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PROGRAMMED HANDWRITING.

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PROGRAMMED HANDWRITING

by
Brunhilde Wilhelmina Sommer

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PROGRAMMED HANDWRITING

By Brunhilde W. Sommer

Programming strategies should make possible an efficient and effective method for teaching English orthography. A task analysis suggested that training in orthographic skills might profitably be viewed as a problem in training visual discriminations rather than primarily as a problem in motor control.

A cursive handwriting program, based on an analysis of the handwriting task, was developed to enable learners to discriminate forms, points in space, forms on points in space, and finally, to impose forms on points in structured and unstructured space. Five hundred ninety two discrimination frames and 246 production frames were included in the handwriting program to train consistency of slant, spacing alignment, height and form of letters and words. For evaluative purposes, a criterion test was constructed to accompany the program.

Upon completion of the handwriting program, eight groups of children, an experimental and control group in grades two, three, four and five, were tested for handwriting ability, prior to training by either programmed or non-programmed methods (Zaner-Bloser). The Zaner-Bloser Scale, the Good Scale, the Noble's Scale and the Michigan Scale were used for testing.

Approximately four weeks later, after training, children were tested with the use of the same instruments. Handwriting samples were rated by three judges and the investigator.

For second grade children, the program produced, in four weeks, writing equivalent to that of the pre-test skill of fourth grade children; for third graders, it produced writing superior to that of fifth grade children. The program is not effective in grades four and five, as measured by the Zaner-Bloser, the Good and the Noble's Handwriting Scale. It is effective, however, on all grade levels as measured by the Michigan Scale, designed to accompany the program. Conventional handwriting instruction produced small, though significant gains at each grade level.

Higher level skills for grades three, four and five, yet to be programmed, include copy-editing and provision for instruction under various stimulus conditions.

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CHAPTER I

HANDWRITING INSTRUCTION: PRESENT STATUS

The Decline in Instruction

In the past fifteen years, emphasis on handwriting instruction in public schools has declined. Few teachers beyond the primary level devote much time to it, and only in rare cases is it taught in secondary schools. Teachers themselves receive only a minimal amount of training in handwriting and in the teaching of handwriting.(23) This training deficit is often reflected in schools: students not only view the poor model of the teacher's handwriting, but receive little or no instruction.

In 1951 Harris and Okada reported survey data indicating that handwriting was taught for fifteen to twenty minutes per day in practically every school in the country.(18) Ten years later, King (25) found that 30% of the schools in four midwestern states no longer had any handwriting program and 59% had a minimum requirement of ten minutes of instruction per day. The remaining 9% required that some handwriting (unspecified) be taught.

What accounts for this apparent decline in the teaching of handwriting? One reason appears to be a curtailment in teaching future teachers how to write

and how to teach handwriting. King (25) questioned 125 elementary teachers on the amount of training they had had in preparation for the teaching of handwriting. Thirty-two per cent had no training, 37% had some training, and 31% of the teachers questioned received a brief course. Freeman (10) stated that, although he is in agreement with the aims of general education, lack of interest in the teaching of handwriting is due to the trend toward general education. Teachers are no longer receiving enough training in teaching methods.

A second reason for the decline in handwriting practices may be an increasing reliance on the typewriter, dictation machines, the telephone and other business machines.

Finally, the modern elementary school curriculum is becoming increasingly crowded with the addition of subjects formerly considered unimportant. Handwriting is no longer stressed in American schools.

Despite the indications that emphasis on the teaching of handwriting is rapidly declining, the fact remains that handwriting is still a skill important in the business world, school and personal life.

Possible Solution

A possible solution to problems incident to the decline of handwriting instruction may be the development of a more effective and efficient method of teaching handwriting than is currently available. An analysis of the

handwriting task makes the development of self-instructional materials a feasible goal.

PURPOSE OF THE STUDY

This study was designed to produce an efficient and effective method for teaching English orthography. A task analysis suggested that training in orthographic skills might profitably be viewed as a problem in training visual discriminations rather than primarily as a problem in training motor control. Previously developed methods for training visual discriminations might well be applied to this longstanding educational problem area.

PERCEPTUAL TRAINING

Theoretical Positions

"Learning to perceive is the prerequisite to all kinds of learning." (17, p. 942) Educational and psychological researchers have long been in agreement about the importance of visual discrimination to the learning of school subjects. However, the results of laboratory studies of discrimination learning have not been used to develop effective methods of teaching.

