<td>10.</td>
<td>lift</td>
<td>Lift the lid off the cooking pot</td>
<td>lift</td>
</tr>
<tr>
<td>11.</td>
<td>receive</td>
<td>I receive letters everyday</td>
<td>receive</td>
</tr>
<tr>
<td>12.</td>
<td>either</td>
<td>Choose either of the two</td>
<td>either</td>
</tr>
<tr>
<td>13.</td>
<td>cheap</td>
<td>The sweater he bought was cheap</td>
<td>cheap</td>
</tr>
<tr>
<td>14.</td>
<td>spent</td>
<td>I spent the night at Dayton</td>
<td>spent</td>
</tr>
<tr>
<td>15.</td>
<td>kept</td>
<td>He kept the money in his pocket</td>
<td>kept</td>
</tr>
</tbody>
</table>
STUDENT 6--List 5

1. breath  He ate mint to help his breath  
2. stock  J.C. Penny took stock of their goods  
3. block  He lived on the next block  
4. pinch  He let out a cry as a result of the pinch  
5. wind  The wind blew strongly last night  
6. grip  Grip his hand to prevent him from running away  
7. brick  The house was built with brick  
8. receive  I receive letters everyday  
9. either  Choose either of the two  
10. tease  Don't tease me please  
11. reach  I can't reach that high  
12. peach  The peach tasted very sweet  
13. least  This blouse costs at least $5.00  
14. feast  He provided a feast for us last night  
15. east  I live in the east side of Columbus

List 6

1. cream  I like cream in my coffee drink  
2. cheap  The sweater he bought was cheap  
3. sweet  Candies are sweet
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>4. speed</td>
<td>The car moved at top speed</td>
<td>speed</td>
<td></td>
</tr>
<tr>
<td>5. need</td>
<td>I need five dollars to buy a blouse</td>
<td>need</td>
<td></td>
</tr>
<tr>
<td>6. greed</td>
<td>His greed for food can't be satisfied</td>
<td>greed</td>
<td></td>
</tr>
<tr>
<td>7. spent</td>
<td>I spent the night at Dayton</td>
<td>spent</td>
<td></td>
</tr>
<tr>
<td>8. kept</td>
<td>He kept the money in his pocket</td>
<td>kept</td>
<td></td>
</tr>
<tr>
<td>9. desk</td>
<td>Put the book on the desk</td>
<td>desk</td>
<td></td>
</tr>
<tr>
<td>10. steak</td>
<td>Do you enjoy eating steak?</td>
<td>steak</td>
<td></td>
</tr>
<tr>
<td>11. pray</td>
<td>Pray to God everyday</td>
<td>pray</td>
<td></td>
</tr>
<tr>
<td>12. clay</td>
<td>The tower vase was made of clay</td>
<td>clay</td>
<td></td>
</tr>
<tr>
<td>13. saint</td>
<td>Saint Matthew is in the Bible</td>
<td>saint</td>
<td></td>
</tr>
<tr>
<td>14. maid</td>
<td>She is a bar maid at the restaurant</td>
<td>maid</td>
<td></td>
</tr>
<tr>
<td>15. jail</td>
<td>He was put in jail for stealing</td>
<td>jail</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX I

QUESTIONNAIRE FOR TEACHERS
QUESTIONNAIRE FOR TEACHERS

DIRECTIONS: Please circle the answer that best agrees with your opinion for each question below.

1. Did you notice that (Student's name) spelled more words correctly in his written work in class during the past 16 weeks?

   Yes  No  Maybe/Didn't notice

   Comments_____________________________________________________

   _______________________________________________________________

2. Was there any change in (Student's name) spelling performance?

   Yes  No  Maybe/Didn't notice

   Comments_____________________________________________________

   _______________________________________________________________
3. Did you notice any change in (Student's name) attitude towards school work in general during the past 20 weeks?

Yes  No  Maybe/Didn't notice

Comments

4. Did the student spell the words he learned to spell correctly in other subjects i.e., social science, science and written expression (story writing)?

Yes  No

Comments
APPENDIX J

QUESTIONNAIRE FOR STUDENTS
QUESTIONNAIRE FOR STUDENTS

Verbal Directions. “When I read the questions to you, answer as best as you can.”

1. Did the self-correction method help you to improve your spelling?

   Yes      No

2. To what extent did the self-correction method help you to improve your spelling?

   1       2       3       4       5
   not     somewhat helpful very Extremely
   helpful helpful helpful helpful

3. Do you like the self-correction method of spelling? (circle one)

   Yes      No
4. Would you like to use the self-correction method to help you study spelling on your own in future?

   Yes               No

5. If the answer for question 4 is yes, can you use the self-correction method on your own?

   Yes               No

6. During your visit here and the exercises in self-correction did you notice any improvement in other subjects such as science, social science and written expression (story writing)?

