TRAINING SECOND GRADERS IN SELF-EVALUATION OF MANUSCRIPT LETTER FORMATION THROUGH USE OF AN ELECTRONIC CARD READER

DISSERTATION

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

By

Mary Ann Gladden, B.A., M.A.

* * * * *

The Ohio State University

1987

Dissertation Committee: Approved by
S.H. McCormick
J.O. Cooper
R. Swassing

Sandra McCormick
Adviser
College of Education
ACKNOWLEDGMENTS

I would like to thank my committee members for their support and encouragement during this endeavor. The opportunity to collect handwriting data under the direction of Dr. John O. Cooper and the grant from the Zaner-Bloser Handwriting Company to conduct such research were greatly appreciated. I also acknowledge the assistance of the Chadron Public School System, and Mrs. Sheryl Larson. I would like to sincerely acknowledge the efforts of Ms. Susan Pullen for her technical assistance.

In particular, I extend heartfelt appreciation to my adviser, Dr. Sandra H. McCormick, for her invaluable guidance and feedback during the writing of drafts of this dissertation. It is her belief that every student should have a mentor, and I am fortunate, indeed, to have her as mine.

Special thanks are given to my friends and students in Chadron, Nebraska who have endorsed me from the beginning of my college teaching career and continue to do so.

Finally, to my sisters, Erla Mowbray and Marcia Lucas, I extend many thanks for the encouragement and help they gave me. To my parents, I gratefully acknowledge and appreciate the sacrifices they made in order to see that "their girls" received the very best education. The final completion of this degree is owed to them.
VITA

August 30, 1951 .............. Born – Martins Ferry, Ohio

1973 ......................... B.A., Baldwin-Wallace College, Berea, Ohio


1974-1977 ..................... Secondary English Teacher, Grades 9 and 12, Brunswick City School Systems, Brunswick, Ohio

1977-1979 ..................... M.A., The Ohio State University, Columbus, Ohio

1979-1981 ..................... Student Graduate Research/Teaching Associate, Faculty for Exceptional Children, The Ohio State University, Columbus, Ohio

1981-Present .................. Assistant Professor of Special Education, Division of Education and Psychology, Chadron State College, Chadron, Nebraska

PUBLICATIONS


FIELDS OF STUDY

Major Field: Mildly Handicapped

Studies in: Clinical and Remedial Reading - Dr. Sandra H. McCormick

Applied Behavior Analysis - Dr. John O. Cooper
- Dr. Daryl Siedentop
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>ACKNOWLEDGEMENTS</th>
<th>ii</th>
</tr>
</thead>
<tbody>
<tr>
<td>VITA</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xi</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td><strong>CHAPTER</strong></td>
<td></td>
</tr>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td>4</td>
</tr>
<tr>
<td>Research Questions</td>
<td>5</td>
</tr>
<tr>
<td>Definition of Terms</td>
<td>6</td>
</tr>
<tr>
<td>Summary</td>
<td>7</td>
</tr>
<tr>
<td>II. REVIEW OF LITERATURE RELATING TO HANDWRITING AND SELF-MANAGEMENT</td>
<td>8</td>
</tr>
<tr>
<td>Handwriting</td>
<td>8</td>
</tr>
<tr>
<td>Definition of Handwriting</td>
<td>8</td>
</tr>
<tr>
<td>Manuscript versus Cursiving Writing</td>
<td>9</td>
</tr>
<tr>
<td>Definition of Legibility</td>
<td>12</td>
</tr>
<tr>
<td>Letter Formation</td>
<td>13</td>
</tr>
<tr>
<td>Modification of Letter Formation</td>
<td>14</td>
</tr>
<tr>
<td>Importance of Legible Handwriting</td>
<td>17</td>
</tr>
<tr>
<td>Strategies for Evaluating Legible Handwriting</td>
<td>19</td>
</tr>
<tr>
<td>Handwriting Scales</td>
<td>19</td>
</tr>
<tr>
<td>Consideration and Criticisms of the Use of Scales</td>
<td>21</td>
</tr>
<tr>
<td>Evaluative Overlays</td>
<td>23</td>
</tr>
<tr>
<td>Development and Reliability of the Manuscript and Cursive Transparent Letter Overlays</td>
<td>23</td>
</tr>
<tr>
<td>Research Studies Using the Evaluative Overlays</td>
<td>24</td>
</tr>
</tbody>
</table>
III. METHODOLOGICAL MATERIALS AND PROCEDURES USED TO COLLECT AND ANALYZE EXPERIMENTAL DATA

Subject Selection .............................................. 40
  Student Subjects ........................................... 40
  Teacher Subjects .......................................... 45
  Experimenter ................................................. 45
Setting .......................................................... 46
  Student Training Setting .................................... 46
  Social Validity Questionnaire Setting ...................... 49
Materials .......................................................... 49
  Commercial Materials ....................................... 49
    Assorted Materials ........................................ 49
      Writing Implement ....................................... 49
      Writing Paper ........................................... 49
      Electronic Card Reader (ECR) ............................ 49
      ECR Cards ................................................. 50
      Instructional Material Folders ......................... 50
      Recording Stamps ....................................... 51
      Ink Stamp Pad ........................................... 51
      Recording Stars ......................................... 51
  Experimenter-Made Instructional Materials .................. 51
    Poster Response Prompts .................................. 51
      Response Prompt 1 ....................................... 52
      Response Prompt 2 ....................................... 52
      Response Prompt 3 ....................................... 56
      Response Prompt 4 ....................................... 59
      Response Prompt 5 ....................................... 61
  ECR Cards ..................................................... 61
    Clue Set 1 ................................................ 65
    Clue Set 2 ................................................ 68
    Clue Set 3 ................................................ 69
    Clue Set 4 ................................................ 72
    Clue Set 5 ................................................ 75
    Clue Set 6 ................................................ 75
    Clue Set 7 ................................................ 77
  Teaching Response Sheets .................................... 78
  Self-Charting Folders ....................................... 79
I. INTRODUCTION ............................................. 1

II. LITERATURE REVIEW ................................. 10

III. METHODS ................................................. 18

IV. RESULTS AND ANALYSIS OF EXPERIMENTAL DATA .... 102

V. DISCUSSION OF RESULTS RELATED TO RESEARCH QUESTIONS,
   LIMITATIONS OF THE PRESENT STUDY, AND SUGGESTIONS
   FOR FUTURE RESEARCH ................................. 121

   Discussion of Results ................................ 121
   Reliability of Data .................................. 121
   Research Question Number One .................... 122
   Research Question Number Two .................... 125
   Research Question Number Three .................. 127
   Research Question Number Four ................... 128

vii
APPENDICES

A. Prerequisite Skills Assessment Form .................. 137
B. Sample Sheet of Writing Paper ...................... 142
C. Clue Set 1 ........................................... 144
D. Auditory Track for Clue Set 1 ......................... 153
E. Clue Set 2 ........................................... 156
F. Auditory Track for Clue Set 2 ......................... 163
G. Clue Set 3 ........................................... 165
H. Auditory Track for Clue Set 3 ......................... 179
I. Clue Set 4 ........................................... 182
J. Auditory Track for Clue Set 4 ......................... 194
K. Clue Set 5 ........................................... 197
L. Auditory Track for Clue Set 5 ......................... 201
M. Clue Set 6 ........................................... 203
N. Auditory Track for Clue Set 6 ......................... 213
O. Clue Set 7 ........................................... 216
P. Auditory Track for Clue Set 7 ......................... 221
Q. Teaching-Response Sheet 1 ............................ 223
R. Teaching-Response Sheet 2 ............................ 225
S. Teaching-Response Sheet 3 ............................ 227
T. Teaching-Response Sheet 4 ............................ 229
U. Teaching-Response Sheet 5 ............................ 231
V. Teaching-Response Sheet 6 ............................ 233
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Demographic Data of Participating Student Subjects</td>
<td>41</td>
</tr>
<tr>
<td>2. Mean Performance Scores for Scoring of Prewritten Lowercase Manuscript Letter Strokes</td>
<td>107</td>
</tr>
<tr>
<td>3. Number of Attempts Required to Achieve 90% Criterion Level</td>
<td>108</td>
</tr>
<tr>
<td>4. Listening Times in Minutes Required to Complete Clue Cards</td>
<td>110</td>
</tr>
<tr>
<td>5. Percentage of Accuracy on Students' Self-scoring of Correct Letter Strokes as Measured by Trained Letter Probes</td>
<td>112</td>
</tr>
<tr>
<td>6. Percentage of Accuracy on Students' Self-scoring of Correct Letters as Measured by Untrained Letter Probes</td>
<td>114</td>
</tr>
<tr>
<td>7. Percentage of Teacher Responses to Statements Pertaining to Handwriting and Handwriting Instruction</td>
<td>116</td>
</tr>
<tr>
<td>8. Percentage of Teacher Responses to Statements Concerning Use and Components of the Electronic Card Reader Program</td>
<td>118</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Floor plan of subjects classroom</td>
<td>48</td>
</tr>
<tr>
<td>2. Poster 1 - Sly the Private Eye</td>
<td>53</td>
</tr>
<tr>
<td>3. Poster 2 - Sly looking for clues</td>
<td>54</td>
</tr>
<tr>
<td>4. Poster 3 - Sly checking the clue sheet</td>
<td>57</td>
</tr>
<tr>
<td>5. Poster 4 - Sly gives directions for moving through the program</td>
<td>60</td>
</tr>
<tr>
<td>6. Poster 5 - The Mad Scribbler</td>
<td>62</td>
</tr>
<tr>
<td>7. Hypothetical delayed multiple baseline design</td>
<td>88</td>
</tr>
<tr>
<td>8. Delayed multiple baseline design across subjects with probes</td>
<td>104</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Handwriting has traditionally been an important part of school curriculum taught at the elementary school level. Generally both teacher and student spend much time engaged in the process of acquisition, evaluation, and practice of this skill.

Some authors consider that the acquisition process may be too inflexible, however. Addy and Wylie (1973) reviewed an international survey conducted by the Committee on Later Childhood Education International, and, in their summary, noted that: handwriting is taught simultaneously to the entire class in most schools. This point has some significance when the issue with regard to the need for accommodating individual progress is considered. Charles (1980) has suggested that few authorities have indicated how individualization could be practically achieved or designed materials to facilitate such individualization. Lovitt (1984) advocates self-instruction in handwriting and suggests that "if an individual is given some instructional aids and shown how to use them, he will later be able to rely on them when he performs the behavior for which they were developed," (p. 238). He further suggests that the behavioral control required to monitor and master self-instructional training may transfer to other behaviors as well.
Results from an extensive review of research prompted Peck, Askov and Fairchild (1980) to suggest that there have been too few projects looking at handwriting programs and materials, and the efficacy of those programs with regard to achievement gain in handwriting skills of children. Of those studies that were conducted, however, a few did look at programming materials and/or developing self-instructional packages. Robin, Armel and O'Leary (1975) in a study investigating kindergarten children with deficient writing skills, compared the effects of self-instruction and direct training on manuscript letter formation. Although both groups received feedback, results indicated that the self-instructed group performed better than the direct training group. Stowitschek and Stowitschek (1979) used a remedial instruction package to adapt traditional student worksheets and workbooks; they found that students did improve on manuscript letter formation, although teachers did not use the package consistently.

Regardless of the technique used to teach it, letter legibility has long been established as one of the most important aspects to any handwriting program. Focus on this element of handwriting has lead to techniques relating to the evaluation of legibility in both manuscript and cursive letter formation. While informal evaluation has traditionally been used in the classroom (Addy & Wylie, 1973), Andersen (1965) suggested that use of handwriting scales was a preferable technique. Studies investigating the efficacy of handwriting scales have indicated that few schools use such scales, because teachers are not cognizant of appropriate criteria for grading samples of writing and tend to rely on personal judgment (Herrick & Okada, 1963). In addition, handwriting
scales are crude and have not been perceived as useful for instruction (Graham & Miller, 1980; Rondinella, 1963). Assessing handwriting legibility by using scales has proven ineffective and unreliable (Andersen, 1965; Askov, Otto & Askov, 1970). As an alternate procedure for evaluating legibility, transparent overlays have been successfully developed for both manuscript writing (Helwig, Johns, Normar & Cooper, 1976; Jones, Trap & Cooper, 1977) and cursive writing (Trap, 1977). Further, Johns (1977) and Jones et al. (1977) have successfully taught young elementary children to reliably self-record their own manuscript letter strokes. However, these studies used demonstration-model strategies by the teacher or researcher and did not attempt to devise a plan to substantiate whether young students could individually train themselves to use the overlays and still achieve reliability for scoring.

Peck, et al. (1980) praised the use of applied behavior analysis in the area of handwriting research and suggested that more studies should utilize the single case multiple baseline design as structure for experimentation. Hersen and Barlow (1976) have suggested that the greater flexibility inherent within the single case design can allow experimental procedures to be modified as needed. Sidman (1960) noted that use of such designs emphasizing systematic replication improves research by extending generality of findings across both populations and situations.

In summary, research has suggested a number of areas with regard to handwriting where more investigation might be useful. These areas include the following: (a) developing effective new materials, (b) evaluating legibility, (c) using more individualization techniques,
and (d) incorporating more single subject design structure in studies. Based on these delineated areas, it seems reasonable to conclude that a study using a single case design to analyze the effectiveness of self-instructional materials which have been developed to aid students in evaluating legibility would be a valuable addition to the current literature.

**Purpose of the Study**

Availability of prepared materials and the amount of engaged teacher time required to present such materials as well as engaged student time to learn and practice are important variables in the classroom adoption of instructional strategies. This study examined whether a treatment package could be designed to teach students to reliably score lowercase manuscript letter strokes independently of teacher time.

The treatment package itself consisted of three components. First, students were presented through a multisensory technique—an electronic card reader (ECR) system—specific rules to follow that comprised the terminal behavior—the ability to recognize correct/incorrect prewritten manuscript letter formation within the context of the Helwig, et. al (1976) overlays. Second, students were given an opportunity to practice each rule to a specified criterion level. Third, students were requested to chart their own progress in the skill acquisition sequence. If the amount of time required by each student to independently progress through the program was deemed unreasonable, however, then such a package might not be useful; therefore, an additional aspect of this study focused on recording both the amount of
time required to complete each phase of the instructional package, as well as the total time required for students to reliably acquire the evaluative scoring technique. A social validity measure was designed to occasion teachers' responses to the package itself (rules, response sheets, self-chart grid), to its self-instructional individualized presentation, and to the length of time required to complete the program. The final aspect of the study attempted to ascertain if met criterion levels of all rules would transfer to students' evaluational skills of their own manuscript printing using both the trained and untrained letters.

**Research Questions**

Research questions which the study attempted to answer were the following:

1. Will an ECR self-instructional program, designed to be used independently by second-grade students, effectively teach reliable scoring of prewritten lowercase manuscript letter strokes?

2. How many trials-to-criterion will be required by each student to achieve completion of each phase of the instructional treatment?

3. How much time, measured in minutes, will be required by each student to reach criterion scoring for the following tasks and levels:
   a. Scoring teaching response sheets
   b. Scoring trained- and untrained-letter probe sheets
   c. Individual listening times required to complete each set of clue cards
d. Completing the entire instructional package which included listening to the clue cards and completing teaching response sheets

4. Will students be able to reliably score their own handwriting on letters they were trained on in the instructional package of prewritten letters?

5. Will students be able to reliably transfer scoring skills to letters not trained in the instructional package?

6. What attitudes will primary-grade elementary teachers demonstrate with regard to general questions pertaining to handwriting and handwriting instruction?

7. Will primary-grade classroom teachers react positively to the treatment package?

**Definition of Terms**

The following terms were used in the study:

**Legibility:** The clarity of the letter or letter stroke.

**Lowercase:** Written or printed letters not in capital letter form.

**Probe:** An intermittent measure of a behavior.

**Treatment Package Materials:** Seven clue sets, seven corresponding teaching response sheets, and a self-charting folder.

**Clue Sets:** Rules designed to define correct manuscript letter strokes.

**Clue Set 1:** All letters must sit on the baseline, in other words, the red line on Zaner-Bloser writing paper.

**Clue Set 2:** Letter strokes must remain within the boundaries of the letter frame.
Clue Set 3: Letter strokes must not be too long.

Clue Set 4: Letter strokes must stay within the boundaries of the letter frame and meet the hash marks.

Clue Set 5: Dots are strokes and must occur within the boundary of the letter frame.

Clue Set 6: Strokes must touch and intersect at appropriate places in the construction of a letter.

Clue Set 7: No stroke may be missing.

Transfer: Appropriate responses are emitted when no treatment or contingency has been applied or when a target behavior occurs in the presence of stimuli other than specific stimuli used in training.

Summary

While handwriting has traditionally been an important part of curriculum taught at the elementary school level, research indicates that the acquisition of this skill may be too inflexible, that is, neglecting aspects of individualization. This study was designed to be an individualized procedure teaching students to self-evaluate lowercase manuscript letter formation.
CHAPTER II
REVIEW OF LITERATURE RELATING TO
HANDWRITING AND SELF-MANAGEMENT

The following review deals with two major areas: the handwriting literature and the literature on behavioral self-management.

Handwriting

Several areas are addressed in regard to handwriting which are pertinent to the present study. These major areas are the definition of handwriting, the definition of legibility, the importance of legibility, and strategies for evaluating legible handwriting.

Definition of Handwriting

It is difficult to arrive at a precise definition of handwriting by studying the research. The reason for this absence of clarity may be the frequent interchange between the words "writing" and "handwriting." Much of the literature does not clearly differentiate nuances in meaning between the two terms. Handwriting as defined by Burns, Broman and Lowe (1971) is the ability to form letters clearly and to communicate with meaning. Hanover (1983) describes it as an individual way of expressing thoughts; Clay (1977), Davis and Miller (1983), and Plattor and Woesterhoff (1983) view it as the process of purposefully communicating information.
This confusion between the technique of forming actual graphemes and the intent behind writing them has been referred to as "writing-as-mechanical act" and "writing-as-conceptual act" (Klein, 1985, p. 5). For purposes of this review, however, references to writing, written expression, or handwriting will refer to the pen/paper production of letters or words in either print or cursive form, i.e. how rather than why letters are written.

Manuscript versus Cursive Writing

A long standing, yet still current research dialogue centers around which of two traditional handwriting instructional methods is better--manuscript or cursive. Prior to 1913, cursive was the handwriting style in use. Then, in 1913, the concept of print script, known as manuscript, was developed in London by Edward Johnson, a calligrapher. Sources do not agree as to his intention behind the introduction of this new style of print. Graham and Miller (1980) and Horton (1972) imply that the form was perfected as a new writing model for young children. Gray (1977) and Enstrom (1969) disagree and suggest that manuscript was the first step toward the reintroduction of calligraphy as a substitute for the more formal italic-style copperplate. Regardless of the reason, the new style garnered wide appeal. Businessmen and tradespeople were encouraged to use the form, because it eliminated all the loops and flourishes so difficult and time-consuming to write. Educators embraced it, because children were now writing letters similar to those they were reading. Manuscript writing was, therefore, formally adopted by English schools in 1927 and was introduced in America in the early 1920's (Gray, 1977).
Because of the wide acceptance of the manuscript form, but an equally pervasive reluctance on the parts of parents and educators to relinquish handwriting instruction in cursive style (Renaud & Groff, 1966; Sloan & Triplett, 1977), children in 80% of elementary schools throughout the United States and Canada are currently taught two very discrete letter production forms and handwriting styles (Addy & Wylie, 1973; Plattor & Woosterhoff, 1971). Currently, it is common practice to initially instruct first and second grade school children in writing manuscript, followed by the introduction in the third grade of the cursive style (Addy & Wylie, 1973; Graham & Miller, 1980; Herrick & Okada, 1961). This duality of program instruction has resulted in a considerable, ongoing debate between the merits of manuscript handwriting versus cursive handwriting instruction.

Those who advocate the teaching of manuscript writing have suggested that it (a) more closely resembles book print (Andersen, 1966; Cutchright, 1936; Gates & Brown, 1929; Herrick, 1960; Hildreth, 1936), (b) tends more readily to accommodate perceptual-motor and developmental phases and plateaus (Birch & Lefford, 1967; Duvall, 1985; Furner, 1969, 1970; Herrick, 1960; Kirkland, 1978), (c) involves fewer retracings, strokes, and joinings than cursive writing (Barbe, Milone, & Wasylyk, 1983), and (d) is quicker and easier to learn than cursive script (Gates & Brown, 1929; Hildreth 1960; Moore, 1986). Western (1977) vehemently states that "insistence on cursive script in the middle grades and later is simply indefensible. It displaces valuable activities and has no value of its own. Cursive script persists
because the fourth grade teacher (or the third or the principal) says it should persist" (p. 3).

Proponents of cursive writing instruction indicate that (a) it more closely resembles adult writing (Barham, 1974; Enstrom, 1969; Renaud & Groff, 1966; Sloan & Triplett, 1977), (b) joined letters are more valid units of legibility (Enstrom, 1969; Gray, 1977), (c) it is recognized as the legal signature, and (d) it is a better style for perceptually-disordered children (Getman, 1983; Lerner, 1982).

Askov, et al. (1970) and Graham and Miller (1980) have indicated that evidence appears to lean toward consistent use of manuscript writing at the primary grades and beyond, although Hildreth (1960) cautioned that there is such a range of individual differences in style at the upper-levels that it is difficult to discern the better method. In an attempt to determine which style of writing resulted in greater legibility by adult writers 10 years out of high school, Templin (1963) compared three groups of subjects. The first group had received only manuscript training in elementary school; the second group had received only cursive instruction, and the third group had received training in manuscript followed by transition to cursive. She determined that the manuscript-only group demonstrated the highest degree of legibility in contrast to the transitional group which demonstrated the lowest degree of legibility. Askov, et al. (1970) have suggested that until empirical data indicate otherwise, manuscript printing should probably be used consistently throughout the school curriculum. It has been noted that handwriting is currently recognized as one of the basic, fundamental subjects in the elementary curriculum (Enstrom, 1969; King, 1961),
and several opinions suggest that handwriting instruction should be promoted in the school curriculum up through secondary level (Bell, 1983; Ruedy, 1983; Plattor, 1971). Based on this information, Furner (1985) and Petty (1982) strongly urge that the issue of manuscript versus cursive writing be resolved. The present study, however, focuses on manuscript writing.

**Definition of Legibility**

The efficiency of handwriting as a vehicle for communication refers both to its production and to the subsequent stage of reading that production (Wing, 1979). Regardless of the instructional method used to teach handwriting, it is clear that one cannot interpret a written message without first being able to decipher the "messengers" or graphemes used to send such a message. Traditionally, the ease with which letters are read is known as legibility (Graham & Miller, 1980). Textbooks on language arts and various research studies in the handwriting literature have concluded that legibility is a composite skill of various subskills including the following: letter form, the degree of slant, the size of the letters, spacing between and within letters and words, alignment of the letters, and line quality, in other words, the consistency of the letter line (Andersen, 1969; Bell, 1969; Craig, 1965; DeHaven, 1979; Donoghue, 1984; Freeman, 1915; Herrick & Okada, 1963; Jackson, 1979; Quant, 1946). There is agreement among some authorities that letter formation is one of the most important aspects of legibility (Burns & Broman, 1975; Freeman, 1915; Herrick & Okada, 1963; Graham & Madan, 1981; Hirsch & Niedermeyer, 1973; Wright & Allen, 1975).
Letter Formation

Studies have revealed that children do demonstrate patterns of specific problems in both manuscript and cursive letter formation. Research has shown, however, that a few errors account for the majority of illegibilities (Graham & Miller, 1980; Kvaraceus, 1954; Love, 1965). Graham and Madan (1981) have reported that most errors in handwriting at any grade level are letter malformations. Of these errors, about 50% are caused by the symbols a, e, r, t. Lewis and Lewis (1964) investigated first graders' letter formation and found that errors occurring most often in letter formation were demonstrated when children were required to print letters in which curves and vertical lines were joined, for example, f, h, u, n. Least frequently demonstrated errors occurred in formation of letters composed of only vertical lines or vertical and horizontal lines (e.g., l, t, F, E). Using a factor analytical procedure, Kuennapas (1969) investigated the lowercase letters of the Swedish alphabet. His findings indicated that letters with vertical linearity and roundness comprised a substantial portion of the strokes required to produce a letter. Stennett, Smithe, and Hardy (1972) investigated the relative difficulties of copying lowercase manuscript alphabet letters as opposed to the uppercase alphabet for kindergarten through third grade students. Their findings demonstrated that copying uppercase letters produced the most efficient letter formation and that the uppercase manuscript alphabet was mastered at the second grade. Lowercase letters, however, remained difficult for third graders to copy with frequent errors resulting in
letters that involved curves and joinings and the most perceptual/visual-motor control. Horton (1970) examined lowercase cursive letter malformations of 1000 sixth graders residing in rural areas and small- and medium-sized cities. The children were presented with a model sentence containing the 26 letters of the alphabet. Students were then asked to copy the sentence as many times as they could in 5 minutes. Judges rated the formation of the lowercase letters. Findings indicated that six types of improper formations for the letter r accounted for 12% of letter illegibilities and that the letters, a, b, c, i, l, m, n, u, v, and x taken together comprised another 12%. Implications of the study were that difficult letters to produce such as r may merit more teacher instruction time, resulting in greater total overall handwriting legibility.