Gates pointed up the need for perceptual training (11, pp. 589-590):

> The perception of words, as in the case of a child trying to learn to recognize printed words in the initial stages of reading, is similar to many forms of perception which have been studied in the psychological laboratory. It has been found that people differ

> considerably in the extent to which they make an alert, careful, analytical search for distinctive clues, rather than look over the item in a casual or passive way. In all forms of perception, alert, careful, analytical study is essential for efficient learning.

Gates continued by emphasizing the importance of teaching the child to be perceptually active through training since the child does not learn this by himself to the extent that it is useful to him. Fabian concurred with Gate's opinion. He stated that children are inclined ". . . to ignore details or to isolate fragments as configural wholes unrelated to the rest of the field." (8, p. 130)

Kephart wrote:

> . . . most of the learning experiences which public school presents to the child are oriented toward symbolic materials. Visually, we present words, diagrams and similar representations on a printed page. Verbally, we manipulate conceptual items and deal in intricate, logical sequences. Underlying such presentations is a fundamental assumption: that the child has established an adequate orientation to the basic realities of the universe--space and time. It is well known that the ability to deal with symbolic and conceptual materials is based upon consistent and veridical perceptions of the environment. (23, p. 201)

Despite widespread agreement on the importance of perceptual training, little has been done to provide such training for school children. Horn stated that, ". . . the influence of perception and verbalization and the effectiveness of distributed practice as compared with mass practice have been, and are being intensively studied in investigations of motor learning." (20, p. 310) He continued by suggesting that research and profitable

experimentation on the basis of present data might be conducted in the field of handwriting but does not cite any completed studies. Gibson stated that, ". . . current textbooks contain little information relating perceptional judgments to learning . . ." despite numerous experiments portraying the effectiveness of perceptual training and discrimination learning in transfer to learning of tasks. (14, p. 402)

Effects of Perceptual Training

Perceptual vs. Motor Training

Rice conducted an early study of perceptual training.(40) Her purpose was to determine whether the reproduction of a model is more closely related to the development of perceptual (visual) skills than to the development of motor (manual) skills. Results of the study showed that 4 out of 5 instances of significant gains in the ability to reproduce figures were from children subjected to visual training. Only one subject out of 5 gained in the task after motor training.

Melcher (31) determined the relative effectiveness of visual cues and manual cues in the maze learning of young children. Three groups were presented cues: one group responded to visual cues, a second to motor cues, and a third to a mixture of the two. Visual guidance of maze learning was superior to motor guidance. Furthermore, success by the visually guided group required

only half as many trials as were needed by the motor guidance group. Visual cues apparently play an important role in learning in children by the time they are three and one-half years of age.

Townsend (46, p. 7) presented results of an examination of copying ability in children. The reason for this study was that,

> . . . an analysis of reading and especially writing suggests that these skills involve both perceptual and motor components. They involve perceptual discriminations in identifying and differentiating the essential word and letter forms. Motor control in writing must be guided by accurate perception of the form to be copied.

Townsend asked whether a ". . . copying task is more closely related to and dependent on the development of adequate form perception, or is it more closely related to the development of motor skills in the preferred hand?" (46, p. 7)

". . . copying skill was postulated as dependent upon a combination of form perception, form comprehension and motor skill. The correlation of copying with form perception, .60, is significantly higher than the correlation of copying with any motor measure." (46, p. 45) From this study it may be inferred that variance in copying ability in children is contributed by motor ability (3%), visual discrimination (36%) and abilities unaccounted for (61%). Thus, of the known factors, the visual component accounts for a major share of variance in skill.

Visual Perception Training

Gibson, et al. (13, pp. 897-906) investigated form discrimination by children four to eight years of age. These children showed significant gains from the age of four to the age of eight in discriminating between "letter-like" forms. The authors concluded that stimuli significant for letter discrimination, rather than pictures, have greater potential transfer value for the teaching of reading and writing to children.

In regard to the effect of various kinds of pretraining on learning, Hudson and Toler (21) used phonics as a means of improving auditory and visual discrimination in children. They hypothesized that pretraining in phonics will improve spelling. Children who received the training made gains in spelling achievement superior to those of children who had not received the training. Phillips (37), using the tachistoscope as a training device for the development of perceptual skills, found that the learning of number skills is facilitated by pretraining.

Additional studies (29; 32; 43) have verified the hypothesis that perceptual pretraining facilitates learning. The implications for modification of present day teaching methods was emphasized by each of the authors. All researchers worked with children, mainly in the fields of reading and spelling.