   Yes               No

7. To what extent was the self-correction procedure helpful in other subjects?

    1       2       3       4       5
    not    somewhat helpful very Extremely
    helpful helpful helpful helpful
8. Would you like to use the self-correction method in other subjects such as science, social science etc.?

Yes  No
APPENDIX K

QUESTIONNAIRE FOR PARENTS
DIRECTIONS: Please circle the answer that best agrees with your opinion for each question below.

1. Did you notice that (Student's name) spelled more words correctly in his written work during the past 16 weeks?

   Yes    No    Maybe/Didn't notice

   Comments

   Comments

2. Was there any change in (Student's name) spelling performance?

   Yes    No    Maybe/Didn't notice

   Comments

   Comments

3. Did you notice any change in (Student's name) attitude towards school work
in general during the past 16 weeks?

Yes        No        Maybe/Didn't notice

Comments________________________________________________________

________________________________________________________

4. Did the student spell correctly the words he learned to spell in other subjects i.e., written expression (story writing)?

Yes        No

Comments________________________________________________________

________________________________________________________
APPENDIX L

INTEROBSERVER QUESTIONNAIRE
INTEROBSERVER QUESTIONNAIRE

CONDITION: SELF-CORRECTION SPELLING ACTIVITY

Date

(Check yes or no)

QUESTION

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

1. Were word list given to students?
2. Are students self-correcting?
3. Are students writing the corrected words?
4. Was timer set?
5. Did the activity last for 30 minutes?
6. Did the experimenter collect word lists to check on correct self-correction activity of students
APPENDIX M

TRAINING SCRIPT
STUDENT TRAINING SCRIPT

Introduction

Today I am going to teach you a method to self-correct your spelling words. The method is called a self-correction procedure because after writing your words, you will check your own work to identify any mistakes you made in the spelling. You will learn to use proof reader's marks to correct your own mistakes. I will help you to practice spelling the words using the self-correction procedure during your visits. During every fifth visit I will ask you to write the words again to find out whether you have learned their correct spelling.

Proof Readers Marks

The following proof readers marks are the marks you will use to correct your own work. This mark ^ means you forgot to write a letter and so that letter has to be added. For example, if you left out a letter r in the word "form" you have to insert the letter (r), and the letter to be inserted will have to be written above the word at the position where it should have been.

This mark, o, means you should omit a letter and the circled letter must be left out. For example, if you wrote "friend" as "friend", the second "i" should be circled and then left out when you are writing the word again.

This mark / means the wrong letter was used and so the correct letter should be written above it. For example if, you wrote "sun" as "san" the slash mark would be made through the a and the 'u' should be written above the "a".
This mark - means reverse the two letters indicated. For example, if you wrote "stop" as "stpo", the letter "p" and "o" have to be reversed.

**Self-Correction Form**

This form (show form to student on overhead projector) will be used for the self-correction exercises. The form contains five columns (point out columns to students). Column 1 will contain the written words. Then columns A-1 (self-correct), A-2 (write it right), and B-1 (self-correct), B-2 (Write it right) will be blank. Column 1 will be folded back like this (demonstrate to student) so that you cannot see the words written in column 1. Then the words will be dictated and you will write them in column A-1.

After dictating all the words you will be asked to expose column 1 (flip it open) and self-correct each word using the proof readers marks. After self-correcting the work, you will write each word correctly in column A-2 while looking at columns 1 & A-(point to columns as you explain to students). You will place a check mark in column A-2 for all words spelled correctly in column 1. Then I will check for proper correction and fold paper back again in order for you to write in column B-1. The words will be dictated again while you write in column B-1. Then afterward you will self-correct. If you correctly spelled a word, you will place a check mark in column B-2. Okay, let's have some practice.
APPENDIX N

SELF-CORRECTION FORM
# Self-Correction Form

**NAME:**

**DATE:**

<table>
<thead>
<tr>
<th>Word List</th>
<th>Column A-1</th>
<th>Column A-2</th>
<th>Column B-1</th>
<th>Column B-2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self-Correct</td>
<td>Write it right</td>
<td>Self-Correct</td>
<td>Write it right</td>
</tr>
</tbody>
</table>

Self-Correction Form with 5-column format. Column 1 would contain the stimulus words, and would be folded back. Column A-1 is reserved for the student's response and his or her proofreading marks. Column A-2 shows where the correct orthography would be spelled. The functions of Columns B-1 and B-2 are identical to Columns A-1 and A-2. Adapted from McNeish (1985).
APPENDIX O

PROOF READING MARKS
Proofreading Marks for Self-Correction

* = insert a letter(s): the letter to be inserted is written above
0 = to omit a letter(s): the circled letters must be left out.
/ = wrong letter (correct letter is marked above).
~ = reverse the two letters

The four proofreading marks for the self-correction procedure.