Modification of Letter Formation

Reviews of current research in handwriting suggest more investigation is needed to determine what modifications in letter formation might make letters more legible (Askov, et al., 1970; Peck, et al., 1980). Quant (1946) indicated that simplified letter formation was easier to read. Hildreth (1960) has found that there is a wide variation in handwriting styles at the secondary level, and Schell and Burns (1963) have asserted that when college students deviate from traditional learned handwriting, they deviate toward simplification. Consequently, alternative modified styles of writing have been suggested to replace the more traditional forms. A continuous stroke method proposed by Thurber (1982) and adoption of italic-style writing for improved legibility have been the two alternate methods receiving
the most attention. Ferris (1982) has suggested that proponents of the D'Nealian approach to handwriting relate that (a) the continuous stroke enables the student to develop a more rhythmical balance in handwriting, since the pen never leaves the paper until the letter is formed, (b) perceptual-motor skills need not be so well-developed in this method, and (c) the use of beginning and ending strokes can increase legibility. Recently, several researchers have investigated the continuous stroke method in comparison with other types of handwriting letter forms (Duvall, 1985; Ferris, 1982; LaNunziata, Trap-Porter, Cooper, Hill & Swisher, 1984). Ferris (1982) compared the continuous stroke method to the ball-stick method in both manuscript and cursive styles. Using a stratified sample of 86 first- and second-grade students who exhibited no perceptual-motor deficits, students were asked to copy three sentences onto a three-lined writing paper. Results indicated that the continuous stroke method reduced the number of letter reversals in first grade children suggesting that perceptual-motor problems might also be reduced. The more traditional cursive method resulted in greater legibility for cursive script. However, interpretation of this data must take into account the fact that both methods were evaluated using the Zaner-Bloser Handwriting Scale (1984) which may have skewed the expectations for criterion for legible writing. In a related investigation, Duvall (1985) researched the performance of kindergarten children's typeset letter recognition ability to four styles of handwriting: manuscript, cursive, italic and D'Nealian letters. The null hypotheses in this study were the following:
(1) There will be no difference between the kindergarten students' scores for matching handwritten manuscript, cursive, italic, and D'Nealian letter styles to typeset, as measured by the Matching Letter Styles Test, (2) there will be no difference between the kindergarten students' scores for reading typeset letters and handwritten letters in manuscript, cursive, italic, and D'Nealian letters, as measured by reading flash cards, (3) there will be no main effect difference between kindergarten students' reading and matching scores, as measured by the Matching Letter Styles Test and reading from flash cards, and (4) there will be no main effect difference between kindergarten students' reading and matching scores for manuscript, cursive, italic, and D'Nealian letter styles, as measured by the Matching Letter Styles Test and reading from flash cards (p. 5).

Using analysis of variance, all hypotheses were rejected at the < .01 level of significance. Post hoc analyses did suggest the following guidelines:

1. Manuscript does not resemble book print for children. (Gray [1977] would concur stating that sans serif print only resembles book print.)

2. Cursive is not a good selection of writing style to teach young children, since the younger children scored significantly lower on cursive writing in all tests.

3. Using all properties of legibility slant, spacing, size, alignment, and formation, italic writing is favored.
LaNunziata, et al., (1984) investigated whether initial training in the ball-stick method or the continuous stroke method would result in greater ease of acquisition of cursive writing by first-grade students. Results indicated no difference in the number of correct letter strokes by students receiving either type of instruction.

**Importance of Legible Handwriting**

Enstrom (1966) indicated that poor handwriting skills cause students to be penalized in learning and teachers to be penalized by reduction in the amount of instructional time due to attempting to score illegible papers. In addition, the literature shows that teachers invariably give better grades to papers with higher quality handwriting (Briggs, 1970; Chase, 1968; Markham, 1976; Rondinella, 1973).

Davis and Miller (1983) note that legibility in handwriting at the secondary level is crucial when attempting to enter the job market. Employers tend to be impressed by and hire those individuals who evidence better quality writing on applications. The authors also indicate that the usefulness of recording pertinent information such as friends' telephone numbers, travelling directions, and dates and times of appointments is dependent on the legibility of the letter form.

Articles have been written deploring the loss in money, as well as time, that illegible handwriting has caused businesses. Large businesses report deficits of millions of dollars because of handwriting errors in personal memos and notes used to link information between efficient highly computerized data sources (Enstrom, 1969). Irwin (1964) relates two pertinent examples of such losses. In one instance,
an error in a large company resulted in an inventory shortfall of $65,000. After a week-long investigation, it was discovered that the illegible figures of the inventory clerk had been read incorrectly. The second example describes the frustration of United Parcel Service (UPS). The company has approximated that "every day, in one city alone, about 1200 packages are undelivered, frequently because of illegible handwriting" (p. 154). Businesses advocate a return of penmanship training (Irwin, 1964; Groff, 1964) and tend to blame education for these handwriting inadequacies (Enstrom, 1969).

Pharmaceutical industries share this concern. Pharmacists have reported that it is often so difficult to read doctors' handwritten prescriptions, that many pharmacists will simply substitute "take as directed" when they are uncertain of the exact dosage. Pharmaceutical companies have required refresher courses in handwriting for their salespeople (Irwin, 1964).

Lest it be assumed that professional educators are exempt from criticism, there is evidence which indicates that they, too, produce illegible handwriting. Groff (1975) contends that (a) teachers' handwriting is more illegible than in the past, (b) many teachers may circumvent this problem by typing directions and assignments, (c) students tend to make similar errors in handwriting as their teachers and, (d) teachers' tend to be hypocritical when they admonish students to write legibly, yet do not provide enough specific feedback to enable the students to correct their handwriting. Responses from teachers themselves have indicated that handwriting is an unpopular subject to teach
(Greenblatt, 1962) and that teachers' perceptions of their own ability to teach handwriting are very low (Groff, 1962).

**Strategies for Evaluating Legible Handwriting**

In handwriting, as in any other academic skill area, there must be a technique which enables either researchers, teachers, or students, to evaluate a written product before any feedback can be objectively supplied or remedial procedures instituted to correct the problem. Generally, handwriting skills are evaluated informally, rather than through norm-referenced measures (Addy & Wylie, 1973; Graham and Miller, 1980; McLoughlin & Lewis, 1986; Peck, et al., 1980). Two methods for evaluating handwriting that have been researched fairly extensively in the literature are the use of handwriting rating scales and evaluative transparencies.

**Handwriting Scales**

Rating scales are handwriting samples which are presented as graduated measures of improved handwriting. In order to determine the quality of a student's handwriting, it is compared to the various samples of the scale. The first scale to be developed was a cursive rating scale (Thorndike, 1910). One thousand samples of children's writing were used to develop the 15-step scale. The scale was not used to measure specific components of legibility, but, rather, was designed to rate the overall esthetic qualities (beauty, merit) of a student's sample. This measure was shortly followed by the Ayres (1912) scale. This scale, intended for evaluating cursive writing samples of children in grades 2 through 8, was fairly simple, and similar to the Thorndike (1910) scale in that it required evaluators
to respond only to a general attractiveness of the written sample. Speed norms accompanied the scale. Shortly thereafter, Freeman (1915) produced a scale designed for both manuscript writing for grades 1 and 2, as well as cursive writing for grades 2 through 8. The scale allowed evaluators to make much finer discriminations in handwriting than either of the two scales described previously, since it measured discrete components such as uniformity of slant, alignment of letters, and spacing between letters and words. These discrete characteristics were assigned equal judgment value, while the overall letter formation was assigned double value. As reported in Herrick and Erlebacher (1963), the Freeman scale (1915) was the most frequently used, and, according to Askov, et al. (1970) is still used widely. Then, in 1957, West described a series of 7-step scales in a manual published by the A.N. Palmer Company. The scales were designed to measure both speed and legibility of cursive writing. The scales were graduated exemplars demonstrating samples of poor legibility with a slow rate of production up to excellent legibility with a fluent rate of production. Bezzi (1962) produced a scale for manuscript writing normed on over 7,000 samples. The scale is intended for children in grades 1 through 3. The most recent scales to be developed are the Zaner-Bloser Evaluation Scales (1984). They provide teachers with appropriate manuscript samples for grades 1 and 2, as well as cursive samples for grades 3 through 8. A transitional cursive scale for grade 2 is also available. Procedures for using this scale require that students copy a sample passage twice. The first attempt is considered a practice, while the second trial is the evaluated attempt. Since the scales are
not powered (i.e., they are not timed), there is no attempt to measure speed. The evaluated copy is then compared against an appropriate grade level sample for letter formation, vertical line quality in manuscript (slant, in cursive), spacing, alignment and proportion, and line quality.

Considerations and criticisms of the use of scales. Herrick and Erlebacher (1963) had reported that problems exist in the use of scales unless finer discriminations could be made in the evaluation procedure. The ability to make such discriminating judgments seems to be difficult for a number of reasons. First, according to Herrick and Erlebacher (1963) scales may simply be too nonspecific to be helpful in terms of clearly differentiating discrete qualities which may comprise legibility. Second, teachers must be objective and unbiased judges. Andersen (1965) has contended that teacher subjectivity is difficult to eliminate from such evaluations. Rondinella (1963) noted that subjectivity will occur if teachers are not sufficiently well-trained. If such training does occur, however, Otto, Askov and Cooper (1969) have found that teachers (a) can reliably use the scales, and (b) eventually can evaluate as reliably without the scales as with them.

Of the Zaner-Bloser Handwriting Scale (1984) specifically, McLoughlin and Lewis (1986) note that these scales do not really measure a student's typical handwriting since the students are directed to write in their "best" handwriting. In addition, practice or fatigue effects may interfere with production of the second sample. Third, an untimed test may not truly reflect the distortions which can occur when speed is taken into account as a variable. Rarick and Harris (1963)
compared the written products of bright, average, and slow sixth-graders for speed. They implemented four different writing conditions which were (1) normal, (2) fast, (3) best, and (4) relaxed. The bright and average groups produced their fastest writing under the "fast" conditions, while, usually, the most legible writing was produced under the "best" condition. Noteworthy in the study was the fact that students judged as having superior handwriting tended to be superior handwriters under all conditions. In a study designed to empirically validate speed norms for the Ayres handwriting scale, Groff (1969) reported his new speed norms devised for fourth, fifth and sixth graders resulted in rates much slower than those reported for the older scale. He attributed this finding to procedural differences between administration of his and the Ayres scale. In the latter, children copied the passage until teachers were certain that they could recognize all the words. Then they were timed on their handwriting speeds. Groff (1969) required the children to read the passage until they were familiar with the words; he then timed their first written passage. Because of these procedural differences, both Askov, et al., (1970) and Groff (1969) contend that the experimental scale is probably the more valid one. A further criticism of the use of scales in general has been aimed at the inadequacy of reliability of ratings (Feldt, 1962). In order to raise reliability ratings, Feldt (1962) has suggested that more samples be provided and directions for administering a writing sample for a scale be made much clearer. These recommendations are substantiated by authorities concerned with tests and measurements (Borg, Gall & Gall, 1963; McLoughlin & Lewis, 1986; Van Dalen, 1969; Ysseldyke & Salvia,
1981). It has been further suggested that scales tend to have low reliability when they are used in the applied setting (Askov, et al., 1970; Feldt, 1962; Harris, 1961; Rondinella, 1963; McLoughlin & Lewis, 1986). Practical utility, therefore, dictates the need for an internalized scale or clearer identification of critical factors used in judging legibility (Askov, et al., 1970).

**Evaluable Overlays**

Because of various problems associated with rating scales as a method used to identify illegibilities in handwriting, handwriting literature has called for new techniques to evaluate legible handwriting (Askov, et al., 1970; Herrick & Okada, 1963; Petty, 1982). One technique which has shown itself to be promising as an objective instrument easily used in the classroom setting is the transparent evaluative overlay.

**Development and reliability of the manuscript and cursive transparent letter overlays.** An alternate procedure to that of using handwriting scales for evaluating manuscript handwriting samples was developed by Helwig (1976) and reported by Helwig, et al. (1976). This procedure utilized transparent letter overlays to evaluate correct and incorrect letter strokes. The overlays were placed over the students' printed manuscript letter, and the correctness of the letter was then evaluated according to whether the letter strokes used to produce the letter met the guidelines of the overlay. The guidelines established for using the overlays were the following:

1. The stroke had to remain within the parameters of the overlay.
2. Each stroke that was not a circle had to begin or end between the hash mark and the boundary line of the overlay.

3. Circle strokes in the letters a, b, d, g, o, p, q, and the top of the letter e had to be closed curves.

4. All strokes had to intersect each subsequent stroke except for the dots on the letters i and j.

5. No stroke could be missing.

6. The horizontal stroke in the letters t and f had to intersect and remain within the boundaries of the lines of the overlay (Helwig, et al., 1976).

In order to score letter strokes as being correct, the overlay had to be aligned correctly over the writing paper. Correct alignment was achieved by matching the lines of the overlay directly over the lines of the writing paper. Naive adult observers required only one training session to learn rules to use the overlay, yet still produced an average 88% interobserver agreement with the trained evaluators. Therefore, the procedure was considered to be fairly simple and reliable for teachers to use. Trap (1977) and Trap, Milner-Davis, Joseph & Cooper (1978) adapted the Helwig, et al. (1976) overlays for use with cursive writing.

Research studies using the evaluative overlays. A number of researchers have used the evaluative overlays developed by Helwig, et al. (1976) and Trap, et al. (1978), to investigate effects of various factors related to handwriting legibility. Johns (1977) and Jones, et al. (1977) demonstrated that first grade students could be trained to reliably evaluate and self-record correct and incorrect letter strokes.
Students were assigned to three groups. Each group was exposed to a series of experimental conditions including the following: (a) self-recording, (b) self-recording combined with public charting of results and (c) self-recording combined with a low performance group contingency. Results indicated that students were able to learn to reliably evaluate their own manuscript handwriting and were able to learn to self-record with agreements averaging 79%, 82%, and 84% between each of the three groups and the experimenter. Trap (1977) and Trap, et al. (1978) used the concept of the manuscript letter overlays and developed overlays for use in evaluating cursive letter formation. In this study 12 first-grade students watched as the experimenter demonstrated correct formation of cursive letters. The students were then required to copy cursive letters from a still model letter sheet. When criterion for appropriate letter formation had been reached students were asked to copy the letters without the experimenter’s model. Using visual-verbal feedback, rewriting and reinforcement as treatment conditions, Trap (1977) found that use of evaluative overlays and feedback did effect an increase in the percent accuracy of correctly formed cursive letter strokes. In addition, the study demonstrated that the overlays could be used to make fairly fine discriminations among letter strokes. Leung, Treblas, Hill, and Cooper (1979) researched the effects of manuscript letter formation and proficiency (the rate of correct responses) on the acquisition of cursive handwriting. Students were individually asked to copy manuscript letters from a still model and then to copy cursive letters (after experimenter demonstration of slant and letter formation) from a still model. The students were timed. These tasks
established baseline measures for the accuracy and proficiency for both manuscript and cursive letter formation. The intervention consisted of a second timed manuscript copying task followed by the placing of the evaluative manuscript overlay on the writing sample. Visual and verbal feedback was then given to each student to explain the student's correct and incorrect letter strokes. Students were required to rewrite letters with more than one incorrect stroke and feedback was again given. The visual-verbal, rewriting and reinforcement strategies were identical to those procedures used in the Trap, et al. (1978) study. Results indicated that accuracy of cursive letter formation improved contingent upon the manuscript training conditions. Waggoner, LaNunziata, Hill, and Cooper (1981) investigated the relationship of writing paper space-size and accuracy of letter formation. Kindergarten and first-grade urban and suburban student manuscript writing samples were evaluated. Results indicated that the suburban students demonstrated more proficiency in manuscript letter formation using wide-spaced paper. No difference was demonstrated by the urban children. In a study replicating the Leung et al. (1981) procedure, Trap-Porter, Gladden, Hill, and Cooper (1983) investigated the effects of space-size on the proficiency of cursive letter formation as demonstrated by second and third-grade students. Results indicated that both grades performed better with wide-spaced paper, although third graders performed better than the second-grade students. No difference due to sex was demonstrated. LaNunziata, et al. (1984) investigated the performance of two groups of first-grade students on cursive
handwriting copying tasks. One group had received instruction in a continuous stroke method; the other had received instruction in the ball-stick method. No differences between performances of the groups were reported.

In a study evaluating the effect of the letter/page prompts found on handwriting worksheets, Sims and Weisberg (1984) compared the effects of such prompts to manuscript letter formation. Subjects were four preschool children. Mean age was 4 years, 9 months. All children had low-income backgrounds. The students had been instructed on the Distor Reading I program (Engelmann & Bruner, 1977). The first six letters were used from the Distor program. Effects of four distinct types of page prompts were examined: (1) dotted line for tracing, (2) start-ball with a directional stroke and dark underline, (3) a start-ball with dark underline, and (4) a blank space which was underlined. Each worksheet contained two letters and provided opportunity to practice two rows per letter. Students were given five worksheets with all possible paired combinations. In effect, the authors were investigating whether gradual fading of prompts would demonstrate differences in letter correctness as measured by the letter overlays of Helwig et al. (1976). The authors did modify the scoring technique from a stroke-by-stroke approach to a whole-letter approach. Results revealed that legibility was definitely affected by the various prompts. Tracing performance was better (p < .01) than writing with either type of prompt, and better than writing in the blank space alone. The two start-ball prompts resulted in better (p < .01) letter formation than the blank space. The overlay technique was reliably
used. The authors did, however, compare the overlay reliability to teacher rating of legibility and found a nonsignificant correlation (-.02). Several explanations for this discrepancy are submitted by Sims et al. (1984) for consideration:

1. The overlay is designed to measure a whole letter regardless of the number of strokes in the letter. Consequently, if the first stroke of the letter did not fit the criterion, it was likely that other strokes were not scored as correct either.

2. The overlay may score different attributes than those considered essential by the teacher. For instance, while teachers may accept reduced letter height as still legible, the transparency overlay would not take that into account.

Behavioral Self-Management

Learners may often have difficulty in mastering academic or social tasks, because they have not learned systematic strategies for approaching such tasks. Even if some strategies are used successfully, there is no guarantee that these same strategies are automatically generalized to other tasks or settings. Indeed, the question of generalization of skills is one of primary concern to educators who promote behavior change technology (Cooper, Heron & Heward, 1987; Israel, 1978; Stokes & Baer, 1977). It may be, however, that such generalization is enhanced through the provision of fewer external, teacher-controlled prompts, cues, and reinforcers while shifting more of the responsibility for behavior change to the student. In discussing the distinction between self- and external control, O'Leary and Dubey (1979) state that no implication is made that "the use of self-control procedures and the
behaviors they influence can somehow exist or persist in spite of or in the absence of external contingencies." In fact, O'Leary and Dubey (1979) assert that most theorists believe that self-control is never completely achieved without some external influence. The goal of this transfer of responsibility from an external source to the student is the acquisition of self-control or self-management procedures which may lead to a greater degree of independence.

Definition of Self-Management

Several terms have been used to indicate self-management: behavioral self-regulation (Bolstad & Johnson, 1972; Wallace & Kaufman, 1986), self-control (Skinner, 1953; Kazdin, 1975), cognitive-behavior modification (Meichenbaum, 1980).

In defining self-control, Skinner (1953) indicated that it is a form of behaving, and asserts that controlling one's self is achieved exactly as one would control the behavior of someone else. Skinner continues to describe self-control by suggesting that this manner of behaving is, in effect, two discrete responses--the controlling and the controlled. The controlling response is that response which effects change on the controlled response. Kazdin (1975) has defined self-control as the degree of efficiency by which individuals can become successful modifiers of their own behaviors. Both Skinner and Kazdin are considered to have a high behavioral orientation, in other words, eschewing any attribution to self-control on the basis of superstitious or covert, mentalistic behaviors. While agreeing with this definition, Cooper, et al. (1987) prefer to use the term self-management rather than self-control, stating that "ultimately causes of behavior will
be found outside the person and ultimately it is the controlling re-
response that must be functionally analyzed . . . ." (p. 544) However,
there are those who perceive self-control as belonging to the cognitive
domain, as well. Bandura (1976; 1977) and Wallace and Kaufman (1986)
have gone so far as to suggest that viewpoints of behaviorists and cog-
nitivists are converging, to some degree, into a dimension of behavior
change study called cognitive-behavior modification. In their view,
cognitive behavior modification fuses both mentalistic (cognitive)
strategies as well as behavioral technologies. They explain cognitive-
behavior modification in the following manner:

Although the term cognitive-behavior modification (CBM)
means somewhat different things to different people, it
generally refers to the use of behavior modification methods
(frequent direct measurement of behavior and manipulation of
antecedents and consequences) to alter cognitions (thoughts
and feeling states) as well as overt behavior. The idea be-
hind CBM is that cognitions partially control behavior and
that altering thought processes might therefore be an effec-
tive way of modifying overt behavior. (p. 100)
Meichenbaum (1980) views the phenomenon of self-control as a composite
of cognitive style, metacognition, memory, internal or external loci
of control, and behavioral self-regulation.

Rationale for Self-Management Training

Regardless of whether researchers and educators refer to the goal
of independence as self-management, self-control, behavioral self-
regulation, or cognitive-behavior modification, the acquisition of this
complex behavior is desirable for several reasons. First, the goal of good teaching is to change the behaviors of students so that they demonstrate self-initiative in problem-solving strategies. However, students must be taught self-reliant, self-management behaviors as they would be taught any other skill area (O'Leary & Dubey, 1979). Lovitt (1973) has indicated that "self-management behaviors are not being systematically programmed in the classroom setting", and suggests that it is important to take steps toward such planning if educators wish to produce self-control behaviors (p. 139).

Kazdin (1975) advocates an increased emphasis on self-management skills for several reasons, including the following:

1. Reliance on external change agents sacrifices consistency, since such agents may not be able to fully observe all instances of a behavior.

2. Discrepancies in communication between change agents in various settings can sabotage the success of behavior change procedures.

3. External change agents may not always be available in a necessary setting.

4. The change agents themselves rather than the technique can become the discriminative stimuli for behavioral responses.

5. It may be the variable of student involvement which causes effective desired change in a behavior. (pp. 189-190)

Cooper et al. (1987) give five additional reasons for implementing self-management instructional strategies.
1. The use of self-management techniques can effect stronger outcomes than those contingencies which maintain a destructive behavior.

2. Certain individuals behave with more success when they select their own reinforcement contingencies.

3. Being in control of one's own behavior is reinforcing.

4. Students who are good self-managers of their behavior can contribute to a more effective classroom environment.

5. Self-management skills support other aspects of school curriculum. Rosenbaum and Drabman (1979) have summarized the importance of self-control procedures as being strategies which will "enable children to develop their own social and academic skills, while teachers devote more time to teaching and less time to classroom mechanics and social behavior" (p. 468).