A study by Elkind and Koegler (5) reported an investigation of the effectiveness of perceptual training

at three age levels. Special training in "figure-ground" reversal was presented to the children. All children improved in ability to reverse figure and ground but maturational influence was also apparent. Six to seven year old children required more teaching and reached a lower terminal level of performance than did eight year old children. Levine, Watson and Feldman (28) used writing as pre-training for association learning. Children were given visual cues from one list of words which were expected to transfer to the learning of a second list. They, too, (28) emphasized the importance of focusing the attention of the children on the most important cues within a word list in order to make pretraining most effective. "When pretraining calls attention to other than the most relevant cues for subsequent learning, it creates confusion which leads to negative transfer effects." (28, p. 184)

Evans (7) used a learning program to teach the writing of numbers to five year old children. At no time during the program did the children write numbers. Visual discrimination tasks enabled the children to construct correctly formed numbers upon completion of the program. This study is important since it presents evidence that handwriting (construction of numbers, in this case) may be taught by training visual discrimination skills in children.

THEORY AND PRACTICE

When one reviews the literature for scientific studies which may have formed the basis for some of our present day methods, one must agree with Petty (36, p. 839) that

> . . . the teaching of handwriting appears to be more influenced by habit than research design. Spelling and handwriting are receiving more attention, but it does not mean they are better taught than formerly.

Herrick (19) concurred with Petty. He stated that many popular articles on educational practices draw conclusions about the teaching of handwriting which are seldom related to the findings of research.

It is apparent when one surveys handwriting programs of thirty years ago and compares them to current programs that little change has occurred in procedures for teaching. As stated above, there is a gulf between laboratory research and the application of the results of this research in practice. There is also a gulf between theory and practice. In the case of handwriting, theorists recommend discrimination training prior to handwriting training; practitioners follow the motor theory.

Theoretical Positions

Arnold Gesell (12) summarized some theories concerning handwriting. He quoted Judd:

> Writing, which is essentially a coordinated movement, has to be developed trial after trial, with consciousness directed not upon the movement itself, but on visual images which appear as the

> result of the movement. There is no conscious selection of hand movement, but rather it gradually becomes incorporated without any conscious purpose and clear recognition into the total automatic form of movement. These facts make it difficult to attribute to the sensations of movement any important part in the building up of the writing habit or in the maintenance of correct forms of movement after the habit has been developed. The various factors have been gradually added to each other by a process of organic fusion, not controlled by consciousness. These separate factors are each the result of many trials in which guiding motives have been first, the reproduction of visual forms, and second, the avoidance of difficult cramped positions of the hand. (12, p. 398)

Gesell commented:

> Such an explanation of the facts reduces the motor function very largely to a mental rather than a physical basis; and makes more probable its (handwriting) correlation with some other function of psychical order. Individual variations in handwriting are due to the ways in which the visual factors and factors of movement have been interrelated. If one insists on the constant and clear recognition of the visual pattern he may ultimately conform the movements by a large amount of practice. (12, p. 399)

Judd emphasized that ". . . success in penmanship or accuracy in the writing movement, is made to depend on the capacity and willingness to exercise visual control." (12, p. 399)

Despite the apparent involvement of motor skills in handwriting, these writers seem to agree that the visual perception component is greater in importance in the teaching of handwriting than is the motor component.

Research Evidence on the Teaching of Handwriting Skills

Learner Variables

A number of authors have offered suggestions for effective methods in the teaching of handwriting. (1; 2; 3; 16; 22; 26; 30; 35; 44) Their programs indicate six factors basic to instruction: (1) readiness of the child for handwriting; (2) motivation of the child to improve his handwriting; (3) practice periods of 10 to 15 minutes at least three days a week with emphasis on transfer to daily work; (4) evaluation of handwriting by the child and by the teacher; (5) drill on words and letters incorrectly formed; (6) correct hand and body positions.

Criterion Variables

In most cases, the writers are in agreement that accuracy in copying the form of letters is of prime importance in developing handwriting skills. (2; 3; 4; 30; 38) Slant, size and spacing rank next in importance. Speed is stressed least since it is expected that this will improve with the child's physical development.

Instructional Variables

Time.--In regard to the length of practice periods and total learning time, MacCalmont (30), Cole (4), Woody (47) and Johnson (22) presented evidence that handwriting may be taught in a much shorter time than is commonly

believed. Woody (47) found no significant relationship between the number of minutes devoted to handwriting instruction and the quality of achievement. Reynolds and Glaser (39) used programmed tasks to evaluate the effect of repetition upon the retention of complex and meaningful learning tasks. They also evaluated the effect of spaced review upon retention of meaningful material previously learned. They concluded that the excess of repetition in programs may be of little value in furthering retention. Proper spacing of review sequences, however, was found to facilitate retention.