**Types of Self-Management**

There are various types of self-management. Three types pertinent to the present study, all of which are based on a behavioral model of learning and behavior change, are self-recording, self-instruction, and self-delivery of reinforcement.

**Self-Recording**

Good teaching practices should involve students in the process of learning. This involvement should be active, in other words, students should be encouraged to solve problems through many opportunities to rehearse, evaluate, and respond. In addition, students should be taught to be aware of the environmental contingencies which affect the
consequences of their behavior. In other words, they should be able to recognize and determine the conditions under which their behavior will be reinforced or punished. By requiring students to verbalize these contingencies, Alberto and Troutman (1986) suggest that it is then a small step to teaching individuals to record their own behavior. Such self-recording is one part of a behavioral self-regulation program and allows students to receive immediate concrete feedback on their behavior. The very act of self-recording may lead to a desired change in the behavior, because the student becomes more aware of the behavior itself (Hayes & Nelson, 1983; Kazdin, 1975; Rosenbaum & Drabman, 1979).

Research studies using behavioral self-recording. A number of research articles cited in the literature have demonstrated use of self-recording strategies both in classroom and nonclassroom settings.

In classroom settings, self-recording has been used as a technique to record manuscript letter strokes (Johns, 1977; Jones, et al. 1977), percentage of time spent studying (Broden, Hall & Mitts, 1971), on-task behavior (Barkley, Copeland, & Sivage, 1980; Glynn, Thomas & Shee, 1973), independent work on math units (Sagotsky, Patterson & Lepper, 1978), the number of appropriate verbal classroom contributions made by retarded students (Nelson, Lipinski & Boykin, 1978), appropriate classroom participation by low-performing secondary students (Gottman & McFall, 1972), as well as reduction of hyperactive behaviors and disruptive behaviors (Barkley et al., 1980; Bolstad & Johnson, 1972).

Johns (1977) and Jones et al. (1977) demonstrated that students could achieve high reliability in self-recording. The self-recording
procedure used in the study was event recording. Reliability of recording averaged 79% accuracy for Group 1, 82% accuracy for Group 2, and 84% accuracy for Group 3. In another study, Broden et al. (1971) designed a system whereby two students were taught to self-record study behavior and talk-out behavior, respectively. In the first instance, the student and the school counselor met to discuss and operantly define the term studying behavior. Initially, the student was simply returned to the classroom on her promise to the counselor that she would try to study more. After several weeks and two meetings with the counselor, the student's estimated study time was approximately 30% of available time. A self-recording condition utilizing a tallying recording system was then implemented. The student was directed to take a self-recording form measuring study time to her class. The recording form was divided into segments in which the student would note a plus for occurrence of the desired behavior or a minus for nonoccurrence of studying after an interval of time. After a month, study time was noted to have increased 48% over the previous estimation.

The second student was given a blank box in which he was required to make a mark each time he talked out. Behaviors were recorded for two periods of the day. Using a reversal design, talkouts were averaged to be 1.1 times per minute and 1.6 times per minute for the first and second periods respectively. The self-recording condition reduced these occurrences to 0.3 and 1.0 talkouts for the two periods. Following an increase in the number of talkouts after reintroduction of baseline conditions, self-recording was again implemented resulting in reduced talkouts during the first period. Glynn et al. (1973)
investigated whether self-recording used in combination with a cued tape procedure would increase the amount of on-task behavior of second grade students. The students were instructed to listen to the tape and then to indicate on individual recording forms whether they were on-task following the sound of the cue. The percentage of time engaged in on-task behavior increased. In a similar procedure, Barkley et al. (1980) used a cued-tape plus publicly posted rules to decrease the amount of off-task behavior exhibited by three hyperactive elementary-aged children.

Sagotsky, et al. (1978) were concerned with issues raised by earlier studies in self-recording. They contended that the use of intra-subject experimental design may not have fully explained acquisitions in appropriate study behaviors, and speculated that certain uncontrolled variables as well as experimental manipulations of the design may have affected the results. In their study, both intrasubject and intersubject variances were analyzed. Sixty-seven fifth- and sixth-grade students were engaged in a curriculum program in which the students learned mathematics through a module format. Comprised of individual units, the individualized format was designed to encourage both self-paced learning as well as goal-setting behaviors. Sagotsky et al. (1978) were interested in examining if such behaviors could be increased through using intrasubject design incorporating self-monitoring and instruction in goal-setting conditions. In order to fulfill experimental requirements of the between-subject design, students were randomly assigned to one of four treatment conditions: goal-setting, self-monitoring, goal setting and self-monitoring, and a control
condition. Regardless of the assigned condition, students were reminded that it was important to do well in mathematics. Results of the study presented an analysis of the effects of contrasting conditions. In other words, effects of self-monitoring was compared to the effects of goal-setting, and the interaction of the self-monitoring and goal setting conditions were compared to either condition alone. Findings supported the use of self-monitoring both in the intrasubject as well as between subject analyses. A significant main effect regarding self-monitoring and rate of correct math problems was found. Interestingly, no significant effect for either goal-setting instruction as a sole condition or the interaction between goal-setting instruction and self-monitoring was observed. In additional analyses, self-monitoring was found to positively correlate with percent of on-task behaviors and with the amount of actual time engaged on-task, suggesting that students are able to reliably self-monitor their behaviors. This reliability of self-monitoring was found to extend to the treatment sessions wherein students set and reached a performance goal. Results further indicated that students in the goal-setting condition were significantly less likely to use the goal-setting procedure as instructed, than students who failed to use self-monitoring in the self-monitoring procedure. Surprisingly, the research did not find self-monitoring and progress through the math program to be significantly correlated.

Several studies have demonstrated the effectiveness of a self-monitoring/self-recording technique. In the area of handwriting specifically, Johns (1977) and Jones, et al. (1977) used the technique to
investigate its effect on manuscript letter formation evaluation. The present study, also one related to handwriting letter formation, has incorporated the self-recording component.

Self-instruction

Another type of self-management strategy is self-instruction. O'Leary and Dubey (1979) report that "self-instruction is defined as verbal statements to oneself which prompt, direct or maintain behavior." (p. 450) Cooper, et al. (1987) suggest that individuals use verbal mediators often "which act as controlling responses that affect the occurrence of other behaviors." (p. 534)

Research studies using behavioral self-instruction. Lovitt (1984) has encouraged the use of self-instruction in handwriting performance as was done in the present study. He suggested that if a child is given instructional aids and then shown how to use such instructional helps, the student will later be able to rely on them when he or she performs the targeted behavior. In a recent study, Graham (1983) examined the effects of self-instructional procedures on the handwriting performance of learning disabled students. Because of a number of studies investigating the pairing of both behavioral and cognitive techniques, Graham (1983) suggested that this pairing might provide a systematic framework for providing practitioners with an effective means of teaching manuscript letter formation. Subject selection required that students had been identified by the teacher as having severe difficulty with manuscript letter formation. Results indicated that, while the treatment was moderately effective, two areas of concern were the lack of generalization to untrained letters and the lack
of cost-effectiveness in terms of time. In a related study, Robin et al. (1975) investigated whether students would learn handwriting more efficiently through self-instruction, or direct training conditions. Their findings suggested that self-instruction was the more effective condition, although they questioned whether the intervention might be too cumbersome to be of practical value for the classroom. It has also been suggested that in handwriting instruction copying letters directly rather than tracing them may be more effective as an instructional technique (Hirsch & Niedermeyer, 1973). Sims and Weisberg (1983) even suggest that the two types of responses are topographically dissimilar. In an attempt to explain this concept, Sims and Weisberg (1984) and Furner (1980) suggest that copying may be a more cognitive rule-governed task. This perspective suggests that overt or covert verbalization techniques such as those used in self-instructional procedures may be quite effective. In the present study, rules were used to mediate the learning of the self-evaluation technique. Cooper et al. (1987) have suggested that regarding the use of rules, it is important that they be "easy-to-follow, strong rules" (p. 546). In that sense, the learning of techniques for evaluating handwriting should use strong rules with an immediate consequence.

**Self-delivery of Consequences**

The self-selection of consequences designed to increase or decrease behaviors has been shown to be an effective component of self-control procedures. Certain studies have demonstrated that self-determination of reinforcement is effective (Felixbrod & O'Leary, 1973) and that self-reinforcement tends to be strengthened by first requiring
students to self-evaluate (Ballard & Glynn, 1975; Balstad & Johnson, 1972; Wood & Flynn, 1978). Other studies indicate that externally-controlled contingencies may operate equally effectively and that "a period of teacher-controlled contingency management precede any effort to teach students self-reinforcement" (Alberto & Troutman, 1986, p. 350). Because studies have indicated that students may be more lenient in devising standards of reinforcement (Felixbrod & O'Leary, 1974), the present study used teacher-determined criteria for reinforcement application. The reinforcement component of this study is a small component of the project, closely related to self-charting.
CHAPTER III

METHODOLOGICAL MATERIALS AND PROCEDURES USED TO COLLECT AND ANALYZE EXPERIMENTAL DATA

The present study investigated the efficacy of a program designed to teach second-grade students to reliably self-evaluate their own lowercase manuscript letter formation. Chapter Three presents a description of the subjects who participated in the study, as well as a description of the materials used in conducting the research. In addition, this chapter presents all methodological procedures used to collect and analyze the experimental data.

METHOD

Subject Selection

Two groups of subjects were selected to participate in this study. The first group was comprised of students selected to use the experimental treatment package. The second group was composed of elementary teachers who were surveyed as to their opinions to statements/questions presented in a social validity questionnaire.

Student Subjects

The experimenter initially selected the targeted classroom on the basis of three factors: a willingness on the part of the school principal and classroom teacher to participate in handwriting research, a second-grade classroom which was involved in learning and/or practicing
manuscript writing, and location of a school district in close proximity to Chadron State College, Chadron, Nebraska. From this classroom population, the teacher and researcher used a table of random numbers to select five students who served as subjects. Students selected as subjects were in the first semester of second grade and had not repeated any grade. Further characteristics of the student subjects are presented in Table 1.

Table 1
Demographic Data of Participating Student Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age&lt;sup&gt;a&lt;/sup&gt;</th>
<th>IQ&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Sex</th>
<th>Grade</th>
<th>Race</th>
<th>SES&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8-1</td>
<td>--</td>
<td>Female</td>
<td>2</td>
<td>White</td>
<td>Middle-class</td>
</tr>
<tr>
<td>2</td>
<td>8-0</td>
<td>--</td>
<td>Male</td>
<td>2</td>
<td>White</td>
<td>Middle-class</td>
</tr>
<tr>
<td>3</td>
<td>8-3</td>
<td>--</td>
<td>Male</td>
<td>2</td>
<td>White</td>
<td>Middle-class</td>
</tr>
<tr>
<td>4</td>
<td>7-9</td>
<td>--</td>
<td>Male</td>
<td>2</td>
<td>White</td>
<td>Middle-class</td>
</tr>
<tr>
<td>5</td>
<td>7-11</td>
<td>--</td>
<td>Female</td>
<td>2</td>
<td>White</td>
<td>Middle-class</td>
</tr>
</tbody>
</table>

<sup>a</sup>Age is expressed in years and months.

<sup>b</sup>IQ data for three students was not approved by parents for use in this study. Therefore, no data are presented in the category.

<sup>c</sup>SES has been ascertained through teacher information.

Prior to participating in the program, these students were given a prerequisite skills assessment designed to determine whether each
student had the necessary prerequisite skills needed to competently use the experimental ECR program (see Appendix B). The assessment, a modified form of an instrument used by Johns (1976), was comprised of sentences containing some essential vocabulary used on the ECR cards and problems of skill application needed to evaluate manuscript letter formation as judged by transparent evaluative overlays (Helwig, et al., 1976).

The assessment was given to individual students in an area removed or secluded from the other students in the class. A student was seated at a table, with the experimenter seated to the right of the student. One prerequisite skills assessment form, a standard pencil with eraser, and a pen were used during each student's session. The experimenter allotted 1 to 2 minutes for casual conversation which typically included statements such as the following: (a) "I am glad that you are helping me today." (b) "I bet that you are a good teacher's helper." and (c) "What is your favorite thing to do in your classroom?" After this brief exchange, the experimenter told the student that there was a task she would like the student to do. The student was instructed to listen carefully to the directions, to ask questions about any directions not understood, and then to try to complete the task as well as he or she was able to do.

Each student was then given a prerequisite skills assessment form and a pencil. The experimenter proceeded with the following directions:

1. "Read the first sentence silently." (Experimenter pointed to the first sentence.)
2. "Print on the paper what the sentence asks you to do." (Experimenter pointed to where the student should make the written response.)

3. "Do every one of the numbers on this paper just like you did Number One. That means that you will read each sentence silently and do what the sentence asks you to do. Do you understand?" (If not, experimenter repeated, pointing out what the student did for sentences 1 and 2.)

4. "Now, if you cannot understand what a sentence is asking you to do because you cannot figure out one of the words in the sentence, then point to the word you cannot read. I will tell you the word."

5. "Do you understand? Tell me what I asked you to do." (If the student could not retell the directions, the experimenter repeated them.)

6. "After I tell you the word, then go ahead and mark on the paper what the sentence told you to do."

7. "If you can read all the words silently, but you do not understand what to mark down, then try reading the sentence aloud to me. If that does not help you, skip that number and go on to the next one."

8. "Do you understand? Tell me what I asked you to do." (If the student could not retell the directions, experimenter repeated them.)

9. "Now try your best and do all the numbers that you can."
The experimenter recorded all inappropriate responses by placing a checkmark (√) next to the appropriate number on a prerequisite skills assessment form which corresponded to each student's form. If the student needed to be told a word, that word was recorded in a space provided on the form as well. If, after having been given a word verbally, the student was able to respond appropriately to the specific task, no checkmark was placed next to the task. In other words, the only time a check was placed on the tally sheet was if the student could not correctly complete the directions. Words which the student could not read on the form were told to the student by the experimenter. These words were then recorded as information necessary to determine if each student could comprehend the written portion of the electronic cards.

When the assessment form was completed, the experimenter collected it, rewarded the student with the pencil she or he had used, thanked the student "for being a good helper" and sent the student back to participate in the regular classroom activities. This procedure was repeated until all of the students in the selected group had been assessed.

It was planned that if there were students who did not meet the minimal skill criterion indicated on the assessment, they did not participate in the program. All five students initially selected, however, met the criterion.

Therefore, final subject selection criteria was agreement between the teacher and experimenter of the choice of five students based upon
both a random selection from the classroom population and student performance on the prerequisite skills assessment at an 80% criterion level.

Teacher Subjects

Also considered as subjects were the 15 inservice and preservice teachers who volunteered to complete the social validity questionnaire. Ten of these persons had just completed their student teaching experiences at the K-3 elementary level. None had formally taught at the elementary level for which they had just finished training. All ten preservice teachers were white females. Five of the teachers were in their early 20s, two teachers were 26 years old and the other three teachers were 30, 35 and 39 years old respectively. The remaining five teacher subjects were currently teaching lower-grade elementary school in the Chadron Public School system. Three of the teachers were in their late 40s and had taught professionally for more than 10 years. The remaining two teachers were 29 and 39 years old respectively and had taught at least 8 years as public school elementary teachers. The 29 year-old was the teacher of the students who were selected to participate in the program.

Experimenter

The experimenter holds a Bachelor of Arts degree in secondary education and a Master of Arts degree in reading. In addition, she has attained the level of doctoral candidate in a program for the mildly handicapped with emphases in applied behavior analysis and clinical and remedial reading. Pertinent coursework relating to the proposed research included three courses in theory of applied behavior
analysis and research design and a clinical course using research
design and data collection. As a graduate research associate during
one year of the doctoral program, the experimenter conducted handwrit-
ing research for The Ohio State University under a grant from the
Zaner-Bloser Handwriting Company. The results of this research have
been published in two journal articles.

Setting

Two locations were considered as experimental settings. The
first location was the actual experimental training site in which stu-
dents learned to use the experimental program. The second setting was
a classroom location on the Chadron State College campus and was used
to present the social validity questionnaire and demonstration of the
experimental instructional program designed for use in this study.

Student Training Setting

The study took place in a small-town, public elementary school
located within a predominantly white, middle-class neighborhood.

The classroom measured approximately 6.7 m in width and 12.2 m
in length. Illumination for the room was provided by three large
windows reaching from 1.2 m above the floor to slightly less than .6 m
below the ceiling, and running the length of the west wall. In addi-
tion, the room was lighted by six large fluorescent fixtures.

The desks of the students were grouped to allow for ease of move-
ment within the room. Twelve desks were grouped together and arranged
so that six desks were touching end to end and parallel to and touching
six other desks. The remainder of the desks formed a horseshoe-shaped
perimeter around the twelve, with the open end of the horseshoe at the front of the room.

Interest stations such as a science wall, story-time and free-reading area, games and activities area, and geography station were well-defined within the classroom. In addition, the classroom teacher designated one corner of the classroom as the handwriting station (see Figure 1).

Equipment and materials in the handwriting corner included one student desk on which was placed an ECR, in this case, a Bell & Howell Language Master and headphones. To the left of the desk and running horizontally half the length of the wall was a bookshelf which was approximately 1 m high. Located on the bookshelf were eight "Clue" folders containing the ECR cards for use with the ECR and corresponding response sheets. Beside these materials were one ink stamp pad, two wooden-handled rubber-faced stamps, and one package of small, foil, multicolored, gummed stars. Directly in front and above the desk, attached to a bulletin board, five poster response prompts developed for the handwriting program were located. The posters were positioned so that the first and last posters of the series were tacked above the three middle posters of the series. The posters were arranged specifically in this manner to ensure that the three posters on which directions were printed would be at eye level of the seated student. Charting folders were kept near the ECR. The students worked at this handwriting corner throughout each condition of the study.
Figure 1. Floor plan of subjects' classroom.
Social Validity Questionnaire Setting

The 15 preservice and inservice teachers were assembled in a college classroom at Chadron State College. The room measured 12.5 m by 9 m and was arranged with 56 desks aligned in seven rows of eight desks each. Illumination for the room was provided by six fluorescent fixtures.

Materials

A significant amount of the time required for this study was spent on the conceptualization, construction, and presentation of the materials used as part of the treatment package. Both commercial and experimenter-made materials used in the study are listed and described.

Commercial Materials

Assorted Materials

Writing implement. Each student was provided with a standard No. 2 pencil with eraser which was used for all conditions of the study.

Writing paper. Number 1 writing paper was used for the study. The line-ruled paper contains a red baseline, along with a blue headline which also functions as the descender space line for letters written on the red baseline above it, and a blue mainline. Space size between each line measures 1.11 cm (see Appendix B).

Electronic card reader (ECR). A Language Master machine manufactured by the Bell & Howell Company (1978) was used for this study. This machine, similar to other ECRs, is designed to both record and play a magnetic tape strip along the bottom of electronic cards. When
these cards are inserted into the machine, the machine automatically moves the cards while "reading" the magnetic tape strip. The machine allows teachers and students to record on double tracks. In this manner, a teacher may present a lesson which can then be heard by the student via the tape strip. While the student is listening to the tape strip, the student can also study the visual space presented on the card. In addition, the student may press a student-record button which allows the student to record responses on the student track of the tape strip. This ECR allows, therefore, students to receive information through several modalities, that is, through auditory and visual sensory processes. Teachers can then present materials so that students not only learn information through several modalities, but can adapt the ECR and cards for any curricular subject area.

**ECR cards.** Two sets of 100, Extended Size, blank, *Bell & Howell Language Master System Cards* produced by Bell & Howell Audio-Visual Products Division were used in the study. Contents of each of the cards were developed as part of the set of teaching materials used to illustrate concepts needed to evaluate the letter formation of manuscript handwriting.

**Instructional material folders.** Eight colored folders with pockets were purchased to contain the ECR cards and corresponding response sheets. Each folder measured 24.8 cm x 31.44 cm. One pocket of each folder was vertically stapled from the center seam of the folder to ensure a more tightly-fitting pocket for the cards. Folder colors included the following: tan, red, yellow, green, orange, blue, white and black.
Recording stamps. Two small, wooden-handled, rubber-faced stamps depicting a rooster and a star were used both by the experimenter and the students participating in the study. The stamps were selected from The Creative Pictured Printer produced by The Creative Educational Society, 1932.

Ink stamp pad. One commercial black ink stamp pad was purchased for the study.

Recording stars. One package containing 325 gummed, foil stars was purchased for and used in the study.

Experimenter-Made Instructional Materials

Several sets of materials were designed and constructed as a part of an instructional package to teach students the basic concepts and proper use of the Helwig, et al., (1976) evaluative lowercase manuscript overlays. Included in the materials were the following: five poster response prompts, seven sets of ECR cards, seven sets of teaching-response sheets, and student self-charting folders. The construction of each of these sets of materials is described in detail.

Poster Response Prompts

A total of five poster response prompts were developed as a set of instructional materials. Three of the posters were specifically designed to provide immediate visual reminders of the correct procedures for the use of the ECR cards, the teaching-response sheets, and the self-recording folders. The remaining two posters were designed to add thematic interest and motivation to the program by utilizing two fictitious characters, "Sly, the Private Eye" and "The Mad
Scribbler," who functioned respectively as hero and villain of the instructional program. Each poster measured 35.56 cm x 55.88 cm and was constructed of heavyweight posterboard.

Both animal characters and all letters and numbers were first drawn or printed free-hand using a regular No. 2 lead pencil. After the preliminary sketching was completed, outlining and coloring of the animals was completed by using oil pastel chalks. Letters and numbers were filled in with thin-point, permanent-color marking pens designed for coloring glass, acetate, transparencies, china, and so forth. After each poster was finished, it was then sprayed with a chalk fixative. Since these posters were explained in a specific serial order to the children, the construction of each individual poster is described in the same order.

**Response prompt 1.** Poster 1 depicted a big-eyed, rather chubby fox casually dressed in orange trousers and a pale green and darker green striped T-shirt. On the front of this poster was printed in red letters: Sly, the Private Eye. Puffing a corncob pipe and wearing a lilac Sherlock Holmes-type cape, Sly is looking through a magnifying glass at what appears to be chicken tracks (see Figure 2).

**Response prompt 2.** Poster 2 (see Figure 3) was horizontally subdivided into two equal visual spaces measuring 27.94 cm x 35.56 cm. The top half of the poster contained a set of four printed directions. Beginning 2.54 cm below the top of the poster, four horizontal parallel lines were drawn, allowing 5.08 cm of space between each line. The contents of each line included a number which measured 5.08 cm
Figure 2. Poster 1 - Sly the Private Eye.
1. **READ THE CARD.**
2. **LISTEN.**
3. **ANSWER OUT LOUD.**
4. **LISTEN TO THE ANSWER.**

*Figure 3. Poster 2 - Sly looking for clues.*
high and approximately .64 cm wide, a number dot, and printed directions to the student. The height of each letter measured 3.81 cm, while the width of each stroke composing the letter measured slightly over .015 cm. Each number, number dot and direction was color-coded. The colors, in vertical order from the top to the bottom space, were the following: green, red, purple and brown. The directions read, in vertical order from the top to the bottom line, as follows:

1. **READ** THE CARD.
2. **LISTEN**.
3. **ANSWER** OUT LOUD.
4. **LISTEN** TO THE ANSWER.

The lower visual space of the poster contained an illustration which portrayed the fox sitting at the desk and operating an ECR machine. More specifically, the character was guiding an ECR card through the machine and examining the writing sample pictured on the card with a magnifying glass. Various elements composing the illustration included the following: a school desk top, **Language Master** machine, an ECR card, the seated animal figure, and a partial rendering of a desk chair. In addition, three one-word operating directions were printed on the top surface of the machine. These included the following: **START**, **LISTEN**, **SPEAK**. These directions were printed with a black pen in all capital letters with each letter measuring .64 cm in height and .08 cm wide. Each corresponding button found beside a direction was also colored with marking pen; the colors, in vertical order, were red, green and brown. The ECR card represented an exact duplicate of a card found in Clue Folder 1. The card measured 12.70 cm long and 4.13
cm wide and was divided into two vertical visual spaces. The left space contained printed information of thematic interest to the student. This information stated the following: "The Mad Scribbler leaves a trail of clues." The right visual space represented a section of lined writing paper, modeled after the Zaner-Bloser writing paper, and contained several letters. These letters were noticeably positioned askew on the paper (i.e., they were not sitting on the red baseline). Directly below the writing paper was drawn two red chicken tracks representing the trail of the Mad Scribbler.

**Response prompt 3.** Poster 3 (see Figure 4) was horizontally divided into two visual spaces. The top visual space measured 15.24 cm x 35.56 cm and was subdivided into three equal horizontal sections. Each section measured 5.08 cm x 35.56 cm and contained one number and number dot as well as a set of printed instructions. Within each set of instructions a key word was highlighted by using all capital letters. Height of the number and key word letter strokes measured 5.04 cm. The width of each number was .8 cm while each key word letter stroke measured approximately .47 cm wide. The remainder of the words comprising the directions were printed using lowercase letters with the exception being the last word of each instruction which was capitalized. The height of the lowercase letter strokes measured slightly over 2.54 cm while the width measured approximately .16 cm. The number, number dot and key word of each set of instructions was color-coded. The colors used for these instructions from top to bottom included orange, blue and green. The remainder of the material was
1. **READ** the Sheet.
2. **TRACE** the Answers.
3. **PUT** in your folder.

**CLUE SHEETS #1**
1. Trace the letters that do not sit on the red line.
2. Count the number of letters you traced and put the number in the purple box at the bottom.

*Figure 4. Poster 3 - Sly checking the clue sheet.*
printed in black. The three sets of instructions read, in vertical order, from top to bottom, as follows:

1. READ the sheet.

2. TRACE the answers.

3. PUT in your folder.

The remainder of the poster illustrated the tracing procedure required to complete a response sheet. In order to demonstrate this procedure, the picture showed an arm and paw of the fox. The paw was gripping a pencil, the point of which was touching a chicken track on a sample clue response sheet. The response sheet, similar to the actual sheets used by the children, contained sample directions along with sample responses which needed to be traced. The sample response sheet contained a title, two numbered directions, and three sets of four parallel lines (representing the Zaner-Bloser writing paper) with five dotted letters printed on each set of lines. All dotted letters not sitting on the red baseline had apparently already been traced by Sly to form solid letters. The letters composing the title of the sample response sheet were printed in purple ink using all capital letters.

The title read: CLUE SHEET #1. Letters composing the directions were printed in black. The directions read as follows:

1. TRACE THE LETTERS THAT DO NOT SIT ON THE RED LINE. (RED will be printed with red ink.)

2. COUNT THE NUMBER OF LETTERS YOU TRACED.

To maintain thematic interest in the clue trail, five chicken tracks were drawn on the poster. The tracks, which began at the lower right
corner of the poster, lead to the response sheet. One track actually appeared on the response sheet, while two other tracks appeared to lead the eye of the viewer away from the sheet and off the poster. Further evidence of the nefarious doings of the Mad Scribbler were indicated by one tail feather which had apparently been left behind after a quick exit by the culprit.

**Response prompt 4.** Poster 4 (see Figure 5) was horizontally divided into two visual spaces. The top visual space measured 30.48 cm x 35.56 cm and was subsequently divided into two approximately equal vertical visual spaces. The left space contained a three-quarter profile drawing of the head of the fox. The top right visual space contained two printed words placed one above the other which said: SLY SAYS. These two words were outlined and colored using a dark green marking pen. The lower half of the poster contained two printed directions representing the criterion for remaining at the present clue folder or the criterion for advancing to the next clue set. The directions stated the following:

1. **A ROOSTER ON YOUR CLUE SHEET = LISTEN TO SAME CARDS. DO CLUE SHEET.**
2. **STAR = GO TO NEXT SET!**

(The words rooster and star were not printed, but were the actual stamped figures each student could expect to see on their response sheet.) Coloring of the first direction (including the numbers, number dot and all words to the equal sign) was orange. The equal sign along with the remainder of the words of the first direction
Figure 9. Poster 4 - Sly gives directions for moving through the program.
was dark green. The number, number dot, and all words contained within the second direction were dark blue.

Response prompt 5. Poster 5 (see Figure 6) was the last poster of the series to be presented to the children. The poster solved the mystery of the unseen culprit behind the chicken scratches by revealing the Mad Scribbler, an arrogant-looking rooster. The rooster was perched on a fence rail. Coloring of the comb and gobbler was red, while the eyelid and beak was bright yellow. The neck, tail and wing feathers were shaded by using a variety of marking pen colors which included: yellow, red, green, brown, black and orange. The tips of the claws were shaded red and yellow. Printed diagonally across the top of the poster and against a background of orange and dark green chicken tracks were the words: MAD SCRIBBLER. Each letter measured approximately 5.72 cm high and .95 cm wide and was colored first in red and then shaded with dark green.

ECR Cards

A series of seven sets of ECR cards were developed as the primary instructional materials for the experimental program. Each of the seven sets of cards were used to illustrate a corresponding criterion developed by Helwig, et al., (1976) for evaluating correct manuscript letter strokes within the boundaries of an evaluative overlay. The cards, Extended Size, provided 8.89 cm x 35.56 cm of visual space and allowed for seven seconds of taping.

Initial preparation for the development of content material on the cards required that each card be vertically subdivided into two visual
Figure 6. Poster 5 - The Mad Scribbler.
spaces. The left visual space, which measured 20.32 cm x 8.26 cm, was reserved for printed instructions to the student. For further ease and clarity of printing, the left visual section was horizontally lined into six equal spaces. These spaces measured 1.27 cm each. The right visual space of the card, which measured 15.24 cm x 8.26 cm was reserved for actual visual presentation of writing samples and/or illustrations demonstrating the written information presented on the left side of each card.

All lettering of the cards was done free-hand using a fine point black felt-tip marking pen. Throughout the program, certain words found on each card were consistently emphasized by artistic elaboration and color-highlighting. For example, the word "look" and the name Mad Scribbler were always printed in this manner: LOOK (in black ink) and MAD SCRIBBLER (in red ink using squiggly lines). In addition, essential instructional words were always color-highlighted, and these highlighted words were continued from one clue set to the next. The number of color-highlighted words accumulated as the student progressed further into the program. This procedure was designed not only to appeal to the student, but to review all important instructional words as they occurred within each set. (These instructional words are listed separately within descriptions of each of the card sets.)

Pictorial representations on each card were developed by using a variety of materials. For example, simple drawings were sketched free-hand and then outlined and colored with thin-point marking pen and pastel oil chalks. More technical illustrations required using actual
writing paper No. 1, photocopied representations of the Helwig, et al., (1976) overlays, or portions of the actual transparent overlays themselves. The degree of technical complexity of each illustration generally corresponded to written information presented on each card. As the level of conceptual difficulty of the printed content increased, the illustrations became more technically detailed, as well.

In addition to the printed and pictorial information presented on each card, the experimenter also reiterated content information and feedback on the magnetic tape tracks of each card. Each student, therefore, was assured of receiving critical instructional information in one of three ways: printed textual material, pictorial or illustrative material, and auditory information.

The auditory track of each of the cards generally included a reiteration (and sometimes augmentation) of the textual material presented on the card. For example, the visual information printed on card 10 of Clue Set 1 included only the following: SET #1. However, the child was auditorily presented with this material: "This is Clue Card Set 1. Pay close attention and find out what the first clue is." If the printed textual material asked a question, then, on the track, the student heard the question, followed by a brief pause, and then heard the correct response. For example, card 17 of the first clue set stated the following printed information: LOOK AT THIS LETTER. CORRECT? The auditory track presented this: "Look at this letter. Correct? (At this point on the tape there occurred a pause, permitting the student to study the illustrative material.) No. It is not on the red line."
Each of the 154 cards that were prepared for the ECR program contained printed textual material with corresponding taped auditory track, and most cards (118) presented pictorial information, as well.

Content of the ECR cards was developed in order to teach students important concepts needed to use the Helwig, et al. (1976) evaluative overlays. These concepts were referred to as "clues." The clues included the following: letters sit on the baseline, letter strokes too long, letter strokes too short, intersection of strokes, closed curves, inside/outside, dotting strokes, incomplete strokes, and correct alignment of the overlay. Each clue set demonstrated one specific teaching concept with the exception of correct alignment of the letter overlay. This concept was introduced as an integral instructional portion of several clue sets.

Because of the quantity and variety of textual, illustrative, and auditory information provided by the ECR cards, each clue card set is discussed separately with regard to construction of the cards and the programming of content material included within each set.

**Clue Set 1.** Twenty-two cards were developed for use in this set (see Appendix C). Of this number, 12 cards were not related to information concerning the first teaching concept at all, but were primarily developed to reiterate thematic information presented to the children during the discussion of Posters 1 and 2. Cards 1-3 referred to the roles of the two characters, Sly and the Mad Scribbler, in the program. Cards 4-9 reproduced the information presented on Poster 2.

A sampling of transcriptions of several of these cards is provided, with both textual (t) and audio (a) information included. The
numbers beside each of the transcriptions refer to the actual card number. Therefore, the numbers listed are incomplete and may not be presented in chronological order.

1. (t) "Hello. My name is Sly. I am a fox! I am a private eye."
   (a) Same as above.

2. (t) "You are Sly's helper. You are looking for the Mad Scribbler."
   (a) Same as above.

4. (t) "Do four things to help Sly find clues."
   (a) "Do four things to help Sly find clues. One, two, three, four."

6. (t) "Listen to each card."
   (a) Same as above.

Card 10 titled the set; card 21 praised the children for working hard, and the final card (22) provided directions regarding the next step the children were to follow for correctly using the clue set.

21. (t) "You worked hard. Good job!"
   (a) "Good job! You worked hard and found out that Clue #1 states that letters must sit on the red line."

22. (t) "1. Open clue folder one. 2. Take out a clue sheet.
   3. Now put these cards away."
   (a) Same as above.

The remaining 10 cards of the set illustrated one clue, (i.e., the first teaching concept). The clue presented the information that "letters sit on the red line" (baseline).
11. (t) "Look at the pictures of the writing paper. Count the lines."
   (a) "Look at the picture of the writing paper. Count the lines. How many are there? (pause) There are four."
13. (t) "What color is line two?"
   (a) "What color is line two? (pause) Red."
14. (t) "All letters sit on line two. Letters sit on the red line."
   (a) "All letters sit on line two. Letters sit on the red line. Right?"
17. (t) "Look at this letter. Correct?"
   (a) "Look at this letter. Correct? (pause) No. It is not on the red line."
18. (t) "Is this letter sitting on the red line?"
   (a) "Is this letter sitting on the red line? (pause) It is."
19. (t) "Say the name of the letter not on the red line."
   (a) "Say the name of the letter not on the red line. (pause) R."

Refer to Appendix D for the complete transcription of the auditory tracks of cards found in Clue Set #1.

Only one word in this set was color-highlighted for instructional emphasis; that word was red (printed in red ink). Illustrations included in the first clue set were of two types: (a) simple line drawings or (b) segments of actual Zaner-Bloser writing paper pasted on each card.
Clue Set 2. Seventeen cards were prepared for use in this set (see Appendix E). Of the 17 cards, only two, (cards 1 and 17) did not present instructional material. These two cards respectively, titled the clue set and directed students to the next step in using the clue set. The remaining 15 cards instructed students on the second clue or teaching concept. This clue explained "strokes being inside/outside the letter frame (overlay letter boundaries)."

Examples of textual and auditory transcriptions from Clue Set 2 include the following:

3. (t) "The picture is called a letter frame."
   (a) Same as above.

6. (t) "The letter frame must match the lines of the writing paper all the way across."
   (a) Same as above.

7. (t) "Does the letter frame match the lines of the writing paper?"
   (a) "Does the letter frame match the lines of the writing paper? (pause) Yes it does."

8. (t) "Does the letter frame fit in this picture?"
   (a) "Does the letter frame fit the writing paper in this picture? (pause) No, the lines do not match."

9. (t) "A letter frame helps us to look to see if our letters are printed correctly."
   (a) Same as above.

11. (t) "Can part of a letter be outside the letter frame?"
(a) "Can part of a letter be outside the letter frame?  
(pause) No, that is wrong."

13. (t) "How about this letter? Is it correct?"
(a) "How about this letter. Is it correct? (pause) No."

Refer to Appendix F for the complete auditory transcription of this set.

Important instructional words that were color-highlighted in this set included the following: letter frame (red), match (purple), fit (purple), part (green), and outside (purple). Pictorial representations used in this clue set required cutting and taping segments of the commercial writing paper on cards, then cutting segments of photocopied evaluative transparencies, Helwig, et al. (1976), and aligning these segments over the writing paper.

**Clue Set 3.** This clue set (see Appendix G) contained 38 cards, more than twice the number developed for the previous set. There were several reasons for the expanded number of cards used in Clue Set 3. First, eight cards (3-10) reviewed information presented in Clue Sets 1 and 2. Because the students needed to remember each clue presented to them throughout the entire program (i.e., an accumulation and integration of each preceding clue was necessary in order to master the use of the overlays), the experimenter considered a brief review of preceding clues desirable. Some of the review cards are demonstrated in the following examples:

3. (t) "What was Clue 1?"
(a) Same as above.
5. (t) "What was Clue 2?"
   (a) Same as above.

6. (t) "Answer: Letter strokes must stay inside the letter frame."
   (a) "I hope you said letter strokes must be inside the letter frame."

7. (t) "How do we match the letter frame to the writing paper?"
   (a) "Do you remember how we match the letter frame to the writing paper?"

Secondly, as in previous sets, some cards were noninstructional and functioned as thematic links to preceding and successive clue sets (cards 1, 2, 10, 36, 37, and 38). This type of material included the following:

10. (t) "I hope you said 'yes'. If you said 'no' then the Mad Scribbler is tricking you!"

36. (t) "Did you learn what these cards told you?"
   (a) "This was a very long lesson. Did you learn everything the cards had to tell you?"

37. (t) "We will see if the Mad Scribbler tricks you."
   (a) "Well, we shall soon see if the Mad Scribbler can trick you."

Finally, a greater number of cards were needed to fully explain the new teaching concept and additional important instructional material. Selected samples from this clue set included the following:

11. (t) "Now, do you know that letters are made from strokes? Look."
(a) "Now let's learn something new. Do you know that letters are made from strokes?"

12. (t) "Letter strokes are the marks you make when you print a letter."
   (a) Same as above.

13. (t) "A letter stroke begins when your pencil first touches the paper. Look."
   (a) Same as above.

18. (t) "The letter is b. It has two strokes."
   (a) Same as above.

21. (t) "Is this a dotted stroke?"
   (a) "OK. Here is a question. Is this a dotted stroke?"

22. (t) "No! The picture shows a solid stroke."
   (a) "No, this is not a dotted stroke. The picture shows a solid stroke."

24. (t) "For all the pictures from now on, look only at the solid stroke."
   (a) "Now, for the rest of the pictures, look only at the solid stroke."

25. (t) "Look at the solid stroke in this letter frame. What is wrong?"
   (a) "Look at the solid stroke in this letter frame. What is wrong with it?"

26. (t) "The solid stroke is too long. It goes outside the letter frame."
   (a) Same as above.
31. (t) "Look at this letter stroke. Correct? (pause) Yes. It is not too long."
   (a) "Look. Is this correct? (pause) Yes. It is not too long."

32. (t) "Now. What is Clue 3?"
   (a) "Now all you good detectives, what is Clue 3?"

33. (t) "Clue is: A letter stroke is too long if it goes outside the letter frame."
   (a) Same as above.

Refer to Appendix H for the auditory transcriptions of Clue Set 3.

Generally, words color-highlighted in this clue set included the following: strokes (red), letter (blue), begins (red), touches (green), ends (green), off (blue), dotted (orange, green), solid (green, blue), too long (green), and outside (orange). Pictorial representations used in this clue set required the cutting and taping of commercial writing paper to the cards, then cutting segments of transparent overlays and aligning these segments over the writing paper. Transparent overlays were used to enhance generalization of alignment skill during the generalization probes of the experiment.

Clue Set 4. This clue set (see Appendix I) contained 33 cards and instructed the students on the teaching concept of "strokes too short."

As discussed in the previous clue set, several of the cards (2, 3, 4, 5, 6, 7 and 8) were developed to provide review of preceding material. Examples included the following:
2. (t) "Let's look at a letter frame."
   (a) "Do you remember the letter frame? Let's look at another one very carefully."

3. (t) "A letter frame shows us if the letter stroke is inside or outside."
   (a) "A letter frame can tell us many things. It can tell us if a letter stroke is inside or outside the letter frame."

5. (t) "Can the pencil stroke touch the letter frame inside and be correct? Look."
   (a) "Can a letter stroke line be touching inside the frame and still be correct? Look."

6. (t) "Yes! But the line can not go outside the letter frame. Look."
   (a) Same as above.

7. (t) "The letter frame can tell you that a letter stroke is too long."
   (a) "A letter frame can also tell us if a letter stroke is too long."

However, the remainder of the cards (with the exception of cards 32 and 33) introduced new material to the student. Examples of some very important cards in this set are included in the following:

12. (t) "Look carefully at the frame. What do you see?"
   (a) "Look carefully at the frame. What do you see inside it?"

13. (t) "you see little lines. Look."
   (a) Same as above.
14. (t) "These little lines are called hash marks."
   (a) Same as above.

15. (t) "Hash marks show you where a letter stroke must touch."
   (a) "Hash marks show us where a stroke must touch."

16. (t) "If a letter stroke does not touch the hash mark, the stroke is too short."
   (a) Same as above.

19. (t) "If the stroke touches the hash mark, the stroke is correct."
   (a) Same as above.

20. (t) "If the stroke goes through the hash mark, the stroke is correct."
   (a) Same as above.

21. (t) "What happens if the stroke goes through the hash mark and the frame? Look."
   (a) Same as above.

28. (t) "The stroke is correct. It touches and goes through the hash mark. It does not go through the frame."
   (a) Same as above.

31. (t) "The letter frame tells us a lot, doesn't it?"
   (a) "Wow! The letter frame really tells us a lot, doesn't it?"

Refer to Appendix J for transcription of the auditory track of Clue Set 4. Colors of important instructional words included in this set are presented here: short (purple), little (green), hash (orange), and correct (yellow). Pictorial representations used in this clue set
included some simple line drawings. However, many representations re-
quired the cutting and taping of commercial writing paper to the cards,
then cutting segments of transparent overlays and aligning these seg-
ments over the writing paper.

Clue Set 5. Eight cards were developed for the fifth clue set
(see Appendix K), and three of those cards (1, 2 and 8) were noninstruc-
tional. The teaching concept that the remaining five cards demonstrat-
ed concerned "dotting a letter stroke."

Contents of the five instructional cards included the following:
3. (t) "Well, here is your new clue: a dot is a letter stroke."
   (a) Same as above.
5. (t) "Look. Is this letter stroke inside the letter frame?
   (pause) No."
6. (t) "Is this correct? Look."
   (a) "Is this correct? Look. (pause) No, it is outside."
7. (t) "Is this stroke correct?"
   (a) "Is this stroke correct? (pause) No, it is outside."

Refer to Appendix L for the complete auditory transcription of
the clue cards in this set.

The only new instructional word color-highlighted in this set
was "dot", which was colored yellow. Illustrations in this clue set
used writing paper over which was aligned a segment of transparent
overlay (as discussed in earlier sets), and segments of writing paper
without an overlay.

Clue Set 6. Twenty-five cards (see Appendix M) were developed
to demonstrate the teaching concept of "circle strokes must be closed."
In addition, a concept of "strokes must touch" was also emphasized. Although this concept was not stated as one of those outlined by Helwig, et al. (1976), the experimenter considered it to be important and closely related to the concept of "closed circle strokes," therefore, it was included in this set.

Several of the more important clue cards within this set were represented by the following transcriptions:

2. (t) "Look at this letter. What is wrong?"
   (a) "Look at this letter. There is something wrong with it. What is wrong?"

3. (t) "Answer: the letter strokes do not touch each other."
   (a) Same as above.

7. (t) "Now, look at the letter strokes inside the letter frame."
   (a) Same as above.

8. (t) "Count the strokes. How many strokes are there?"
   (a) Same as above.

9. (t) "Do the strokes touch each other?"
   (a) Same as above.

11. (t) "Yes. The strokes touch each other and that is correct! Letter strokes must touch."
    (a) "Yes, they do, and that is correct. Letter strokes must touch."

14. (t) "Something is wrong with this letter! Look. What is wrong?"
(a) "Look at this letter. There is something wrong. What is wrong."

15. (t) "Answer: the circle stroke is open."
   (a) "Answer: the circle stroke is not closed."

16. (t) "A letter is not correct if the circle stroke is open."
   (a) Same as above.

17. (t) "Look inside the letter frame. Is the circle stroke closed?"
   (a) "Is the circle stroke open or closed?"

Refer to Appendix N for the complete set of transcriptions representing the tape tracks of cards included in Clue Set 6.

Additional instructional words color-highlighted in this set were these: circle (yellow), closed (orange), open (green), and touch (green). Pictorial illustrations used were line drawings, segments of commercial writing paper taped to the card, as well as writing paper with a segment of clear transparent overlay aligned over it.

**Clue Set 7.** The final clue set (see Appendix O) contained 11 cards developed to teach the concept of "missing or incomplete letter strokes."

Several samples of content material introduced in this clue set are included in the following:

2. (t) "Clue 7 says that letter strokes cannot have a part missing."
   (a) Same as above.

4. (t) "Stroke 2 is not there. It is missing. Look."
   (a) Same as above.
7. (t) "Look at this letter. Is there a letter stroke missing?"
   (a) Same as above.

8. (t) "No! Stroke number one is not missing. It is too short."
   (a) Same as above.

9. (t) "A stroke is missing if it is not there. Look."
   (a) Same as above.

10. (t) "A letter stroke is too short when the stroke does not touch a hash mark."
    (a) "A letter stroke is too short when the stroke is there, but does not touch a hash mark."

Refer to Appendix P for the complete set of audio transcriptions used in this clue set.

The one additional instructional word introduced in this set was the word **missing** which was colored with red marking pen.

**Teaching Response Sheets**

A series of seven response sheets (called clue sheets) was developed for use in the ECR program in order to provide the students with opportunities to practice the teaching concepts that were presented in each clue set. In addition, these response sheets furnished a measure whereby both the student and experimenter could determine the proficiency level at which the student was performing. These clue sheets directly corresponded to one of the seven teaching concepts specified in each of the clue sets (see Appendices Q, R, S, T, U, V, W).

Criterion level required for mastery of the teaching-response sheets in each set was set at 90% mastery level per trial. If a student mastered a teaching-response sheet in only one trial, then the
student moved on to the next clue set. If, however, mastery was not achieved with the initial attempt at a teaching-response sheet, the student was directed to repeat the entire set. This meant listening again to the clue cards and re-doing the corresponding teaching-response sheet. Regardless of the number of trials required, this procedure was repeated until the 90% criterion level was met.

Self-Charting Folders

All students participating in the study were given one regular rectangular manila folder measuring 22.86 cm x 29.85 cm. Except for the name of the student printed on the tab, the front and back of the folder was blank. When the folder was opened, it became a progress grid for recording trials-to-criterion level of each clue set.

The grids were constructed by drawing rectangles measuring 2.54 cm x 30.48 cm across the inside of the folder. Each rectangle was color-coded to match a clue folder or label of a clue folder. For example, the color of the lettering that labelled Clue Set #1 was purple. Therefore, the rectangle corresponding to that specific clue set was purple.

Each rectangle was then subdivided into six blocks representing six possible sessions or trials to meet criterion, although the grid could be extended in the instance that six sessions did not provide an adequate number of trials. Once all the rectangles were vertically divided, the resulting progress grid measured 20.32 cm x 30.48 cm and was composed of 48 blocks measuring 2.54 x 5.08 cm.

To the left of each of the seven long horizontal rectangles was printed the name of the clue folder to which the rectangle
corresponded. The printed name of the clue set was also color-coded (see Appendix X).

**Evaluable Materials**

**Trained-letter probe sheets.** Students were presented with a trained-letter sheet to be used as a model for copying lowercase manuscript letters. The paper was printed with two sets of parallel lines representing the headline, mainline, baseline, and descender space found on commercial writing paper. Space size between each line measured 1.11 cm.