Evaluation.--Studies reviewed pertaining to evaluation of handwriting stressed the need for new scales, teacher education in the use of these scales, and the importance of self-evaluation by the child. Rondinella (41) evaluated the subjectivity of elementary school teachers in grading handwriting. He concluded that subjectivity does exist among teachers in rating specimens of handwriting, and ". . . that teachers are insufficiently aware of the major criteria for grading these specimens. Teachers consider letter formation as the dominant criterion in rating penmanship. Neat, easy to read handwriting affects the teacher's rating." (41, p. 532) General quality was not considered by the teachers. A final conclusion was that a teacher's experience has little effect on subjectivity in the grading of handwriting.

Harris and Herrick (18) tested three groups of children (intellectually low, bright and average children)

for the purpose of finding out how well these children were able to match their own handwriting samples with samples of other same-aged children. All children were successful in choosing samples to which they could aspire. Only the brighter children, however, were able to successfully match their best and worst samples relative to an ordered scale. Klausheimer (27) questioned, in regard to this study, whether the child is able to perceive fine discriminations in handwriting since many children involved in Herrick's study did not gain skill in evaluation over the two year duration of experimentation.

Motor Skills.--Readiness programs for the development of hand-eye coordination, visual discrimination and the movement of the hand and eye from left to right contribute to successful experience in learning to write according to Page (35), King (25) and Cole (3). However, use of exercise to develop muscular coordination showed little relationship to either quality or rate scores in Woody's study.(47) Rowley (42) found that slow handwriting was not the result of poor motor coordination as measured by tests of tapping, finger movement and arm movement. There was some evidence that fine motor coordination may be involved in writing speed. This was measured by sensitive tests of steadiness in drawing straight lines. In a recent study, Goff (15) determined that boys write slower than girls at all grade levels. No difference in speed was reported between left and

right handed children.

Erlebacher, in a comparison between children's and adult's handwriting, noted that children in the middle grades write better than they do as adults.(6) She found no relationship between intelligence and quality of handwriting.

SUMMARY

Investigators appear to agree on the parameters of handwriting skill, viz., form, spacing, slant, size and alignment. They also agree that visual discrimination and motor coordination are dominant components of the skill. However, both theorists and laboratory researchers agree that the visual discrimination component is the major determinant of differences in skill.

CHAPTER II

DEVELOPMENT OF A PROGRAMMED COURSE IN ENGLISH ORTHOGRAPHY

A summary of contents included in Chapter II of this study is as follows: (1) a statement of the objective of this research and definition of terms; (2) an analysis of current practice in the teaching of handwriting; (3) a task analysis of the handwriting process; (4) a description of the handwriting program; (5) criterion goals expected to be reached through use of a program; (6) the development of the Michigan Handwriting Scale by the investigator; and (7) a description of the pilot study.

OBJECTIVE OF A HANDWRITING PROGRAM

The objective of the handwriting program reported here is to enable primary school children to produce legible English orthography. Legibility is defined as correct spacing, form, slant, height and alignment of letters and groups of letters.

Definition of Terms

Spacing:
Constant distances between words and letters. A space between words is approximately equivalent to the space occupied by one lower case letter.

Height:

Consistent and correct height of letters. Ascenders (b,l,k,h) are approximately 7/8 of the height of a given space. Descenders (g,j,p,z) project 1/2 space below the base line. The remaining letters, except for "p" and "t," are 1/3 space in height. The "p" and "t" are 2/3 space in height.

Slant:

A 60 degree angle of down stroke relative to the base line in lower case letters.

Form:

Given forms of letters as defined by the National Association of Penmanship Teachers and Supervisors with the following exception: an upstroke on "a," "d," "g," "c" and "q" to facilitate use of connecting lines.

Alignment:

Letters placed on a base line.

CURRENT PRACTICE

An analysis of current methods of teaching handwriting in the elementary school was carried out by the writer. It revealed that some 35% of the time devoted to handwriting instruction is used for discussing and demonstrating the subject matter to be written. Discussion of the subject matter is intended to motivate the child to write. Class discussion is the method usually employed. Demonstration involves both teacher and pupil activity. The teacher demonstrates by writing the weekly phrase or sentence on the blackboard; letters or letter combinations within the sentence are selected for drill. The pupils participate in the demonstration by copying the teacher's model on the blackboard and on their papers. Discussion of correct copy and errors in copy follows. The teacher then discusses body and hand position, hand and arm movement, and the position of the paper on the learner's desk.