The sheet contained 10 lowercase manuscript letters consisting of a 1 mm line weight, with five letters printed on each set of parallel lines. The 10 letters were selected from the Zaner-Bloser Creative Growth Manuscript Alphabet (1974). These 10 letters were trained letters in the sense that they were the letters used on the ECR cards to demonstrate to students the rules necessary to recognize correct and incorrect strokes (see Appendix Y).

**Untrained-letter probe sheets.** Students were also presented with one probe sheet containing the remaining 16 untrained letters of the alphabet. These remaining letters were considered to be untrained in that they were letters not previously used on the ECR cards to demonstrate correct and incorrect strokes according to the Helwig, et al. (1976) overlays (see Appendix Z).

**Evaluable overlays.** Transparent evaluative letter overlays developed by Helwig, et al. (1976) were used by each student to evaluate both prewritten letters as well as their own manuscript print letter strokes for containment within a 0 to 1 mm range. This range was a
width of 1 mm from the outside boundary line to the inside boundary line of the letter overlay. The overlays were modified so that only one letter parameter containment was found per overlay square (referred to as letter frames in the program). Therefore, 26 overlay frames corresponding to each trained and untrained letter were used for scoring.

Small slash marks allowed the overlay to be aligned over the copy paper, and the correctness of the manuscript letter or letter stroke was then evaluated according to whether the letter or letter strokes met the guidelines of the overlay. Helwig, et al. (1976) developed the following guidelines for using the overlay:

1. The stroke must remain within the parameters of the overlay.
2. Each stroke that was not a circle had to begin or end between the hash mark and the boundary line of the overlay.
3. Circle strokes in the letters a, b, d, g, o, p, q, and the top of the letter e had to be closed curves.
4. All strokes had to intersect each subsequent stroke except for the dots on the letters i and j.
5. No stroke could be missing.
6. The horizontal stroke in the letters t and f had to intersect and remain within the boundaries of the line of the overlay (see Appendices AA and BB for trained- and untrained-letter evaluative overlays).

**Recording sheets.** Both students and raters were required to evaluate probe samples of the students' own manuscript lowercase letters. Two recording sheets were developed to be used in conjunction with
the trained-letter and untrained-letter probe samples (see Appendices CC and DD).

All-clues measurement form. In addition to the recording sheets used for scoring the probe samples, students were also presented with a form which provided opportunities to identify correct and incorrect prewritten trained-letter strokes as defined by every rule presented in the ECR cards. Each session students were measured on this form until students had reached a 90% criterion level per form for three consecutive sessions (see Appendix EE).

All-clues measurement form recording key. A key was provided to facilitate interrater scoring of the all-clues measurement form completed by each student (see Appendix FF).

Procedures

The procedures section of this study addresses the following components: (a) definition and measurement of the dependent variable, (b) interrater agreement measures, (c) specification of the experimental design, (d) transfer effects of learned skills, (e) general procedures, (f) baseline, (g) instruction, and (h) social validity. Each section is presented and discussed separately.

Definition and Measurement of the Dependent Variable

Hersen and Barlow (1976) suggest that

... in the multiple baseline design across subjects a single targeted behavior serves as the primary focus of inquiry. However, there is no experimental contraindication to monitoring concurrent (untreated) behaviors as
well. Indeed, it is quite likely that the monitoring of concurrent behaviors will lead to additional findings of merit. (p. 228)

The dependent variables measured in this study were students' percentages of correct scoring responses on preprinted letters during baseline and during trials-to-criterion within each phase of intervention.

Concurrent (untreated) behaviors to be measured were the following:

1. number of trials-to-criterion required by each to achieve completion of each phase of the instructional treatment

2. amount of time, measured in minutes, required by each student to reach criterion scoring in the following tasks and levels:
   a. scoring teaching response sheets
   b. scoring trained and untrained probe letter sheets
   c. individual listening times required to complete each set of clue cards
   d. completion of the entire instructional package which included listening to the clue cards and completing teaching response sheets

3. transfer and reliability of students' learned scoring responses to trained letters in their own handwriting

4. transfer and reliability of students' learned scoring responses to untrained letters written in their own handwriting
5. attitudes of primary-grade elementary teachers toward general questions pertaining to handwriting and handwriting instruction

6. reactions of primary-grade elementary teachers to the experimental treatment package

**Interrater Agreement Measures**

Data collection and recording of reliability was obtained using interrater agreement measures on the following types of data: (a) accurate scoring of prewriten trained letters, (b) accurate scoring of trained- and untrained-letter probes (i.e., samples of the children's own handwriting on trained- and untrained-letter probe sheets), and (c) timing. Duration recording was used to establish the amount of minutes spent on various training tasks. Percentage data were used to measure correct/incorrect letter stroke formation.

Two naive evaluators were trained to use the 1 mm tolerance evaluative overlay used to measure correct/incorrect stroke responses from student handwriting samples. The experimenter explained the definition and procedures outlined by Helwig, et al. (1976) for correct use of the overlays. Evaluators were then trained to correctly use the recording sheets for trained- and untrained-letter probe samples as well as the scoring key for the all-clues measurement form. Evaluators were then trained on a total of 1,140 strokes until 85% agreement was reached on total responses with the experimenter. Interobserver agreement was calculated using the following formulas:

\[
\text{Number of Agreements} \div \left( \text{Number of Agreements} + \text{Number of Disagreements} \right) \times 100\% =
\]
Percentage of Agreement

Agreement measures were also obtained on strokes scored as correct and those scored as incorrect. Percentage of agreement for correct strokes was determined by dividing the total number of agreements for correct strokes, by the sum of the agreements and disagreements of correct strokes, and multiplying by one hundred. Percentage of agreement for incorrect strokes was assessed by dividing the total number of agreements for incorrect strokes by the sum of the agreements and disagreements of incorrect strokes, and multiplying by one hundred.

Observer agreement measures were obtained by the experimenter on each subject's sample during each of the following conditions: pre-baseline probes, baseline and each intervention component. Inter-agreement measures were obtained at least once during these conditions.

For Interrater agreement data on timing, the experimenter conducted an agreement check a minimum of one time during intervention phase per child. The subjects of the research timed each instructional session. The experimenter and the classroom teacher then timed both the child's responses per task and observed the child timing himself or herself once per condition.

Experimental Design and Program Evaluation

The delayed multiple baseline design (Heward, 1978) with probes and across subjects was used to determine whether a functional relationship existed between the independent and dependent variables.

The delayed baseline design is a variation of the basic multiple baseline across subjects (Baer, Wolf & Risley, 1968) which assumes that
two or more subjects (or groups) who share particular needs or behaviors will benefit from exposure to the same treatment. In this study, informal hypothesis suggested that changes in students' skills in accurately scoring letter strokes would occur only after intervention was implemented. Implementation of the intervention for all students does not occur simultaneously, but, rather at varied points of time. In effect, the staggered baselines and interventions became predictors of treatment efficacy.

In addition, the multiple baseline design alleviates the necessity of reversing a behavior to demonstrate functionality. Since the targeted behavior in this study was academic, it was not considered functionally feasible to reverse a learned behavior, that is, for purposes of experimental control to require a student to "unlearn" a behavior.

The delayed multiple baseline design was particularly appropriate for this study for several reasons. First, if additional students became "available" for the study, they could be added to the design. Secondly, in some cases, an intervention might require many sessions of baseline data collection. For the student(s) measured on later tiers, the repeated baseline collection can become monotonous, resulting in a lack of interest, lack of accurate responding, or, in the worst scenario, resulting in the student's complete withdrawal from the study. In addition, classroom teachers object to what they may view as a technique to systematically nullify objectives of good teaching (i.e., encouraging students' purposeful responding with opportunity for feedback). While these problems are certainly valid in an applied
setting, an experimental design, by its very nature, poses artificial (controlled) strictures on the method whereby data can be collected. The decision to use the delayed multiple baseline design was a compromise. Use of this design, by definition, resulted in a weakening of any functional relationship demonstrated. However, it was more feasible in the applied setting (see Figure 7).

Transfer Effects to Learned Skills

Response transfer was monitored by recording targeted responses emitted when no treatment or contingency had been applied. For instance, the targeted behavior of this study required recognition and application of several rules in order to be performed at a high competency level. Specific operants of topographical responses were reinforced systematically throughout various subphases of the intervention. While these responses were similar to placing, manipulating and scoring with the actual transparent overlay, at no time in the treatment phase did the subjects actually use the transparencies to evaluate letter strokes on their response sheets (with the exception of probes).

In addition, response transfer was monitored by recording targeted behaviors that occurred in the presence of stimuli other than those specific stimuli used to train the responses. In this instance, students were required to change the behavior of responding to pre-designed correct and incorrect letter strokes represented on their response sheets to copying their own letters and scoring them with a clear transparent overlay. In addition, this study presented students with opportunities to practice correct technique on selected letters of the alphabet. However, if a student were presented with letters
Figure 7. Hypothetical delayed multiple baseline design.
from the remainder of the alphabet would the student(s) be able to transfer learned rules and behavior to this new stimulus?

Maintenance and transfer of learned skills may not occur in and of itself without planning. For instance, the occurrence of response transfer may be facilitated through the use of a specific programming technique, rather than through a "train and hope" procedure (Baer, 1981). The technique selected for this study was "programming common stimuli" (Baer, 1981). In this case, common stimuli from trained to the untrained setting was emphasized. For example, students in this study were required to copy letters onto a lined writing paper of a particular width as part of a probe measure. They were also required to use a transparent overlay to evaluate letter strokes. Both the lined paper and actual transparencies were used as part of the instructional materials. Letters used to train the rules of the instructional package were the same letters students copied in their own handwriting and evaluated.

**General Procedures**

Implementation of the experimental program required each student participating in the program to spend daily time at the handwriting center. The time of day when each child used the equipment and materials was dependent upon the classroom academic work schedule and free time of the student.

Students were instructed to complete materials in their self-charting folders twice each day. The folders were then collected, self-charting of the folder verified, the contents of the folders
evaluated, and the folders returned to the students the subsequent day. This procedure was followed throughout the duration of data collection.

**Prebaseline Sessions**

Prior to collecting baseline data, the experimenter met with the students selected for the program for six introductory sessions. The sessions were designed to provide the participating students with information concerning the nature of the experimental program, as well as an introduction to the thematic and practical functions of the materials and equipment which were used by the students throughout the baseline and treatment portions of the study. These materials included the following: five poster prompts, the ECR and ECR cards, the teaching-response sets, the self-charting folders, the probe sheets, and the transparent overlays and recording sheets. In addition, the students were given a detailed oral explanation of the task commitments required from them, along with an explanation of the role of the experimenter during this phase.

For purposes of minimizing classroom disruption and maximizing opportunities for the participating students to ask questions and respond to statements and questions issued by the experimenter, students met for prebaseline sessions prior to class in the regular classroom. Contents of each session are discussed separately.

**Day 1.** At this time the experimenter introduced the program to the students, placing emphasis upon the importance of the children's role as helpers. The following statements indicate the manner in which the students' role was presented:
"Hello. My name is ______________. I am a teacher at Chadron State College. Have any of you seen or visited the college? Well, I need some helpers for a very special project. Your teacher has told me that you are very special people who would be good helpers. Now tell me, what are some things good helpers do? (Students supply various answers.) Yes, very nice answers! Good helpers especially listen and do what they are asked to do, don't they? Now, before I explain anything to you about the project, I want to be sure that you will be good helpers for Chadron State. Will you? (Students answer "yes.") Good! Now, will you tell me your names? (Students respond.) Thank you. Please watch closely and listen carefully.

The experimenter exhibited Poster 1 (Figure 2) to the children and discussed both the thematic role of the character depicted, as well as the practical function of all of the posters. For example, the experimenter presented the first poster to the group and pointed to various items illustrated in the poster (such as the magnifying glass). Comments were occasioned from the students concerning the nature and purpose of a magnifying glass. When the students suggested words such as "detective" and "clues" in conjunction with the discussion of the poster, the experimenter provided a brief story to the children explaining the character of Sly, the Private Eye and the Mad Scribbler (see Appendix GG). Clues were offered by both the experimenter and the children in an attempt to define the writing behavior of "scribblers." These clues included such characteristics as "letters not sitting on the line of the writing paper," "circle strokes not
closed," and others. Essentially, the scribbling characteristics were defined as those teaching concepts which the students later heard explained on the ECR cards.

This concluded the first instructional session which lasted approximately 15-20 minutes. The students were then thanked and dismissed to their regular classroom activities. This dismissal procedure was followed throughout the first six sessions of pre-baseline instruction.

Day 2. During the second day of instruction, the experimenter explained Poster 2 (see Figure 3) of the five poster sequence, taking particular care to point out to the students that the posters were numbered and should be consulted in their sequenced order.

In addition, the experimenter exhibited the seven folders containing the seven teaching card sets/concepts (alias Sly's clues) which were used by the students during the treatment phase of the program. The students were instructed that each folder contained both ECR cards and corresponding response sheets. However, during this session, only the ECR cards were discussed (see Appendix HH). Following these explanations, the experimenter modeled the correct use of the ECR machine by selecting a few introductory cards from the first concept folder for demonstration. The students were reminded that the cards were to help them learn to recognize clues that could aid Sly in locating the Mad Scribbler and that it was important that each student watch, listen to, and learn each set of clues as carefully as possible. Discussion ended the second prebaseline session which lasted approximately 20 minutes.
Day 3. The experimenter introduced the session by requesting the students to briefly review information presented at the two previous sessions. When the experimenter was satisfied that the children had comprehended the necessary prior information, she proceeded with the presentation of additional information. At this point, the seven concept folders were again shown to the students with special emphasis placed on the discussion of the student response sheets contained within each folder. This explanation (see Appendix II) was augmented by visually inspecting Poster 3 (see Figure 4) which depicted Sly actually marking a response sheet. At the termination of the explanation, the experimenter requested each student to briefly retell the task expectation required in using the student response sheet. This concluded the third instructional session.

Day 4. The experimenter briefly reviewed the new information given the previous day. Additional new information provided during this session concerned the marking of the response sheets by the experimenter and an explanation of the student self-charting progress folders (see Appendix JJ). At this time, each student was given a progress folder. To supplement the verbal explanation of the self-charting procedures, the experimenter presented Poster 4 (see Figure 5) as well as a sample of a stamped progress chart (see Appendix X). After the explanation by the experimenter, one student was requested to read the instructions printed on the poster and then to explain in his own words what the instructions meant. Another student was selected to review the correct procedure for marking the progress chart. Once the experimenter was satisfied that the group had no questions
and comprehended the task, the group was dismissed. Total time required for this session was approximately 20 minutes.

Day 5. The experimenter presented Posters 1 through 4 in sequential order and requested volunteers from the group to summarize the thematic and functional relevance of each poster. In addition, procedures for operating the ECR cards were reviewed. Special emphasis was placed on a correct review of procedures regarding the marking of the student response sheets and student self-charting progress folders. When the experimenter was satisfied that the students demonstrated a thorough understanding of the procedures and materials to be used in the treatment phase of the study, the experimenter finally revealed to the students Poster 5 (see Figure 6). Until that point, none of the students had seen the face or form of the Mad Scribbler, the culprit responsible for the "chicken scratch" (i.e., poor handwriting scribbles) scattered across all the posters. After listening to several minutes of comments from the students concerning the looks and writing habits of this character, the experimenter informed the students that they "now are officially helpers of Sly, the Private Eye" and would shortly begin work on the project. At this time, the experimenter explained when each child could begin the project (Appendix KK). Total time required for this session was approximately 20-30 minutes.

Day 6. All students were instructed to prepare for the program and were told to check their folders for directions every morning and every lunch period. The experimenter explained that there would be a note paper-clipped to each folder telling each student that day's
assignments. The experimenter then showed and explained each type of note that a student might receive. The notes were explained in the following manner:

1. The experimenter showed a slip of paper with an empty circle drawn on it. "If you see this note, this means you have nothing to do for Sly today. See, the empty circle means zero, and zero means nothing. That's easy to remember, isn't it?"

2. The experimenter selected a second note. It had a circle with a "1" printed inside it. "What is this?" (The experimenter waited for an appropriate response.) She then explained that if this note appeared in the folder, there would be only one task for the child to do. The experimenter picked up the prewritten manuscript all-clues measurement form (Appendix EE) and showed that paper to the students.

"When you see this note paper-clipped to your folder, this sheet will be in your folder. (Experimenter pointed.) You will only need to read and follow directions on this sheet. If you have questions, you must not ask your teacher or your friends or anyone to help you. Just do the best that you can. Does everyone understand this? If you can't do any of it, or just part of it, don't worry. You are not being graded, just checked to see what you know and can do without help. You will all be asked to fill out these sheets for several days. Again, don't be unhappy if you are not sure
about what you are doing. Just keep doing your best every
day until you receive another note."

3. The experimenter exhibited a third note. This note had a
circle with a "3" printed inside it. The experimenter ex-
plained the following: "When you see this note, your folder
will have this sheet (Appendix EE), this sheet (Appendix Y),
and this sheet (Appendix Z) inside it. (Experimenter placed
each sheet on a table in front of the group.) Now, we have
already talked about how we do this sheet (Appendix EE),
haven't we? What do we do with these two sheets?"

"First, you will take the piece of writing paper (Appendix B)
also in your folder and you will copy the letters you see
here on your writing paper. You will copy these letters (ex-
perimenter pointed to Appendix Y) on one side of the writing
paper, and you will copy these letters (Appendix Z) on the
other side of the paper." (Experimenter turned over the writ-
ing paper.)

"What does 'copy' mean? (Experimenter waited for responses
and reinforced any close approximations.) To copy something
means to try to print it just like the printed letters you
see here. Does everyone understand? The letters you printed
should be the same size and on the same place on your paper
as these letters."

"Once you have copied the letters you will find two boxes on
the handwriting desk. (Experimenter picked up the boxes and
opened them.) Inside each box you will find these letter
frames. What do you think you will do with these? (Experimenter smiled and waited for guesses.) You will see how well your letters fit inside these frames. See? (Experimenter placed an overlay over a model letter.) Each one of you pick out a frame and put it on the right letter. (Students selected an overlay and placed it on an appropriate letter on the model letter sheet.) Yes, that's how you do it, except that you will put the frames over your own printed letters. Do you understand?" (Experimenter made certain everyone understood.)

"Really, what you are doing is checking to see if your letter, or a part of your letter fits correctly. This is what your teachers do, when they grade your printing, don't they? As you place your frame over your letter you will mark on one of these two sheets (Appendices CC and DD) what part or parts of your letter is correct. Now it might not be easy for you to decide if your letter is correct. Just do your best. You are not being graded on this by your teacher. You are just seeing how well you can do before Sly teaches you all the rules, alright?"

"Now, let's review what your notes mean and what you are supposed to do when you receive them." (Experimenter and students reviewed all the notes. Students were selected to explain procedures that accompanied each note.)

This summary ended the session which lasted approximately 20-30 minutes.
**Baseline**

On the first session of baseline, each subject was presented with an individual self-charting folder (see Appendix X) containing the following materials: one piece of writing paper, one trained-letter and one untrained-letter probe sheet, one trained-letter and one untrained-letter recording sheet, and one all-clues measurement form.

The two probe measures collected during the initial session required students to copy trained letters (see Appendix Y) and untrained letters (see Appendix Z) and then to evaluate their own print by using the trained- and untrained-letter overlays (see Appendices AA and BB). Students' perceptions of their own correct and incorrect letter strokes were then self-recorded on the appropriate recording sheets (see Appendices CC and DD). These two probe measures were for purposes of assessment of transfer of skills.

The all-clues measurement form (see Appendix EE) was presented to the students during each session of baseline data collection, and provided opportunity for students to recognize and respond to pre-printed correct and incorrect letter strokes within a photocopied letter frame. After the initial session, students received only the all-clues measurement form in their self-charting folder.

Baseline data collection was begun simultaneously (i.e., on the same day) on two students. Baseline was collected until one of the student's data indicated stability or a limited range of variability (Sidman, 1960) at which time, the intervention was applied. Baseline data collection was continued on Student 2 until criterion level had been reached in the intervention phase with the first student. The
remainder of the students participating in the program were success-
ively added to the delayed multiple baseline design in exactly the
manner described above.

Several students were responding to baseline measures concur-
rently. However, since baseline was instituted on each student at stag-
gerated sessions, the length of baseline phases per student varied. A
minimum of four baseline data points were obtained prior to the intro-
duction of the treatment. Students received no feedback on either the
probes or the all-clues measurement form throughout baseline.

**Instruction**

Baseline data of each student and the design format of the exper-
imenter indicated when intervention should be applied. At the appro-
priate time, each student was reminded to use the poster as prompts
for correct procedure and began the ECR card sets with accompanying
response sheets, and self-charting components of the experiment.
Procedures followed were those described during the prebaseline ses-
sions.

Data were collected during each session on the all-clues measure-
ment form (see Appendix EE) until a 90% criterion level was reached
on the form for three consecutive sessions. In addition, probe data
(see Appendices Y and Z) were collected during the initial session of
intervention as well as prior to listening to each of the other six
clue sets. Probe data was, therefore, collected seven times during
intervention. Procedures used to collect the data were identical to
those described in the Baseline section of this chapter. As in
baseline, no feedback was provided on the probe data. Students were provided feedback in the form of a rooster or star on their all-clues measurement form. This feedback signified to the student if he or she could progress to the next clue card set (refer to Appendices HH, II, JJ and KK for a more detailed explanation of the procedure).

Social Validity

This study was designed to evaluate whether the treatment package could promote reliable self-recording of manuscript strokes by second-grade students.

However, it was important to note whether such a package was viewed as (a) accurate, (b) valuable, and (c) feasible by the classroom teacher. Therefore, a validity questionnaire was administered to 15 primary-grade elementary teachers. The experimenter first explained the purpose of the study and then demonstrated the treatment package. At the conclusion of the demonstration, the experimenter distributed the social validity questionnaire.

The questionnaire was divided into three sections. The first section queried teachers on general attitudes relating to handwriting and handwriting instruction. The second section surveyed teachers' responses to the particular handwriting treatment package used in this study. Both of these sections used a scale similar to Likert responses. The final section of the questionnaire was composed of two open-ended statements to which the teachers were asked to respond in writing. The questionnaire was completed by teachers anonymously. Results of the questionnaire were calculated using percentage data.
for the two sections composed of statements/questions. The open-ended questions were summarized in textual form.
CHAPTER IV
RESULTS AND ANALYSIS OF
EXPERIMENTAL DATA

The purpose of the present study was to determine whether a specific treatment package consisting of three components could be designed to teach students to reliably score lowercase manuscript letter strokes independent of teacher assistance. Chapter IV presents the results of this study. Data shown in this chapter were examined through use of a delayed multiple baseline design.

Reliability in Measurement of Dependent Variables

The following formula was used to measure interrater agreement on the dependent variables:

\[
\frac{\text{Number of Agreements}}{\text{Number of Agreements Plus Number of Disagreements}} \times 100\% = \text{Percentage of Agreement}
\]

Using this formula, interrater agreement was calculated for total responses as well as for correct and incorrect responses. Percentage of agreement for correct strokes was determined by dividing the total number of agreements for correct strokes, by the sum of the agreements and disagreements of correct strokes, and multiplying by one hundred. Percentage of agreement for incorrect strokes was determined by dividing
the total number of agreements for incorrect strokes by the number of agreements plus disagreements for incorrect strokes.

The percentage of agreement for the following dependent variables was computed: (a) accurate scoring of prewritten trained letters, (b) accurate scoring of children's own handwriting (for both trained and untrained letters), and (c) timing.

Percentage data were used to evaluate variables (a) and (b). For these two variables reliability was checked every session for all students throughout baseline and intervention. Data recorded by the experimenter and the raters showed 100% agreement across all sessions and students for scoring of prewritten trained letters.

In addition, interrater agreement was calculated for trained-letter and untrained-letter probe samples collected during baseline and intervention conditions. A total of 300 trained-letter strokes were scored from samples from both conditions. Lowest percentage of agreement for accurate strokes recorded was 58%, while the highest percentage of agreement was 100%. Mean percentage of interrater agreement for accurate strokes was 93%. Mean percentage of agreement for inaccurate trained-letter strokes was 89%, with the lowest agreement percentage recorded as 66% and the highest percentage of agreement recorded as 100%. A total of 500 untrained-letter strokes were also scored from samples collected during both conditions of the study. The lowest percentage of agreement recorded for accurate strokes was 72%, while the highest agreement of percentage recorded was 100%. Mean percentage of accurate strokes scored was 91%. Mean percentage of interrater agreement for accurate strokes was 86%, with the lowest
percentage of agreement recorded at 62%; the highest percentage was recorded as 100%.

Duration recording was used to establish the amount of minutes spent on training tasks. The rater checked data on timing once per condition for each student. Reliability was 100%.

Research Questions

Research Question Number One

Research Question Number One was: "Will an electronic card reader self-instructional program, designed to be used independently by second grade students, effectively teach reliable scoring of prewritten lowercase manuscript letter strokes?"

Student One

As indicated by Figure 8, the initial percentage of correct responses on the prewritten dependent variable measure for Student One was 57.5%. Baseline mean for correct responses was 54.2%. At the outset of intervention (i.e., the 7th session) accuracy of responding decreased to 45%. However, by the end of the training program percentage of correct responding was at or above 90%. The mean percentage during intervention for Student One was recorded as 71.5% correct responding.

Student Two

The mean percentage of accurate scoring for Student Two during baseline was measured as 35.7%. Lowest accurate scoring percentage recorded during baseline condition was measured as 30%, while the highest baseline percentage was measured at 40%. After Student Two began
Figure 8. Delayed multiple baseline design across subjects with probes.
intervention, accuracy of recording increased from a low percentage of 35%, to a high of 100%. Intervention mean was computed to be 70.5%. The increase from the lowest to the highest percentage during intervention required 11 sessions (see Figure 8).

**Student Three**

Student Three was able to accurately score 45% of the prewritten lowercase manuscript letters during the initial session of baseline. The lowest percentage of correctly scored letters during baseline was 40%, while the highest score was recorded as 45%. The baseline mean for percent of correct scoring responses was calculated to be 43.1% as indicated in Figure 8, the student began intervention with a correct recording score of 55% which increased after 10 sessions to 100% accurate scoring. Intervention mean for correctly scored responses was 76%.

**Student Four**

As depicted in Figure 8, Student Four began baseline conditions by scoring 52.5% correct responses which then increased to a high of 70% correct responses during this condition. The baseline mean for Student Four was 59.4% correct responding. At the initiation of intervention, correct scoring response was measured as 75%, which was later increased to 100%. This score was maintained over the last four sessions. The intervention mean was 90.5%.

**Student Five**

Student Five began baseline by responding correctly to 50% of the letter strokes indicated on the prewritten trained-letter sheet. At
the end of baseline, correct responding was measured at 52.5%. Baseline mean was computed to be 54%. Intervention began with a 60% score of accurate responding which increased to 100%. This level of responding was maintained over the last two sessions. Mean for correct responding during intervention was computed to be 80%. See Figure 8.

Table 2 presents baseline and intervention means for each student, as well as the percentage of increase between the two conditions. The group mean increase in intervention performance over that of baseline was 29.9%.

Table 2
Mean Performance Scores for Scoring of Prewritten Lowercase Manuscript Letter Strokes

<table>
<thead>
<tr>
<th>Student</th>
<th>Baseline</th>
<th>Intervention</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>54.2%</td>
<td>71.5%</td>
<td>17.3%</td>
</tr>
<tr>
<td>2</td>
<td>35.7%</td>
<td>70.5%</td>
<td>34.8%</td>
</tr>
<tr>
<td>3</td>
<td>43.1%</td>
<td>76.0%</td>
<td>40.3%</td>
</tr>
<tr>
<td>4</td>
<td>59.4%</td>
<td>90.5%</td>
<td>31.1%</td>
</tr>
<tr>
<td>5</td>
<td>54.0%</td>
<td>80.0%</td>
<td>26.0%</td>
</tr>
</tbody>
</table>

Research Question Number Two

Research Question Number Two asked: "How many trials to criterion will be required by each student to achieve completion of each phase of the instructional treatment?"
Intervention was, in effect, one treatment package comprised of clue sets, a self-charting folder, and clue set response sheets. However, the experimenter considered an analysis of the number of trials per clue set to be an important factor in determining time effectiveness for students and teachers who might wish to use the program. In Table 3, data are presented for the individual students giving the number of trials-to-completion to reach criterion. In addition, a group mean was calculated to indicate the number of trials required per each set.

Table 3

Number of Attempts Required to Achieve 90% Criterion Level

<table>
<thead>
<tr>
<th>Student</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

\[ \bar{x} \]

| Group   | 1.2 | 1.8 | 1.4 | 2.6 | 1.2 | 1.0 | 1.0 |
Research Question Number Three

Research Question Number Three states: "How much time, measured in minutes, will be required by each student to reach criterion scoring for each of the following levels and tasks:

a. Scoring teaching - response sheets
b. Scoring trained and untrained probe letter sheets
c. Individual listening times required to complete each set of clue cards
d. Completing the entire instructional package which included listening to the clue cards and completing teaching response sheets

Students were required to self-record the number of minutes necessary to complete various components of the experimental treatment condition.

In the first component, students recorded the amount of time measured in minutes required to complete the scoring of each teaching response sheet. Each student took one minute or less to complete the task.

In scoring both trained-letter probe samples and untrained-letter probe samples, again students were asked to record the amount of time required to self-evaluate and self-record each letter stroke. The time required was minimal. The trained-letter probe consisted of 10 letters and required no more than five minutes for students to self-evaluate and self-record on their recording sheets. Self-evaluation and self-recording of the untrained letters fell into the same time frame.
Listening times required to complete each set of clue cards are shown in Table 4.

Table 4

<table>
<thead>
<tr>
<th>Student</th>
<th>1</th>
<th>2</th>
<th>3(^b)</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1(^a)</td>
<td>2</td>
<td>3(^b)</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>24</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>3</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>--</td>
</tr>
</tbody>
</table>

\(^a\)Numerals indicate number of minutes

\(^b\)Where more than one numeral is given for a clue set, this indicates the student required more than one trial to reach the pre-established criterion.
Group means for clue sets were as follows: Set 1 = 1 minute; Set 2 = 3.6 minutes; Set 3 = 4.6 minutes; Set 4 = 8.6 minutes; Set 5 = 2 minutes; Set 6 = 1 minute; and Set 7 = 1 minute. The overall group mean for listening times for all clue sets in the instructional package was 22.6 minutes.

Completion of the instructional package was defined as including each time students were required to listen to a clue set, as well as number of attempts to complete a teaching response sheet. In several instances, students did not meet scoring response criterion when scoring teaching response sheets. In that case, they were required to listen again to the clue card sets and redo the appropriate response sheet. Even with the repetition of listening to card sets again and redoing a response sheet, total instructional time required to complete the package was less than 40 minutes. Students One and Five required 35 minutes; Students Two and Four required 33 minutes. Student Three required 34 minutes to complete the entire package. Mean completion time for the group was 34 minutes.

Research Question Number Four

Research Question Number Four was: "Will students be able to reliably score their own handwriting on letters they were trained on in the instructional package of prewritten letters?"

Students evaluated their own handwriting samples as a result of two separate copying tasks required in both conditions of the experiment. The first copying task required students to copy 10 model letters presented to them on a model letter sheet. These letters were also used to demonstrate the rules (provided by the electronic card
reader sets) necessary to evaluate their own manuscript letter formation. These samples were collected as probe data. During baseline, the initial probe was collected prior to any other data. Results indicate that students' scores ranged from 15% accuracy to 40% accuracy in self-evaluating and self-recording of trained letters. Group mean accuracy of self-evaluation and self-recording was 31%. During the intervention condition, a probe measure was taken prior to each clue set instructional package. Therefore, probe measures were collected on each student seven times during intervention. Data are presented in Table 5 for each probe session for each student.

Table 5

Percentage of Accuracy on Students' Self-scoring of Correct Letter Strokes as Measured by Trained Letter Probes

<table>
<thead>
<tr>
<th>Student</th>
<th>B</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35%</td>
<td>55%</td>
<td>60%</td>
<td>75%</td>
<td>80%</td>
<td>90%</td>
<td>90%</td>
<td>90%</td>
</tr>
<tr>
<td>2</td>
<td>25%</td>
<td>35%</td>
<td>35%</td>
<td>45%</td>
<td>65%</td>
<td>80%</td>
<td>80%</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>75%</td>
<td>80%</td>
<td>85%</td>
<td>85%</td>
</tr>
<tr>
<td>4</td>
<td>40%</td>
<td>45%</td>
<td>55%</td>
<td>75%</td>
<td>95%</td>
<td>85%</td>
<td>85%</td>
<td>80%</td>
</tr>
<tr>
<td>5</td>
<td>15%</td>
<td>30%</td>
<td>40%</td>
<td>45%</td>
<td>75%</td>
<td>85%</td>
<td>80%</td>
<td>85%</td>
</tr>
</tbody>
</table>

Note. B refers to the baseline condition. Numerals 1 through 7 refer to data collected during clue card sequences in the intervention condition.
Research Question Number Five

Research Question Number Five asked: "Will students be able to reliably score their own handwriting on letters they were not trained on in the instructional package of prewritten letters?"

The prewritten instructional package used 10 letters in training students to evaluate correct characteristics of manuscript letters. Research Question Number Four asked whether students could transfer this knowledge from the prewritten letters to the same 10 letters in their own handwriting. Research Question Number Five extended this transfer question and asked whether characteristics they had learned to identify in the prewritten letters they were trained with (e.g., "Does the letter sit on the line?" "Are letter strokes too short?", etc.) would be identified on letters in their own handwriting they had not been trained with. Data were collected for this question in the same manner as for Research Question Number Four but on the remaining 16 letters of the alphabet that had not been trained in the electronic card reader instructional treatment. See Table 6 for results of each probe session for each student.

Research Questions Numbers Six and Seven

Research Question Number Six asked: "What attitudes will primary grade elementary teachers demonstrate with regard to general questions pertaining to handwriting and handwriting instruction?"

Research Question Number Seven stated: "Will primary grade elementary teachers react positively to the treatment package?"

Five teachers and 10 preservice student teachers in their final semester of a college teacher-training program were administered a
Table 6

Percentage of Accuracy on Students' Self-scoring of Correct Letters as Measured by Untrained Letter Probes

<table>
<thead>
<tr>
<th>Student</th>
<th>Accuracy Data Probes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
</tr>
<tr>
<td>1</td>
<td>35%</td>
</tr>
<tr>
<td>2</td>
<td>29%</td>
</tr>
<tr>
<td>3</td>
<td>41%</td>
</tr>
<tr>
<td>4</td>
<td>24%</td>
</tr>
<tr>
<td>5</td>
<td>29%</td>
</tr>
</tbody>
</table>

Note: B refers to the baseline condition. Numerals 1 through 7 refer to data collected during clue card sequences in the intervention condition.

Social validity questionnaire. Of the 15 individuals surveyed, all responded in written form to the questionnaire. The forms were completed anonymously. A scale similar to a Likert scale was used for the marking procedure with the number 1 indicating "Very Little" through number 5 indicating "Very Much." In addition, there were two open-ended questions. See Appendix MM for a copy of the questionnaire.

The social validity questionnaire was divided into three parts. Part I queried teachers on their views regarding handwriting in general and handwriting instruction. Teachers responded using a Likert scale format. The following statements were used:
Statement 1: Handwriting is an important academic skills area at the elementary level.

Statement 2: I feel competent to teach manuscript printing.

Statement 3: I feel that good printing is a skill that I can visually evaluate.

Statement 4: I am familiar with several different types of programming to teach handwriting skills.

Statement 5: I will teach handwriting the way I was taught this skill.

Statement 6: I am familiar with various scales for use in evaluating manuscript printing.

Statement 7: I feel that skills/learning centers are beneficial in an elementary classroom.

Statement 8: I will use self-instructional programming in my classroom.

Statement 9: If self-instructional materials are available for students, I would use them.

Statement 10: I think teaching students to evaluate their own printing is beneficial.

Teacher's responses to Part I are seen in Table 7.

Part II of the social validity questionnaire was designed to respond to Research Question Number 7. Again teachers responded to statements presented in a Likert scale format. The following statements were used:

Statement 1: Do you feel that students would enjoy working on this program?
Table 7

Percentage of Teacher Responses to Statements Pertaining to Handwriting and Handwriting Instruction

<table>
<thead>
<tr>
<th>Statement</th>
<th>Rating Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>33%</td>
</tr>
<tr>
<td>6</td>
<td>40%</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Note. Percentages have been rounded to the nearest whole number.

Statement 2: Do you feel that the program is cost efficient in terms of classroom instructional time?

Statement 3: I like the electronic card reader machine format.

Statement 4: I feel that the program would be motivating to my students.
Statement 5: The prerequisite skills needed for this program seem appropriate for the second-semester first grade student or the second grade student.

Statement 6: I would rate the following components to the whole program as:

a. poster response prompts
b. Clue Set #1
c. Clue Set #2
d. Clue Set #3
e. Clue Set #4
f. Clue Set #5
g. Clue Set #6

Statement 7: I think that it is important for students to chart their own progress.

Statement 8: I view students using the letter frames to evaluate their own letter strokes as having importance.

See Table 8 for teachers responses to Part II of the questionnaire.

Part III gave teachers an opportunity to answer these open-ended questions:

1. I like this/these aspect(s) of the program: _______________________
   _______________________________________________________________
   _______________________________________________________________

2. I would improve the program by _________________________________
   _______________________________________________________________
   _______________________________________________________________
Table 8

Percentage of Teacher Responses to Statements Concerning Use and Components of the Electronic Card Reader Program

<table>
<thead>
<tr>
<th>Statement</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>13%</td>
<td>33%</td>
<td>53%</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>20%</td>
<td>40%</td>
<td>13%</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>13%</td>
<td>47%</td>
<td>40%</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>7%</td>
<td>53%</td>
<td>40%</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>6a</td>
<td></td>
<td></td>
<td></td>
<td>13%</td>
<td>86%</td>
</tr>
<tr>
<td>b</td>
<td></td>
<td></td>
<td></td>
<td>7%</td>
<td>93%</td>
</tr>
<tr>
<td>c</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>d</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>e</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>f</td>
<td></td>
<td></td>
<td></td>
<td>7%</td>
<td>93%</td>
</tr>
<tr>
<td>g</td>
<td></td>
<td></td>
<td></td>
<td>13%</td>
<td>87%</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>7%</td>
<td>13%</td>
<td>80%</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>13%</td>
<td>33%</td>
<td>47%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Note. Percentages have been rounded to the nearest whole number.

Responses to question one showed teachers believed these to be the strengths of the program:
1. The self-instructional nature of the program enabled students to work at their own pace.

2. The presentation of the rules as represented by the clue sets occurred in an appropriate sequence with an adequate number of cards used to represent each concept.

3. The materials were perceived as colorful, attractive, and useful. The poster characters developed for the program were evaluated as a factor for motivating interest, and it was believed students could easily relate to these.

4. Teachers indicated that the electronic card reader system was unfamiliar to them as an instructional device. They indicated that the nature of the system, which allowed auditory and visual feedback, appeared to be positive.

5. Teachers indicated that such a program focusing on handwriting rules would call students' attention to the importance of this important functional skill.

Responses to question two indicated the following perceived weaknesses:

1. Several teachers were not fully convinced that good handwriting means just meeting the rules presented in the program.

2. Teachers indicated that the program could be improved by both clarifying directions and lessening the number of cards presented in clue sets 3, 4, and 5.

3. A further concern as perceived by teachers was the lack of specific feedback enabling students to improve their own handwriting skills.
4. Teachers suggested that there needed to be some element built into the program which would continually emphasize the importance of always evaluating their progress.

5. Teachers indicated that this evaluation program might not be effective for all handwriting instructional programs which are available to teachers.
CHAPTER V

DISCUSSION OF RESULTS RELATED TO RESEARCH QUESTIONS, LIMITATIONS OF THE PRESENT STUDY, AND SUGGESTIONS FOR FUTURE RESEARCH

In the present study children were taught to score lowercase manuscript letter strokes through use of a self-instructional program. This chapter discusses the results presented in the preceding chapter in relation to each of seven research questions, as well as the reliability of that data. In addition, limitations of the study and suggestions for future research are discussed.

Discussion of Results

Reliability of Data

Interrater reliability for results of the study was high. One hundred percent reliability for accuracy of children's scoring responses for prewritten trained letters was obtained. Since this behavior was measured through permanent product recording, this high reliability is not unusual. The achievement of this high reliability level may have been further enhanced by the provision of a scoring key to the raters.

In regard to the high reliability obtained for timing—again 100%—this can be explained by the provision of a digital clock with a large face which allowed these young children to record their beginning
and ending times accurately, which might not have been the case had a regular clock been used.

**Research Question Number One**

This research question dealt with the effectiveness of the specially designed electronic card reader program to teach primary grade children to score manuscript letter strokes.

Previous research has been conducted in handwriting indicating that a technique using transparent overlays to evaluate letter stroke formation is feasible (Helwig, 1976; Helwig et al., 1976; Trap, 1977; Trap, et al., 1978; Stowitschek & Stowitschek, 1979; Sims & Swisberg, 1984), can make fairly fine discriminations in both cursive writing (Trapp, 1977) and manuscript letter formation (Sims & Weisberg, 1984), and can be taught reliably to children (Jones et al., 1977). In addition, research on self-instruction in handwriting has indicated that self-instructional procedures are efficacious in the classroom with regular students (Robin, et al., 1975) and learning disabled students (Graham, 1983). The present study sought to combine the technique of using the transparent overlays and modified self-instructional techniques through the use of an electronic card reader system. The Jones et al. (1977) study indicated that students could learn to use rules to learn to reliably evaluate manuscript letter formation. The present study supported the results from the Jones et al. (1977) study. The present study indicates that by the termination of the training program, children were able to score prewritten manuscript letter strokes in a highly successful manner. All students ended the program by scoring at least at the 90% accuracy level for three successive
trials. Several reasons may account for the success of the program. First, the study incorporated, to some degree, a self-instructional technique. In this particular program, students were required to listen to each rule, then say each rule aloud. In addition, the electronic cards were designed so that, often, questions were asked on the cards which the students were required to answer aloud. Feedback in the form of the correct answer was provided immediately by the auditory track on the card. While students were not instructed to praise themselves for correct responses, they did self-stamp their own charting folders. Poster response prompts used to cue the self-instructional behaviors were similar to the kind designed for a Porteus Maze experiment with learning disabled boys Palkes, Stewart, & Kahana, 1968).

A second explanation for the positive results of the program might be the level at which students were required to master each set of clue cards (each of which contained a new manuscript writing rule). Each child had to demonstrate mastery at a 90% criterion level as measured by a corresponding response sheet, and many of the sheets required students to make very fine discriminations in terms of correctness of letter strokes. This degree of rule mastery was not required in the Jones et al. (1977) study.

Third, with regard to the rules themselves, the experimenter tried to provide strong rules, (i.e., a rule with an immediate consequence). Several researchers have indicated that strong rules are more beneficial than weak rules in the self-management of behavior (Cooper, et al., 1987; Malott, 1984). In addition, other handwriting
research has shown that the type of copying tasks involved in the present program are, in fact, rule-governed (Furner, 1980; Hirsch & Niedermeyer, 1973; Sims & Weisberg, 1984).

Fourth, the experimenter tried to sequence the provision of the rules in such a manner as to allow the students to gradually and systematically acquire new information. Connis (1979) and others have found that deliberate preplanned sequencing is very effective in terms of task acquisition and maintenance of behavior.

An additional factor contributing to the success of the program might have been the emphasis on a multisensory approach to instruction of the rules. Fernald (1943) was one of the first researchers to advocate that children may learn via several modalities. In her work, she instructed children so that tactile and kinesthetic modalities were used along with visual and auditory modalities. In the present study, while it was the auditory and visual modality learning that was directly related to instruction, the use of the tactile and kinesthetic modes (through manipulation of the electronic cards into the card reader and the manipulation of the transparent overlays over students' own handwriting) may have at least generated some interest.

Another factor may have been that the experimenter tried to motivate the students in their learning tasks by devising colorful poster response prompts illustrating animal characters with whom the students might empathize. In other words, the cards in each clue set and accompanying materials were designed to be appealing to primary-age children.

Finally, the acquisition of this skill at a high level might be due to the types of response prompts used to increase the likelihood
that appropriate scoring behaviors would occur in the presence of the transparent overlays (Billingsley & Romer, 1983). The transparent overlay, of course, in the applied setting would function as a discriminative stimulus (SD) for occasioning appropriate letter-evaluation behaviors. Cooper, et al. (1987) suggest that verbal directions are, indeed, a type of response prompt, that is, they do "serve as a supplementary prompt to occasion the behavior." (p. 312) One of the less intrusive types of response prompts is the use of verbal directions. As defined by Cooper et al. (1987) verbal prompts can range from one word to a paragraph in length. This study used verbal prompts in the form of a short story explaining the characters of Sly, the Fox and the Mad Scribbler, poster response prompts (pictures plus written directions demonstrating correct steps for using the instructional materials), as well as verbal directions specifying appropriate behaviors presented both visually and auditorily on the electronic cards. All of these types of response prompts fit into the category of procedural directions. This type of verbal prompt is most effective for teaching new behaviors.

**Research Question Number Two**

The experimenter wished to determine the number of trials-to-criterion necessary for each student to complete each of the clue set phases of instruction. This question was considered important because in an applied setting, determinants of whether an effective instructional technique is used may often depend on the time-effectiveness of the materials. Neither teachers nor students have the time to engage in long-term instruction without maximal benefits. For example, in
the Johns (1977) and Jones et al. (1977) studies, students were reliably taught to score their handwriting. However, this outcome was the result of several hours of demonstration on the part of the experimenter. Results indicated that students could be taught to self-evaluate their own letter strokes in a time frame ranging from 80 minutes to 120 minutes of instruction. In the present study, the longest amount of time required was 35 minutes. These results would suggest that the program is time-efficient. In addition, the skill acquisition occurred with no teacher time involved during use of the intervention package itself (since an electronic card reader was used) and only 1 hour of teacher demonstration time was required. While it is true that time involved in preparing materials for the card reader, once this task is accomplished no materials-preparation time is necessary.

Finally, the experimenter wished to determine which, if any of the clue sets required more attempts to achieve mastery. Results of the study indicated that clue sets 2, 3, and 4 required the most number of trials. Four trials-to-criterion was the highest number of trials recorded for any one student using a clue card set. These repeated trials may be expected, in that clue sets 2, 3, and 4 introduced the most materials and also repeated material that had been discussed on previous sets. However, these repeated trials might be an indication that the illustrations or directions are not clear enough or that too much information was presented in the set. These factors could interfere with a clear understanding of the rule designed to be taught by a particular clue set. For example, clue set 3 not only included information about the rule regarding letter strokes being too
long, but also included an explanation of the hash mark located within the parameter of the letter frame. In addition, the set taught students about letter strokes. Perhaps future studies could analyze whether components were appropriate in terms of content and analysis of the clue card sets.

Research Question Number Three

Data collected to answer this question indicated the amount of time needed for three sub-components—(a) scoring teaching-response sheets, (b) scoring untrained- and trained-letter sheets, and (c) individual listening times—plus the total amount of time for completing the entire instructional package. The data clearly indicate that the amount of time involved in each of the three sub-components is minimal. The amount of time required per student to score the teaching response sheets was 1 minute per sheet, regardless of which clue set rule was being evaluated. Student evaluation and self-recording of their own handwriting samples required no more than 5 minutes as a maximum amount of time. The trained-letter probe sheets required less time than the untrained-letter sheets. This was probably to be expected since the untrained-letter sheets contained 16 letters, while the trained-letter sheets contained only 10 letters. Obviously, another explanation may have been that students were simply less familiar with the latter letters since these letters had not been presented as illustrations or examples in any of the clue sets.