The remaining 65% of handwriting time is used for practice in writing the material previously discussed and demonstrated. The final handwriting period of each week is usually devoted to writing the weekly sentence or paragraph lesson in a handwriting book.

To enrich handwriting instruction, some teachers use practical tasks such as letter writing and handwriting notebooks.

THE PROGRAMMING STRATEGY

A task analysis of the writing process starts with the same objective one finds in current practice, but leads to a different strategy. Handwriting may be defined as the imposition of forms on space. The task, then, is to discriminate forms, points in space, forms on points in space and, finally, to impose forms on points in space. Thus, the five kinds of tasks may be described as follows:

1. Forms: cursive letters are discriminated from one another;
2. Space: points in an arbitrarily structured space are discriminated from other points in that space;
3. Forms on space: letters on points in space are discriminated from letters on other points in that space;
4. Imposing forms on a structured space: learner draws letters on points in a structured space;
5. Imposing forms on open space: learner draws letters on open space using only a base line.

Description of the Handwriting Program

Part I. Discrimination of Cursive Letters (78 frames)

Alphabetically arranged, cursive, lower case letters, one per frame serve as models. Three foils and one target are included in each frame. There are three presentations of each letter. In the first presentation, all letters (models, targets, foils) are 1-1/2 inches in height. Foils deviate greatly in form from the models and targets. In the next two presentations, the letters are reduced to one inch and one-half inch, respectively. Foils become increasingly similar in form to the models and targets.

Part II. Discrimination of the Cursive Letter Equivalents of Manuscript Letters (78 frames)

The letters are of the same size as in Part I of the

program. The task difference entails the discrimination of the cursive letter equivalents of manuscript letters.

Part III. Discrimination of Points in Space and Forms on Points in Space (492 frames)

A. Stimulus Array

A series of small circles (called "points") are placed in a specific pattern so that every lower case letter of the alphabet may be imposed on the pattern. The spatial arrangement of points on the matrix used can be varied to provide discrimination training in this program.

B. Required Response of the Student

The student is required to circle the choice similar to the model. ("Look at the one at the top. Find one the same. Circle it. Do the rest by yourself.")

C. Thread of Progression Throughout the Program

Outcome: The student discriminates distances within a given space.

Steps Leading to the Outcome

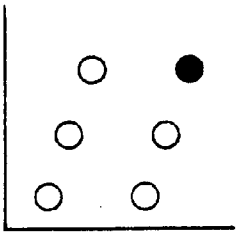
1. The student discriminates the locus of single points within this space. The foil differs from the model and target in the placement of one solid circle.

2. The student discriminates the loci of a series of points within this space. The series of points in the foil may be reversed, inverted or changed in distance. Models, targets and foils all contain the same number of solid circles.

3. The student discriminates a pattern of points or lines (partial letters or letters). Form, slant, height, alignment and spacing of letters is taught.

In order to facilitate learning, complexity is gradually increased. The learner begins with a partial matrix and proceeds to a complete matrix. As the matrix increases in complexity, the discriminations tend to remain of standard difficulty. There are roughly five levels of difficulty of matrices:

Matrix 1:

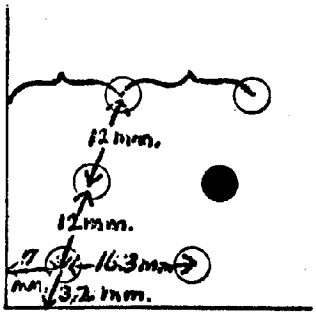


Model

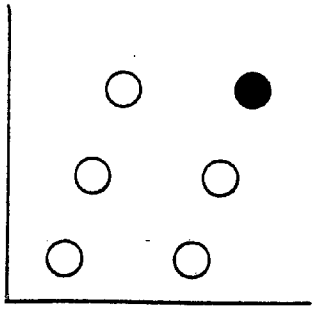
Specifications

Number of circles: 6
Base line: 1-1/2"
Vertical line: 1-1/2"
Diameter of large circles: 4.5mm.
Diameter of small circles: 2.3mm.

The model is one-third smaller in size than foil and target.

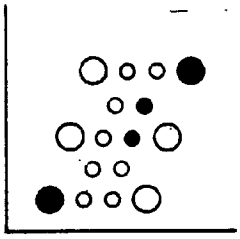


Foil

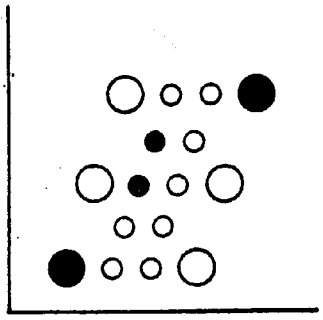


Target

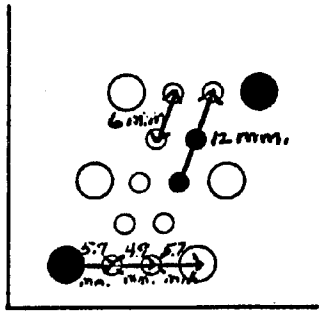
Matrix 2



Model



Foil

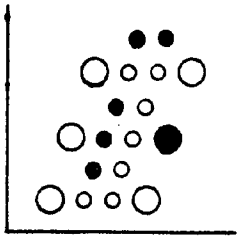


Target

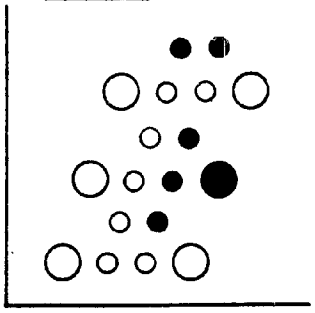
Specifications

Number of circles: 16
Specification the same as Matrix 1, except where noted.

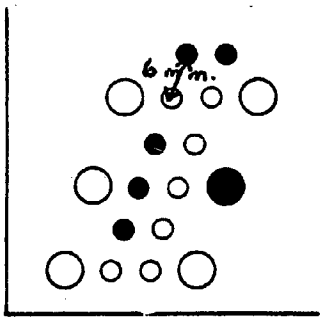
Matrix 3



Model



Foil

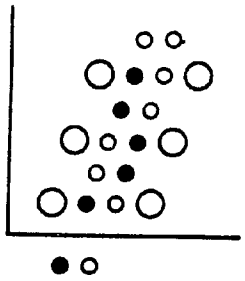


Target

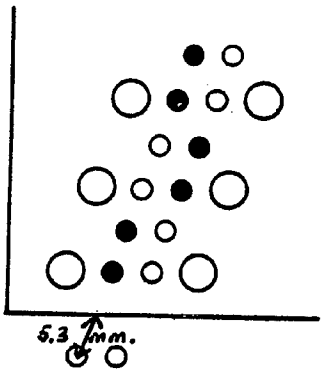
Specifications

Number of circles: 18
Specifications the same as Matrices 1 and 2, except where noted.

Matrix 4



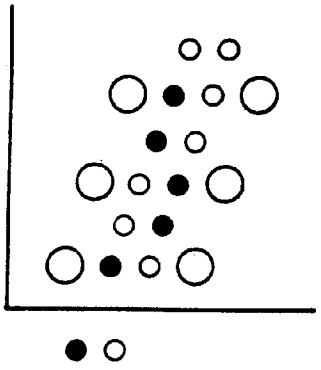
Model



Foil

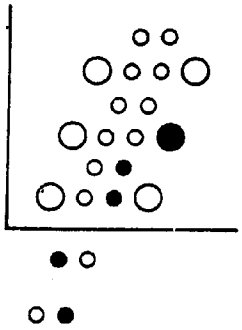
Specifications

Number of circles: 20
Specifications the same as Matrices 1, 2, 3, except where noted.

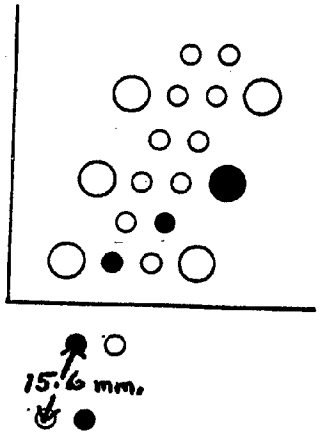


Target

Matrix 5 - Complete



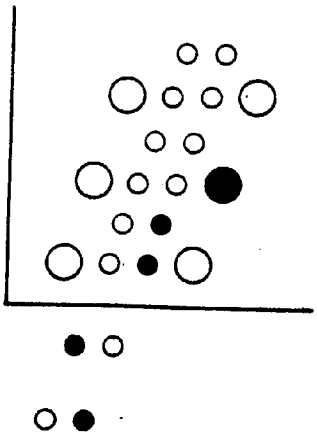
Model



Foil

Specifications

Number of circles: 22
Specifications the same as Matrices 1, 2, 3, 4, except where noted.