With regard to the amount of listening time that each clue set required, the greatest number of minutes (which was still a minimal amount of time) was required for clue sets 2, 3, and 4. These sets
required 3 to 4 minutes per set of listening time. These sets were the longest and most content-laden of the group of clue card sets. Since the students were instructed that they could stop the electronic card reader at any time to examine a card more closely, or could listen again to any card in the set, these data may include even these types of behaviors. However, there are no data to indicate whether either or both of these latter behaviors did, in fact, occur.

The total amount of time required to complete the instructional package including repeated trials-to-criterion on card sets and response sheets was 35 minutes. Although probe data were collected and timed, these data are not part of the instructional package per se.

Research Question Number Four

In addition to reliably scoring teacher-prepared materials, the study sought to determine if children could reliably score their own handwriting.

Students did learn to reliably score prewritten manuscript letter strokes with a high percentage of reliability. However, in order for the scoring behavior to have any applied utility it would need to transfer to students' own handwriting. In other words, the program could be considered successful only if students were able to reliably score their own handwriting in the natural setting under the stimulus control (SD) of the transparent overlay alone. In this study apparently transfer did occur. As measured by probe samples of trained letters, students were able to reliably self-record and self-score their own handwriting samples. Probe data taken periodically throughout the program (see Figure 8) indicate that by the end of the program students were
self-scoring letter strokes with a minimum of 80% reliability. Several students scored at the 90% reliability level. While the experimenter did not program for such transfer to occur, except in the designing of response sheets which would resemble the students' own handwriting samples once the overlay had been placed, it did occur. One reason for this effect might have been that the task was broken down into simple enough components (i.e., letters must sit on the baseline, no strokes missing) that students had no difficulty applying these rules to their own handwriting samples.

It should be noted that during the scoring of their own handwriting samples (both for trained and untrained letters) children self-recorded their own responses. Their self-recordings were verified by the experimenter and by an independent rater and found to be accurate (as reported in the reliability sections of Chapter 4 and this chapter). These results support those of other researchers. Broden et al. (1971), for example, reported a 1% difference between the average estimate of a target student and the average estimate of a reliability observer. Glynn et al. (1973) compared estimates of self-recording of eight students with the observer's data and found that, in five cases, students underestimated their own performance, while the remaining students differed only slightly in their self-recorded percentage of on-task behavior from that of the observer's record. In a psychiatric setting, Santogrossi, O'Leary, Romanczyk, and Kaufman (1973) have reported 95% reliability of recording among adolescent boys.
Research Question Number Five

Data were also collected to determine if students transferred their scoring skills for their own handwriting to letters that had not been trained.

As with Research Question Number Four, the issue of transfer was examined here (i.e., could appropriate responses occasioned by supplementary stimuli occur even when such stimuli were not present). While it was predicted that this transfer would occur with trained letters, the experimenter also wished to know if the initial training might transfer to untrained letters as well. Results indicated that such transfer did occur (Figure 8). In terms of time-effectiveness and cost-effectiveness of an instructional program, certainly a program resulting in students learning all letters rather than only a few, as in the Graham (1983) study, would be preferred. In that sense, then, this program is both time- and cost-efficient.

Reasons for this transfer effect may have been the simplicity of the basic concepts being taught, as discussed in regard to Research Question Number Four. However, another reason may simply have been practice effects. The students were probed seven times during intervention on trained letters and seven times on untrained letters. While no feedback was given to the students regarding the correctness of their scoring, it may have been that the availability of opportunities to self-score and self-record helped students to reliably achieve this task.
Research Questions Number Six and Seven

In applied research, social validity questions are important (Wolf, 1978). For this reason, classroom teachers were asked to give their reactions to statements regarding handwriting and handwriting instruction, as well as their responses to the particular treatment package used in the study. These reactions also included suggestions for improvement of the package.

With regard to statements relating to handwriting instruction, teachers indicated that they felt handwriting was an important academic skill to be taught. While 40% of the teachers felt that their competency in teaching handwriting was average, 13% felt ill-equipped to teach it. One hundred percent of the teachers rated themselves as average or lower with regard to their knowledge of handwriting scales and the appropriate use of such scales. However, 60% of the teachers surveyed felt that they could visually judge the legibility of teachers samples well or very well. Fifty-four percent viewed self-instructional (i.e., independent) learning as important. These responses indicate that although teachers have some knowledge of handwriting instruction, because they consider handwriting to be an important skill, they could use new programs for teaching in this area—programs such as the one which is the focus of this study.

Responses to statements surveying teachers attitudes about the specific program designed to be used in this study indicated that a very high percentage of the teachers regarded the components of the program to be appropriate in terms of sequencing and grade level. Teachers indicated that materials were attractive and felt they would
be motivating to students. Oral feedback from the young children employed as subjects in the study indicated that they liked, Sly, the Fox and the Mad Scribbler and enjoyed the program. Teachers did suggest, however, that the program might be improved by providing more specific feedback to the students in terms of correcting their own manuscript letter formations. Some teachers also felt that there needed to be some element built into the program which would continually emphasize the importance of requiring children to always evaluate their handwriting letter formation in daily work.

Limitations of the Study

All experiments involving human behaviors are limited to some extent in the conclusions that can be made in regard to the effect on the dependent variables made by the selected independent variables. Several specific limitations of the present study are as follows:

1. Because of the experimental design used, results may not be generalized beyond the subjects involved in the study. Generalization is predicted on replication of the experiment. However, it should be noted that this experiment is a partial replication of the Johns (1977) study.

2. Great care was taken to implement the procedures exactly as described in Chapter Three. However, reliability of the independent variable was assessed only informally, that is through oral feedback from the classroom teacher who observed the experimenter conducting each procedure. Presently there is a trend to encourage researchers to formally assess the reliability of the independent variable as well as the dependent variable. The conclusions of
the present study would have been strengthened if the reliability of the independent variable had been determined more formally, for example, through use of checklists for assessing consistency of implementation with the planned procedures and observations conducted at times which were not known to the experimenter beforehand. In addition, in future studies, maintenance data should be collected in order to determine if the behavior will persist over time.

3. Use of a multiple probe baseline design rather than a delayed multiple baseline may have accounted somewhat more accurately for the student's baseline history. Both the multiple probe baseline and the delayed multiple baseline designs have advantages over a regular multiple baseline design when students must remain in baseline conditions for a protracted length of time.

4. The study was limited to selecting five students enrolled in the second grade in one elementary school in Chadron, Nebraska.

5. The study was limited to implementing the program and collecting data during the time of day that would be convenient for the classroom teacher and students participating in the program.

6. The study was limited in that the treatment package used experimenter-made materials rather than professional processes for most materials used throughout the experimental treatment package program.

Suggestions for Future Research

Handwriting is a skill which must be legible to be useful. Research has indicated that teachers receive minimal training in
evaluating this skill. In addition, Addy and Wylie (1973) and Petty (1982) have indicated that emphasis on individualized aspects of instructional procedures in handwriting should be emphasized. A body of literature suggests that self-recording is an effective behavioral technique to use with handwriting. However, no study with the exception of the present study has combined both of the above mentioned aspects in regard to handwriting. Because of the lack of studies in this area, the following suggestions for research are offered:

1. More studies should be conducted emphasizing individualization techniques for handwriting. Studies replicating the use of an electronic card reader could investigate such areas as cursive writing, italic, or any other modification of a handwriting instructional method.

2. Because this study used a single subject design, generality of findings cannot be easily extended to students other than those who participated in this study. Findings of the present study would be strengthened if the same self-evaluative procedure were investigated with other second grade students.

3. It would be interesting to study the application of this technique with learning disabled students. This population is suggested because these students often have difficulties not only with the reading of written language, but also with producing it.

4. It is recommended that a study be implemented in an identical manner as this one with the exception of the type of design used. A multiple probe multiple baseline design might account for some of the limitations in this study. Redesigning the study could
also include a provision for assessing reliability of the independent variable.

5. An assumption inherent in the present study was that the entire treatment package affected the reliability of the evaluation of letter formation. This may not be an accurate assumption. A study should be conducted to determine if any of the several sub-components could affect the outcome, such as use of the electronic card reader alone, the self-charting aspect only, or whether work with any of the individual rules alone might positively affect the evaluation procedure.
APPENDICES
APPENDIX A

PREREQUISITE SKILLS ASSESSMENT FORM
PREREQUISITE SKILLS ASSESSMENT FORM

Date:

FIRST NAME:

1. Print your first name on the line.
   ________________________________

2. Print the numbers from one to ten on the lines.
   ________ ________ ________ ________ ________ ________ ________ ________ ________

3. Print the numbers from eleven to twenty in the right order on the lines.
   ________ ________ ________ ________ ________ ________ ________ ________ ________

4. Trace the dotted line.
   ________________________________

5. Trace the part of the letter which is a dotted line.
   ________ ________ ________ ________ ________ ________ ________ ________ ________

6. Draw an X on the picture where the lines touch each other.
   ________________________________

7. Draw an X on the picture that shows lines that cross.
   ________________________________

8. Draw an X on the picture that shows a line that is straight.
   ________________________________
9. Draw an X on the picture that shows a curve.

10. Draw an X on the letter that has two straight lines.

11. Draw an X on the letter that has a curve and a straight line.

12. Match the pictures that are the same.

A. 
B. 
C. 

13. Print an X on the picture of the man with a short arm.

14. Print an X on the picture of the man with a short leg.

15. Print an X on the picture of the man with a long arm.

16. Print an X on the picture of the long dress.
17. Print an X on the picture that shows a dot below the boat.

18. Print an X on the picture that shows a dot above the fish.

19. Print an X on the picture that shows a dot below the cup.

20. Print an X inside the circle.

21. Print an X outside the circle.

22. Print an X inside the box.

23. Print an X outside the box.

24. Print an X on the picture of the closed door.

25. Print an X on the picture of the closed circle.

26. Print an X on the picture of the open mouth.
PREREQUISITE SKILLS ASSESSMENT FORM (page 4)

_____ 27. DRAW AN X ON THE PICTURE OF AN OPEN CIRCLE.

O  O

_____ 28. PRINT AN X ON THE LETTER WHICH SHOWS AN OPEN CIRCLE.

b  a  b

_____ 29. PRINT AN X ON THE LETTER WHICH SHOWS A CLOSED CIRCLE.

h  a  b

_____ 30. PRINT AN X ON THE LETTER WHICH IS ALL STRAIGHT LINES.

m  f  x

Thank you for your help!
APPENDIX B

SAMPLE SHEET OF WRITING PAPER
APPENDIX C
CLUE SET 1
HELLO. MY NAME IS SLY. I AM A FOX!
I AM A PRIVATE EYE.
YOU ARE SLY'S HELPER.
YOU ARE LOOKING FOR THE MAD SCRIBBLER!

THE MAD SCRIBBLER LEAVES A TRAIL OF CLUES.
DO 4 THINGS TO HELP "SLY" FIND CLUES.

1. READ THE CARD AND LOOK AT THE PICTURE.

2. LISTEN TO EACH CARD.
3. ANSWER ANY QUESTION. SAY THE ANSWER OUT LOUD.

4. LISTEN TO THE CORRECT ANSWER ON THE CARD.

ARE YOU READY? BEGIN NOW. LOOK AT CLUE CARD SET #1.
Look at the picture.

Of the writing paper.

Count the lines.

Look at the writing paper. Each line has a number.
WHAT COLOR IS LINE NUMBER 2?

ALL LETTERS SIT ON LINE 2. LETTERS SIT ON THE RED LINE.

IS THE LETTER SITTING ON THE RED LINE?
Is this letter sitting on the red line?

Look at this letter. Correct?

Is this letter sitting on the red line?
Say the name of the letter **not** on the red line.

One more time... which letter is **not** on the red line?

You worked hard. Good job! 😊
1. **OPEN** CLUE FOLDER 1.

2. **TAKE OUT A CLUE SHEET.**

3. **NOW** PUT THESE CARDS **AWAY.**
APPENDIX D

AUDITORY TRACK FOR CLUE SET 1
Auditory Track for Clue Set 1

1. "Hello. My name is Sly. I am a fox. I am a private eye."
2. "You are Sly's helper. You are looking for the Mad Scribbler!"
3. "The Mad Scribbler leaves a trail of clues."
4. "Do four things to help Sly find clues. 1, 2, 3, 4."
5. "Read the card and look at the picture."
6. "Listen to each card."
7. "Answer any question. Say the answer out loud."
8. "Listen to the correct answer on the card."
10. "This is Clue Card Set 1. Pay close attention and find out what the first clue is."
11. "Look at the picture of the writing paper. Count the lines. How many are there? (pause) There are four."
12. "Look at the writing paper. Each line has a number."
13. "What color is line number 2? (pause) Red."
14. "All letters sit on line 2. Letters sit on the red line."
15. "Is the letter sitting on the red line? (pause) Yes. Good for you."
16. "Is this one? (pause) Yes. It is, but it has a tail that hangs below the red line."
17. "Look at this letter. (pause) Correct? (pause) No. It is not on the red line."
18. "Is this letter sitting on the red line? (pause) Good! It is."
19. "Say the name of the letter not on the red line. (pause) X."
20. "One more time. Which letter is not on the red line? (pause) r."
21. "Good job! You worked hard and found out that Clue 1 is letters must sit on the red line."

22. "Open clue Folder 1. Take out a clue sheet. Now put these cards away."
APPENDIX E

CLUE SET 2
CLUE SET#2

Look at the picture.
Do you know what it is?

The picture is called a letter frame.
A letter frame fits over this writing paper. Look.

The lines of the letter frame must match the lines of the writing paper.

The letter frame must match the lines of the writing paper all the way across.
DOES THE LETTER FRAME MATCH THE LINES OF WRITING PAPER?

DOES THE LETTER FRAME FIT IN THIS PICTURE?

A LETTER FRAME HELPS US TO LOOK TO SEE IF OUR LETTERS ARE PRINTED CORRECTLY.
ALL PARTS OF A LETTER MUST BE INSIDE THE LETTER FRAME.

CAN PART OF A LETTER BE OUTSIDE THE LETTER FRAME?

CORRECT?
HOW ABOUT THIS LETTER?  
IS IT CORRECT?

What IS WRONG HERE?  
LOOK CAREFULLY!?!?

ARE YOU READY TO DO  
CLUE SHEET #2?
If you worked hard then you know what clue #2 is.

1. Take out a clue sheet.
2. Put these cards away.
3. Do your best!!
APPENDIX F

AUDITORY TRACK FOR CLUE SET 2
Auditory Track for Clue Set 2

1. "Before beginning Clue Set 2, you must have finished Clue Set 1."
2. "Look at the picture. Do you know what it is?"
3. "The picture is called a letter frame."
4. "A letter frame fits over this writing paper."
5. "The letter frame must match the lines of the writing paper all the way across."
6. "Does the letter frame match the lines of the writing paper? (pause) Yes."
7. "Does the letter frame fit the writing paper in this picture? (pause) No."
8. "A letter frame helps us to look to see if our letters are printed correctly."
9. "Can part of a letter be outside the letter frame? (pause) No."
10. "Is this correct? (pause) No. Part of the line is outside of the frame."
12. "What is wrong here? Look carefully. It is a tricky one."
13. "If you worked hard then you know what Clue 2 is."
14. "Put these cards away. Take out a clue sheet. Do your very best."
APPENDIX G
CLUE SET 3
Clue Set #3

How well do you listen and learn? Let’s find out!

What was Clue #1?
ANSWER: ALL LETTERS MUST SIT ON THE RED LINE.

WHAT WAS CLUE #2?

ANSWER: LETTER STROKES MUST STAY INSIDE THE LETTER FRAME.
HOW DO WE MATCH THE LETTER FRAME TO THE WRITING PAPER?

ANSWER: WE MATCH THE LINES ALL ACROSS THE PAPER.

WHEN YOU PRINT, DO YOUR LETTERS SIT ON THE LINE?
I HOPE YOU SAID YES.
IF YOU SAID NO THEN THE MAD SCRIBBLER IS TRICKING YOU!

NOW, DO YOU KNOW THAT LETTERS ARE MADE FROM STROKES. LOOK.

LETTER STROKES ARE THE MARKS YOU MAKE WHEN YOU PRINT A LETTER.
A LETTER STROKE BEGINS WHEN YOUR PENCIL FIRST TOUCHES THE PAPER. LOOK.

A LETTER STROKE ENDS WHEN YOU TAKE YOUR PENCIL OFF THE PAPER. LOOK.

WHAT LETTER DOES THIS STROKE MAKE?
DID YOU SAY J?
IF YOU DID, THAT IS CORRECT!

TRY THIS ONE.
WHAT IS THE LETTER?

THE LETTER IS $\sqrt{1} \cdot \sqrt{2}$.
IT HAS 2 STROKES.
LOOK AT THIS ONE.→
WHAT LETTER DOES THESE 2 STROKES MAKE?

√2

√1

√f

IS RIGHT.
YOU ARE WORKING HARD,
I CAN TELL. THANK YOU. 😊

IS THIS A DOTTED STROKE?
NO! THE PICTURE SHOWS A SOLID STROKE.

IS THIS A DOTTED STROKE?
YES.

FOR ALL THE PICTURES FROM NOW ON, LOOK ONLY AT THE SOLID STROKE.
LOOK AT THE SOLID STROKE IN THIS LETTER FRAME. WHAT IS WRONG?

THE SOLID STROKE IS TOO LONG. IT GOES OUTSIDE THE LETTER FRAME.

IS THIS SOLID STROKE CORRECT?
ANSWER: NO. THE SOLID STROKE IS TOO LONG. IT GOES OUTSIDE THE LETTER FRAME.

LOOK AT THIS SOLID STROKE. CORRECT?

IT STAYS RIGHT INSIDE THE LETTER FRAME.
LOOK AT THIS LETTER
STROKE. CORRECT?
YES. IT IS NOT TOO LONG.
NOW. WHAT IS CLUE
#3.?

CLUE IS: A LETTER
STROKE IS TOO LONG IF
IT GOES OUTSIDE THE LETTER FRAME.
LOOK AT THIS SOLID STROKE. TOO LONG?

NO. THE STROKE IS NOT TOO LONG. IT STAYS INSIDE THE LETTER FRAME.

WE WILL SEE IF THE MAD SCRIBBLER TRICKS YOU.
3. Do your best. Good luck!
2. Take out clue sheet #3.
1. Put these cards away.

Your cards told you what you learn.
APPENDIX H

AUDITORY TRACK FOR CLUE SET 3
Auditory Track for Clue Set 3

1. "This is Clue Set 3."
2. "How well do you listen and learn? Let's find out!"
3. "What was Clue 1?"
4. "Answer: All letters must sit on the red line. Did you remember?"
5. "OK. What was Clue 2?"
6. "I hope you said: letter strokes must be inside the letter frame."
7. "Do you remember how we match the letter frame to the writing paper?"
8. "Answer: we match the lines all the way across, right?"
9. "When you print do your letters sit on the line?"
10. "I hope so. If not, the Mad Scribbler is tricking you."
11. "Now let's learn something new. Do you know that letters are made from strokes?"
12. "Letter strokes are the marks you make when you print a letter."
13. "A letter stroke begins when your pencil touches the paper."
14. "A letter stroke ends when you take your pencil off the paper. Look."
15. "Let's see what a good private eye you are. What letter does this stroke make?"
16. "Did you say y? If you did that's absolutely . . . right."
17. "OK. Let's try this one. What is the letter?"
18. "The letter is b. It has 2 strokes."
19. "Look at this one. What letter do these 2 strokes make?"
20. "You are working hard. I can tell and f is the right answer."
21. "OK. Here's a question. Is this a dotted stroke?"
22. "No, this is not a dotted stroke. The picture shows a solid stroke."
23. "Is this a dotted stroke? (pause) Yes."
24. "Now for the rest of the pictures look only at the solid stroke."
25. "Look at the solid stroke in this letter frame. What is wrong with it?"
26. "The solid stroke is too long, because it goes outside of the letter frame."
27. "Is this solid stroke correct?"
28. "Answer: No. The solid stroke is too long. It goes outside the letter frame."
29. "What about this solid stroke? Is it too long?"
30. "No. It is not too long. It stops right inside the letter frame."
31. "Look. Is this correct? (pause) Yes. It is not too long."
32. "Now, all you good detectives, what is Clue 3?"
33. "The clue is that a letter stroke is too long if it goes outside the letter frame."
34. "Let's look at one more solid stroke. Is it too long?"
35. "No. That stroke was not too long, because it didn't go through the letter frame."
36. "Well, we shall soon see if the Mad Scribbler can trick you."
37. "This was a very long lesson. Did you learn everything the cards had to tell you?"
38. "Put these cards away. Take out your clue sheet and do your best."
APPENDIX I

CLUE SET 4
CLUE SET A

Let's look at a letter frame.

A letter frame shows us: 1) if the letter stroke is inside or outside.
IF THE LETTER STROKE IS INSIDE THE LETTER FRAME, THE STROKE IS CORRECT!

CAN THE PENCIL STROKE TOUCH THE LETTER FRAME INSIDE AND BE CORRECT? LOOK.

YES! 😊 BUT THE LINE CAN NOT GO OUTSIDE THE LETTER FRAME. LOOK.
THE LETTER FRAME CAN TELL YOU THAT A LETTER STROKE IS TOO **LONG**.

IF THE STROKE IS TOO LONG, THE STROKE GOES THROUGH THE LETTER FRAME. **LOOK.**

**CLUE #4** SAYS THAT **NO** LETTER STROKE CAN BE TOO SHORT.
HOW DO YOU TELL IF A LETTER STROKE IS TOO SHORT?

THE LETTER FRAME CAN TELL YOU THAT THE LETTER STROKE IS TOO SHORT.

LOOK CAREFULLY AT THE FRAME.
WHAT DO YOU SEE?
You see little lines. Look.

These little lines are called hash marks.

Hash marks show you where a letter stroke must touch.
If a letter stroke does not touch the hash mark, the stroke is too short.

Look at the solid strokes.

See, they do not touch the hash marks. The strokes are too short.
If the stroke touches the hash mark, the stroke is correct.

If the stroke goes through the hash mark, the stroke is correct.

What happens if the stroke goes through the hash mark and the frame? Look.
Then the stroke is too long.

Is the solid stroke too long or too short?

The stroke is too short.
IS THE STROKE TOO SHORT HERE? Look.

No! The stroke touches the hash mark.

Look at the solid stroke here.
THE STROKE IS CORRECT.
IT TOUCHES AND GOES THROUGH
THE HASH MARK. IT DOES NOT GO THROUGH THE FRAME.

WHAT ABOUT THIS STROKE?

IT IS TOO SHORT. IT DOES NOT
TOUCH THE HASH MARK.
THE LETTER FRAME TELLS US A LOT, DOESN'T IT?

LET'S SEE HOW WELL YOU CAN TRACE THE STROKES THAT ARE TOO SHORT ON CLUE SHEET #4.

1. PUT YOUR CARDS AWAY.
2. TAKE OUT CLUE SHEET #4.
3. BEGIN AND GOOD LUCK 🌟
APPENDIX J

AUDITORY TRACK FOR CLUE SET 4
Auditory Track for Clue Set 4

1. "This is Clue Set 4."

2. "Do you remember the letter frame? Let's look at another one very carefully."

3. "A letter frame can tell us many things. It can tell us if a letter stroke is inside or outside the letter frame."

4. "If the letter stroke is inside the frame, that's correct."

5. "Can the letter stroke line be touching inside the frame and still be correct? Look."

6. "Yes. But the line cannot go outside the frame. Look."

7. "A letter frame can also tell us if a letter stroke is too long."

8. "If the stroke is too long, it goes through the frame. Look at that."

9. "Now listen to this: Clue 4 says that no letter stroke can be too short."

10. "How can you tell if a letter stroke is too short?"

11. "The letter frame can tell us if the letter stroke is too short."

12. "Look carefully at the frame. What do you see inside it?"

13. "You see little lines. Look."

14. "These little lines are called hash marks."

15. "Hash marks show us where a stroke must touch."

16. "If the letter stroke does not touch the hash mark, the stroke is too short."

17. "Look at the solid letter strokes here."