Target

Tasks and Number of Frames

Discrimination of:	Single Points in Space	122 frames
	Series of Points in Space	72 frames
	Lines on Space	48 frames
	Partial Patterns on Space (parts of letters	17 frames
	Forms on Space (letters)	95 frames
	Slant of the Matrix	8 frames
Production:	Reproducing letters under conditions of stimulus support	130 frames

Part IV. Discrimination of Forms on Points in Space and Imposition of Forms on Space. (190 frames)

The student discriminates patterns (letters) and various lines by which one pattern is connected with another (words).

The following is a task analysis of Part IV of the Handwriting Program. All tasks are to be completed without the support of the matrix.

Discrimination of:	Series of patterns (letters) -	26
	Series of patterns of letters and various lines by which one discrete pattern is connected with another (words and parts of words) -	48
Production:	Reproducing letters and words without the support of a matrix -	116
Total Number of Frames in Program		838

CRITERION GOALS FOR THE DEVELOPMENT OF A HANDWRITING PROGRAM

1. Ninety per cent of the subjects in the experimental groups will reach a score of 70-79 on each of the handwriting scales; namely, the Zaner Bloser Handwriting Scale, the Noble Handwriting Scale and the Good Handwriting Scale.

A score of 70 to 79 may be defined as satisfactory according to the following numerical values assigned in judging the handwriting samples:

100-90 superior handwriting
89-80 good handwriting
79-70 satisfactory handwriting
69-60 fair handwriting
59-0 poor handwriting

2. Ninety per cent of the subjects in the groups will reach a score of 48 of a possible 50 on the Michigan Handwriting Scale.

INTERNAL VALIDATION PROCEDURE

Subjects

Six boys and six girls in the first grade at the E. S. George School, located in Ypsilanti, Michigan, were used as subjects. None of the children had received formal handwriting instruction previous to training. The children ranged from 6 years, 9 months to 7 years, 6 months in age. Subjects were selected by the classroom teacher. All children were of average or higher intelligence; none of them had problems in school achievement.

Procedure

The children were sent to the examiner daily for the duration of the training period. A room, containing only tables and chairs, was provided by the school. All distractors (pictures, blackboard, toys and books) were removed from the room previous to the start of the training. The children received only the programs and #2 pencils of standard size.

Since all children were naive subjects, a pre-test was not administered. Instructions on how to hold a pencil or position of the arm and body during handwriting practice was not given at any time during training. Only instructions contained in the handwriting program were read to the children, and in some cases, the children read these to themselves.

Each child worked on the program at his own rate. Although the length of each instruction period was twenty minutes per day, a few children worked only ten or fifteen minutes during some periods. The children were informed prior to the start of the program that they might stop work on the program whenever they felt the need to stop. They were allowed to return to the classroom, use the lavatory or get a drink without permission from the investigator. Only one rule, "No Talking," was enforced during the work periods.

Of the twelve children, eleven completed the program in fifteen to eighteen instructional periods. The

twelfth child completed the program in twenty-two periods. Thus, ninety per cent of the children completed the program in six instructional hours, or less.

Evaluation

Upon completion of the program, all children wrote selected parts of the third grade Zaner-Bloser Handwriting Scale and the third grade Noble's Handwriting Scale. First grade cursive handwriting scales were not available.

Three teachers from outside the Ypsilanti School System were asked to serve as judges. The investigator also judged the results. Each judge worked independently, and at no time during the judging period was there communication among them. Results appear in Table 1.

On the Zaner-Bloser Handwriting Scale a score of 70-80 designated a satisfactory sample of handwriting. Eighty-one to 100 above was considered as good to superior, and 69 to 0 was considered fair to poor. When mean scores of four judges were used, seven first grade children reached a satisfactory level of handwriting, one child scored higher than satisfactory, and four children scored below the satisfactory level. Of the twelve subjects, only one child's writing was judged as poor.

On the Noble's Handwriting Scale a score of 2.5 to 3.5 was designated as satisfactory handwriting. 2.6 to 1 was considered as good to superior, and 3.6 to 5 was considered to be fair to poor. When the mean scores of the four judges were used three children reached a satisfactory