18. "See, they don't touch the hash marks. The strokes are too short."

19. "If the stroke touches the hash mark the stroke is correct."

20. "If the stroke goes through the hash mark, the stroke is also correct."
21. "What happens if the stroke goes through the hash mark and the frame? Look."

22. "You know the answer to that one, don't you? The stroke is too long."

23. "Alright. Look at the solid stroke. Is it too long or too short?"

24. "Did you say the stroke was too short? You're right. It is too short."

25. "Is the stroke too short here?"

26. "No. The stroke touches the hash mark. It is not too short."

27. "Look at the solid stroke here. Is it correct?"

28. "The stroke is correct. It touches and goes through the hash marks, but not through the frame."

29. "What about this stroke? Is it correct?"

30. "It is too short. It does not touch the hash mark."

31. "Wow! The letter frame really tells us a lot, doesn't it?"

32. "Let's see how well you can pick out the strokes that are too short on your clue sheet."

CLUE SET #5

IN CLUE SETS #1 #2 #3 AND #4 YOU LEARNED 4 CLUES TO TRACK THE MAD SCRIBBLER.

WELL, HERE IS YOUR NEW CLUE: A DOT IS A LETTER STROKE. LOOK.

SEE!
The dot must be inside the letter frame.

Look.

Look. Is this letter stroke inside the letter frame?

Is this correct? Look.
IS THIS STROKE CORRECT?

1. PUT THESE CARDS AWAY.
2. TAKE OUT A CLUE SHEET.
3. DO YOUR BEST AND GOOD LUCK! 🌟
APPENDIX L

AUDITORY TRACK FOR CLUE SET 5
Auditory Track for Clue Set 5

1. "Prepare to begin Clue Set 5. Do your best."
2. "In Clue sets 1, 2, 3, and 4 you learned four clues to track the Mad Scribbler."
3. "Well, here is your new clue. A dot is a letter stroke. Look."
4. "The dot must be inside the letter frame. Look."
5. "Is this letter stroke inside the letter frame? (pause) No."
6. "Is this correct? Look. (pause) No, it's outside."
7. "Is this stroke correct? No, it's outside."
8. "Put these cards away. Take out a clue sheet. Do your best and good luck."
APPENDIX M

CLUE SET 6
CLUE SET 6

LOOK AT THE LETTER. WHAT IS WRONG?

ANSWER: THE LETTER STROKES DO NOT TOUCH EACH OTHER.
LOOK. DO THE LETTER STROKES TOUCH EACH OTHER?

LOOK AT THIS LETTER. IS IT CORRECT?

YES. THE LETTER IS CORRECT. THE LETTER STROKES TOUCH.
Now, look at the letter strokes inside the letter frame.

Count the strokes. How many strokes are there?

There are 2 strokes. Look.
DO THE STROKES TOUCH EACH OTHER?

YES. THE STROKES TOUCH!

AND THAT IS CORRECT!

LETTER STROKES MUST TOUCH.

 IS THIS LETTER CORRECT?

LOK.
YES. THE LETTER IS CORRECT BECAUSE THE LETTER STROKES TOUCH.

SOMETHING IS WRONG WITH THIS LETTER! LOOK.
WHAT IS WRONG?

ANSWER: THE CIRCLE STROKE IS OPEN.
A LETTER IS **NOT** CORRECT IF THE CIRCLE STROKE IS OPEN.

IS THE CIRCLE STROKE OPEN OR CLOSED?

THE CIRCLE STROKE IS CLOSED. THAT IS CORRECT.
Look inside the letter frame. Is the circle closed?

No. Circle stroke is open. That is not correct.

Clue #6: Letter strokes must touch and circle strokes are closed.
SAY CLUE #6 OUT LOUD.

LETTER STROKES MUST TOUCH AND CIRCLE STROKES MUST BE CLOSED.

WELL, ARE YOU READY TO DO YOUR CLUE SHEET?
1. PUT THESE CARDS AWAY.
2. TAKE OUT YOUR CLUE SHEET.
3. DO YOUR BEST.
APPENDIX N

AUDITORY TRACK FOR CLUE SET 6
Auditory Track for Clue Set 6

1. "Prepare to listen to Clue Set 6."

2. "Look at this letter. There is something wrong with it. What is wrong?"

3. "Answer: The letter strokes do not touch each other."

4. "Look at this letter. Do the strokes touch each other? (pause) No."

5. "Look at this letter. Is it correct?"

6. "This letter is correct, because the strokes touch each other."

7. "Now, look at the letter strokes inside the letter frame."

8. "Count the strokes. (pause) How many strokes are there?"

9. "There are two strokes. Look."

10. "Do the strokes touch each other?"

11. "Yes. They do, and that is correct. Letter strokes must touch."

12. "Is this letter correct?"

13. "Yes, the letter is correct, because letter strokes must touch each other."

14. "Look at this letter. There is something wrong. What's wrong?"

15. "Answer: the circle stroke is not closed."

16. "A letter is not correct if the circle stroke is open."

17. "Is the circle stroke open or closed?"

18. "The circle stroke is closed. That is correct."

19. "Look inside the letter frame. Is the circle closed?"

20. "No. The circle stroke is open. That is not correct."

21. "Clue 6 is that letter strokes must touch and circle strokes are closed."

22. "Say Clue 6 out loud."
23. "Letter strokes must touch and circle strokes must be closed. That is Clue 6."

24. "Well, are you ready to do your worksheet? I hope so."

25. "Put these clue cards away. Take out clue sheet 6 and . . . good luck!"
CLUE SET #7

CLUE #7 SAYS THAT LETTER STROKES CAN NOT HAVE A PART MISSING.

LOOK AT THIS LETTER INSIDE THE LETTER FRAME. WHICH STROKE IS MISSING?
STROKE NUMBER 2 IS NOT THERE. IT IS MISSING.

LOOK.

LOOK. WHICH STROKE IS MISSING?

STROKE NUMBER 2 IS MISSING.
LOOK AT THIS LETTER.
IS THERE A LETTER STROKE MISSING?

NO! STROKE NUMBER 1 IS NOT MISSING. IT IS TOO SHORT.

A STROKE IS MISSING IF IT IS NOT THERE. LOOK.
A LETTER STROKE IS TOO SHORT WHEN THE STROKE DOES NOT TOUCH A HASH MARK.

1. PLEASE PUT THESE CLUE CARDS AWAY.

2. TAKE OUT CLUE SHEET #7
APPENDIX P

AUDITORY TRACK FOR CLUE SET 7
Auditory Track for Clue Set 7

1. "This is Clue Set 7. Look carefully at the pictures."
2. "Clue 7 says that letter strokes cannot have a part missing."
3. "Look at this letter inside the letter frame. Which stroke is missing?"
4. "Stroke 2 is not there. It is missing. Look."
5. "Look. Which stroke is missing?"
6. "Stroke number 2 is missing."
7. "Look at this letter. Is there a letter stroke missing?"
8. "No. Stroke number 1 is not missing. It is too short."
9. "A stroke is missing if it is not there. Look."
10. "A letter stroke is too short, when the stroke is there but does not touch a hash mark."
11. "Please put these clue cards away. Take out clue sheet number 7. Good luck."
APPENDIX Q

TEACHING-RESPONSE SHEET 1

LETTERS NOT SITTING ON THE BASELINE
1. NAME

2. Look at clock. Mark time you started and time you ended with this sheet. Begin: _____ End: _____

3. Trace letters that do not sit on the red line.

4. Put in your folder.
APPENDIX R

TEACHING-RESPONSE SHEET 2

LETTERS OUTSIDE THE LETTER FRAME
1. NAME ________________________________

2. LOOK AT CLOCK. MARK TIME YOU STARTED AND TIME YOU ENDED WITH THIS SHEET. BEGIN: ___ END: ___

3. TRACE THE LETTERS THAT DO NOT FIT INSIDE THE LETTER FRAME.

4. PUT IN YOUR FOLDER.

b
r
f
h
a

u
j
q
v
x
APPENDIX S

TEACHING-RESPONSE SHEET 3

LETTER STROKES TOO LONG
1. NAME

2. LOOK AT CLOCK. MARK TIME YOU STARTED AND TIME YOU ENDED WITH THIS SHEET. BEGIN: ____ END: ____

3. TRACE THE DOTTED STROKES THAT ARE TOO LONG.

4. PUT IN YOUR FOLDER.

b=2 strokes
1=10=2

1. b  2. r  3. f  4. h  5. o

1. u  2. j  3. q  4. v  5. x
APPENDIX T
TEACHING-RESPONSE SHEET 4
LETTER STROKES TOO SHORT
1. NAME ____________________________

2. LOOK AT CLOCK. MARK TIME YOU STARTED AND TIME YOU ENDED WITH THIS SHEET. BEGIN: ___ END: ___

3. TRACE THE DOTTED STROKES THAT ARE TOO SHORT.

4. PUT IN YOUR FOLDER.

b r f h a

u j q v x
1. NAME

2. LOOK AT CLOCK. MARK TIME YOU STARTED AND TIME YOU ENDED WITH THIS SHEET. BEGIN: _____ END: _____

3. CIRCLE THE STROKE (DOT) WHICH IS NOT CORRECT.

4. PUT IN YOUR FOLDER.
APPENDIX V

TEACHING-RESPONSE SHEET 6

STROKES THAT DO NOT TOUCH
1. NAME ______________________________

2. LOOK AT CLOCK. MARK TIME YOU STARTED AND TIME YOU ENDED WITH THIS SHEET. BEGIN: _____ END: _____

3. PUT AN X BESIDE THE SOLID STROKE THAT DOES NOT TOUCH.

4. PUT IN YOUR FOLDER.

   1. 2. 3. 4. 5.
   b - a - f - h - a

   6. 7. 8. 9. 10.
   q - b - q - h - a
APPENDIX W

TEACHING-RESPONSE SHEET 7

MISSING STROKES
1. NAME __________________________

2. LOOK AT CLOCK. MARK TIME YOU STARTED AND TIME YOU END WITH THIS SHEET. BEGIN: _____ END: _____

3. PUT AN X IN THE BLANK BESIDE EACH STROKE THAT IS MISSING.

4. PUT IN YOUR FOLDER.

   1. __________  2. __________  3. __________  4. __________  5. __________

      b  a  f  h  r

   6. __________  7. __________  8. __________  9. __________  10. __________

      u  v  j  q  x

236
APPENDIX Y

TRAINED-LETTER PROBE SHEET
APPENDIX Z

UNTRAINED-LETTER PROBE SHEET
APPENDIX AA

TRAINED-LETTERS EVALUATIVE OVERLAY
APPENDIX BB

UNTRAINED-LETTERS EVALUATIVE OVERLAY
APPENDIX CC

TRAINED-LETTER RECORDING SHEET
<table>
<thead>
<tr>
<th>Name of student</th>
<th>Rater</th>
<th>Date of trial</th>
<th>Interrater</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>_</td>
<td></td>
<td>1_</td>
</tr>
<tr>
<td>x</td>
<td>_</td>
<td></td>
<td>/_</td>
</tr>
<tr>
<td>b</td>
<td>_</td>
<td></td>
<td>0_</td>
</tr>
<tr>
<td>a</td>
<td>0_</td>
<td></td>
<td>1_</td>
</tr>
<tr>
<td>f</td>
<td>_</td>
<td></td>
<td>0_</td>
</tr>
<tr>
<td>h</td>
<td>_</td>
<td></td>
<td>1_</td>
</tr>
<tr>
<td>r</td>
<td>_</td>
<td></td>
<td>_</td>
</tr>
<tr>
<td>u</td>
<td>_</td>
<td></td>
<td>_</td>
</tr>
<tr>
<td>j</td>
<td>_</td>
<td></td>
<td>_</td>
</tr>
<tr>
<td>q</td>
<td>0_</td>
<td></td>
<td>1_</td>
</tr>
</tbody>
</table>

Total correct
Total errors
Total opportunity
APPENDIX DD

UNTRAINED-LETTER RECORDING SHEET
1. n

2. w

3. s

4. g

5. i

6. p

7. y

8. o

9. c

10. t

11. z

12. m

13. e

14. d

15. k

16. l

Total correct ______
Total errors ______
Total opportunity ______
APPENDIX EE

ALL-CLUES MEASUREMENT FORM
ALL-CLUES MEASUREMENT FORM

1. THIS CLUE SET WILL TEST YOU TO SEE IF YOU CAN USE ALL
   THE CLUES TO FIND MISTAKES. BE VERY CAREFUL.
2. LOOK AT EACH LETTER.
3. LOOK AT EACH LETTER STROKE.
4. PRINT AN X BESIDE EACH LETTER STROKE THAT IS WRONG.

Begin_____  End _____

1. b
2. a
3. f
4. h
5. r
6. u
7. j
8. q
9. v
10. x
11. b
12. a
13. f
14. h
15. r
16. u
17. j
18. q
19. v
20. x
APPENDIX FF

SCORING KEY FOR ALL-CLUES MEASUREMENT FORM
SCORING KEY FOR ALL-CLUES MEASUREMENT FORM

STUDENT RESPONSE AND ANSWER KEY:  + = STROKES MARKED AS INCORRECT  
- = STROKES MARKED AS CORRECT

STUDENT'S NAME ________________________________

<table>
<thead>
<tr>
<th>ACTUAL STUDENT RESPONSE</th>
<th>ANSWER KEY</th>
<th>RELIABILITY CHECK (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (Stroke 1) (Stroke 2)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>2. &quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
13. 

14. 

15. 

16. 

17. 

18. 

19. 

20. 

TOTAL RESPONSE OPPORTUNITIES

RELIABILITY PERCENTAGE CORRECT
APPENDIX GG

THEMATIC STORY OF SLY
Sly's Story

"We have already guessed that (a) Sly is smart, and (b) he is a private eye. You have all told me that you know what a private eye does. Do you know why Sly became a private eye? (pause to elicit various remarks)

This is why Sly became a private eye:

Sly was born into a wonderful family. Everyone knew that this little fox was going to be smart. They sent him to school. Sly understood everything his teachers taught him, and got good grades. The only problem was that Sly had trouble with his printing. It was terrible! Sly's teacher said that his handwriting looked like chicken scratch! Well ... Sly knew he wasn't a chicken, he was a fox. Foxes were supposed to be smart. He decided that there was someone who was playing tricks on him and his friends. He decided that when he grew up he was going to become a private detective and find the sneak who was ruining his and his friends handwriting.

Now many times, Sly has gotten close to finding the mysterious villain, but Sly has a problem. There are so many schools and young children learning to print, that he needs helpers.

Will you help Sly find clues to stop the Mad Scribbler?"
APPENDIX HH

HOW TO USE ECR AND CARDS
How to Use ECR and Cards

"Now, I want everyone to listen carefully. Each one of you will train to become one of Sly's helpers. This is a very special program. No teacher will need to train you. I won't need to train you. You will train yourselves and become experts at finding clues just like Sly. What is an expert? (pause for responses and appropriate verbal guidance and reinforcement)

When I tell you that you can begin your training program, you will use this machine (point to ECR) and these clue sets (point to clue card sets). I have a question for you. Here it is: When can you begin your training program? (responses) Alright, everybody say, 'When Mary Ann tells me to.' Can you begin when you want to? (no) If your teacher tells you to? (no) If you get tired of doing another thing? (no) You can only begin when I say to begin. Does everyone understand? (pause) Good! I know your teacher didn't make a mistake picking you to train.

Now, when each of you is told to begin you will begin by listening to Clue Card Set #1. These (holding ECR cards) are your clue cards. Each card has a number. You must keep the cards in the right order.

This (pointing to ECR machine) is the machine that will let you hear what each card says.

I will show you what to do.

1. First, put on the earphones. (Experimenter models.)
2. Take out the set of cards like this. (Experimenter takes out set and places beside ECR machine face up.)

3. Put the card in the machine and push gently until it moves by itself. (Experimenter models.)

4. Listen to the card. If you can't hear it very well, turn up the volume. If it is too loud, turn down the volume. (Experimenter models.)

5. When you take out the card, pull sideways like this (experimenter models), but not like this (experimenter pulls up on the card).

6. Place each card on the other side of the machine face down. (Experimenter models.) This will keep the cards in the right order.

7. Now here is a card with a notch in it. (Experimenter points to notch.) Let's see what happens when we put this card in the machine. (Card stops at notch.)

8. You see, the card has stopped. This gives you time to answer a question on the card. When you have answered the question out loud, push the card gently again until the machine makes it move by itself. (Experimenter models.)

9. Now, I will let you try the machine and the cards. (Students practice the machine and cards.)

10. Each time you listen to the cards I want you to mark down the time you begin listening and the time you finish listening to the cards.
11. Inside the pocket will be a slip of paper with the word 'begin' and the word 'end' printed on it.

12. When you put the first card into the machine, mark down the time. Look at the clock (digital) and copy the numbers from it.

13. Let's pretend. Here I am putting on the earphones. Is this when I mark down the 'begin' time? (no) Now I am pulling out the slip of paper and the cards. Is this when I mark down the time? (no) Now I have put the first card into the machine. Is this when I copy down the time? (yes)

14. When do I mark down the end time? You mark down the end time after you pull out the last card, don't you? (Experimenter models.)

15. What should you do if you can't finish listening to the cards all at once? What if the lunch bell rings or the recess bell or you have to go back to your seat? Can anyone guess? (pause for guesses) Mark down the card number you stopped with like this (experimenter models) and the time you stopped. (Experimenter models.) Then, when you come back to finish, put in the next card number, mark down the time, listen to the cards, then mark down the end time. OK?

16. Let's go through the steps again." (Children and experimenter recite the steps.)
APPENDIX II

DESCRIPTION OF POSTER 3

COMPLETING THE CLUE SETS
Description of Poster 3

"Do you remember how Sly listened to the cards to learn a clue? (Experimenter shows the second poster.)

Well, each time that Sly listens to the clue cards, he makes sure that he understands the cards by completing a clue sheet. (Experimenter shows the third poster.)

What do the directions tell Sly to do? Let's read out loud together. (Experimenter and students read the directions.)

Each time you listen to a set of cards, you will fill out a clue sheet, too. See, in each clue card folder, there are the cards and sheets. (Experimenter opens each clue card set to point out the cards and clue sheets.) You must read the directions carefully. What do I mean when I say 'directions'? (Experimenter listens for responses, verbally reinforces appropriate answers, then defines directions clearly.)

Some sheets will tell you to do one thing. Other clue sheets will ask you to do something else. It is very important that you read the directions.

When you have finished with your clue sheet, you will put the sheet in your chart folder. (Experimenter opens up a folder and places clue sheet inside.)

(Experimenter shows the group another clue sheet and points to the blanks marked 'begin' and 'end'.) Before you begin your sheet, look at the clock and mark down the time you begin. Put the numbers here (experimenter points to 'begin' blank). When you finish the clue
sheet mark down the time you finished in this space. (Experimenter points to end.)

Let's pretend we are completing a clue sheet. (Experimenter hands out a sheet to each student.) Let's begin. (Students mark down the time in the end blank.) Where do we put our clue sheets? (in folders)
APPENDIX JJ

EXPLANATION OF SELF-CHARTING FOLDER
Procedures for Progressing to Next Clue Set

"When you begin your program, each of you will complete a response sheet each time you listen to the cards.

Put this sheet in your folder. I will return the sheet to you the next day. Your paper will be stamped with either a rooster or a star. If you have a star, go ahead to the next clue set and place a star on your folder.

If you have a rooster, stamp your folder with the rooster stamp and listen to the same cards. The Mad Scribbler tricked you! Do another response sheet from the same set. You may not go to another clue set until you earn a star on your sheet."
APPENDIX KK

WHEN TO BEGIN THE PROGRAM
Explanation of When to Begin

Listening to the Clue Cards

It is important for you to understand that you will not all begin to work for Sly right away. Some of you will receive folders with notes giving you a task. Some of you will receive folders with notes indicating that you are to do nothing for me right now. When you receive a folder with a picture of Sly paper-clipped to the folder you may begin to listen to the clue cards. You may not begin to listen to the clue cards until you see a picture of Sly inside your folder. Does everyone understand?"
APPENDIX LL

SOCIAL VALIDITY QUESTIONNAIRE
SOCIAL VALIDITY QUESTIONNAIRE

DIRECTIONS: Please respond to the following questions by circling the response which most closely reflects your attitude to the statement or question.

SCALE VALUES: 1 = NOT AT ALL    2 = VERY LITTLE    3 = AVERAGE
           4 = MORE THAN AVERAGE  5 = VERY

STATEMENT/QUESTIONS

1. Handwriting is an important academic skills area at the elementary level.
   1  2  3  4  5

2. I feel competent to teach manuscript printing.
   1  2  3  4  5

3. I feel that good printing is a skill that I can visually evaluate.
   1  2  3  4  5

4. I am familiar with several different types of programming to teach handwriting skills.
   1  2  3  4  5

5. I will teach handwriting the way I was taught this skill.
   1  2  3  4  5

6. I am familiar with various scales for use in evaluating manuscript printing.
   1  2  3  4  5

7. I feel that skills/learning centers are beneficial in an elementary classroom.
   1  2  3  4  5

8. I will use self-instructional programming in my classroom.
   1  2  3  4  5
9. If self-instructional materials are available for students, I would use them.
   1  2  3  4  5

10. I think teaching students to evaluate their own printing is beneficial.
    1  2  3  4  5

QUESTIONS CONCERNING THE ACTUAL PROGRAM

1. Do you feel that students would enjoy working on this program?
   1  2  3  4  5

2. Do you feel that the program is cost efficient in terms of classroom instructional time?
   1  2  3  4  5

3. I like the Language Master machine format.
   1  2  3  4  5

4. I feel that the program would be motivating to my students.
   1  2  3  4  5

5. The prerequisite skills needed for this program seem appropriate for the second-semester first grade student or the second-grade student.
   1  2  3  4  5

6. I would rate the following components to the whole program as:
   a. poster prompts
      1  2  3  4  5
   b. Clue Set #1 (Letters must sit on the baseline.)
      1  2  3  4  5
   c. Clue Set #2 (Letters must stay inside the letter frame.)
      1  2  3  4  5
d. Clue Set #3 (Strokes must not be too long.)
    1    2    3    4    5

e. Clue Set #4 (Strokes must no be too short.)
    1    2    3    4    5

f. Clue Set #5 (Strokes must touch.)
    1    2    3    4    5

g. Clue Set #6 (Dots are strokes, too.)
    1    2    3    4    5

7. I think that it is important for students to chart their own progress.
    1    2    3    4    5

8. I view students using the letter frames to evaluate their own letter strokes as having importance.
    1    2    3    4    5

OPEN-ENDED RESPONSES

I like this/these aspect(s) of the program:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

I would improve the program by

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
REFERENCES


Duvall, B. Evaluating the difficulty of cursive, manuscript, italic, and D'Nealian handwriting. Boston: University of Massachusetts, (ERIC Document Reproduction Service No. ED265539 CS 209484)


Gates, A., & Brown, H. (1929). Experimental comparisons of print-
script and cursive writing. Journal of Educational Research, 20,
1-14.

139-146.

control of on-task behavior in an elementary classroom. Journal
of Applied Behavior Analysis, 6, 105-114.

a program for potential high school dropouts: A time series anal-

Therapy, 16, 389-396.

Graham, S., & Miller, L. (1980). Handwriting research and practice:
A unified approach. Focus on Exceptional Children, 13, 1-16.

Educational Supplement.

Greenblatt, E. (1962). An analysis of school subject preferences of
elementary school children of middle grades. Journal of Educa-
tional Research, 55, 554-560.

Elementary English, 41, 863-868.

K. Koenke (Eds.), Remedial teaching: Research and comment (pp.


Hanover, S. (1983). Handwriting comes naturally. Academic Therapy,
18, 408-411.

Harris, T. L. Handwriting. In C. W. Harris (Ed.), Encyclopedia of
Education Research. New York: Macmillan

external cues and self-monitoring. Behavior Modification, 7,
183-196.

Helwig, J. J. (1976). Measurement of visual-verbal feedback on changes
in manuscript letter formation. Unpublished doctoral dissertation,
Columbus, OH: The Ohio State University.