TABLE 1

HANDWRITING SCORES OF FIRST GRADE CHILDREN
TRAINED BY A HANDWRITING PROGRAM

Subjects		Judges' Scores										Errors (Possible = 838)
		Zaner-Bloser Handwriting Scale					Noble's Handwriting Scale					
		A	B	C	D	M	A	B	C	D	M	
Boys	1	70	65	65	70	67.5	3	5	4	3	3.8	4
	2	45	50	50	40	46.2	5	5	5	5	5.0	115
	3	75	65	65	70	68.8	4	5	4	4	4.3	20
	4	75	70	70	75	72.3	4	5	4	4	4.3	38
	5	70	70	70	70	70.0	3	4	3	3	3.3	18
	6	75	65	65	75	70.0	3	5	4	3	3.8	18
Girls	7	65	65	55	55	60.0	5	4	5	4	4.5	55
	8	75	70	75	75	73.9	3	3	3	2	2.8	17
	9	80	75	80	80	78.8	2	3	1	2	2.0	14
	10	80	70	75	75	75.0	3	3	2	2	2.5	22
	11	85	80	80	80	81.3	2	2	2	2	2.0	15
	12	85	75	80	80	80.0	1	2	2	2	1.9	19
Mean		73.3	68.3	69.2	70.4		3.2	3.0	3.3	3.0		27.9

ρ Z-B·N = .88; ρ Z-B·Er = .47; ρ N·E_r = .60

where Z-B represents Zaner-Bloser Scale; N represents the Noble's Scale; and Er represents "Errors" (last column above).

handwriting level, four children's handwriting was considered better than satisfactory and five children's handwriting was considered below the satisfactory level.

The pilot study provided data concerning the parts of the program needing revision and suggested, further, the need for the development of an objective measure of handwriting.

CRITERION TEST

Description of the Instrument

Purpose.--An instrument, called the Michigan Handwriting Scales (Appendix A) was developed for the purpose of obtaining an objective measure of each child's handwriting. In effect, the instrument also defines the behaviors to be achieved by means of the handwriting program.

Words and Letters Used on the Scale.--Three single letters, "l," "y," and "m," were selected to measure the child's ability to write an ascender, a descender and a letter of 1/3 space in height. Two two-letter words, two three-letter words and six four-letter words were selected to measure the child's ability to write letter combinations. The letters and words were based upon frequency counts of letter combinations in the words on the Thorndike Word List (45). The first two letters of each word were used. Letter combinations appearing most frequently were further combined to form the words used in the scale. (Appendix A)

The handwriting test was constructed to measure the following parameters of cursive handwriting:

1. consistency of slant among letters;
2. alignment points of single letters and letters in a word relative to the base line;
3. consistency of height within letters;
4. consistency of height between letters within words;
5. consistency of spacing of letters within words;
6. the correct form of letters;
7. the consistency of slant among letters in a word.

The following number of points were awarded:

consistency of slant	= 4
alignment	= 10
spacing	= 8
height	= 10
form	= 18
Total points	50

Validation data appears in Chapter III.

CHAPTER III

EVALUATION OF A PROGRAMMED COURSE IN ENGLISH ORTHOGRAPHY

This chapter is divided into two main sections. The first section includes: (1) a description of subjects used in the study; (2) procedures followed in obtaining handwriting samples of children before and after programmed instruction; (3) the administration of the handwriting program; (4) an evaluation of the reliability of handwriting scales which were used as measuring devices; (5) procedures for scoring handwriting; and (6) statistical procedures. The second section of the chapter presents the results of the study and an analysis of these results.

DESCRIPTION OF SUBJECTS

Two hundred twenty-nine children in grades two through five served as subjects for the study (Table 2). One hundred eighty-seven subjects, 102 boys and 85 girls, attended public elementary schools in Saline, Michigan. The remainder, 42 second graders, 21 boys and 21 girls, attended Erickson Elementary School in Ypsilanti, Michigan. One hundred twenty of the subjects used the handwriting program devised by the investigator; 109 subjects used practices recommended in the Zaner-Bloser Company manual.

TABLE 2

GRADE AND SEX DISTRIBUTION OF SUBJECTS RECEIVING HANDWRITING TRAINING BY PROGRAMMING AND NON-PROGRAMMING METHODS

Group	Sex	Grade 2	Grade 3	Grade 4	Grade 5	Total
Programming	M	11	18	18	18	
	F	11	14	16	14	
	Tot.	22	32	34	32	120
Non-Programming	M	10	15	18	15	
	F	10	14	13	14	
	Tot.	20	29	31	29	109
Total		42	61	65	61	229

Descriptive variables of age, I.Q. and reading age are reported in Table 3. Differences in the size of N's within Table 2 and between Table 2 and Table 3 result from incomplete data. Scores were taken from school records. The groups receiving programmed material were approximately equivalent to those receiving non-programmed instruction with one exception, a discrepancy in reading level favoring the non-programmed group in grade three.

TABLE 3

GROUP MEANS OF DESCRIPTIVE VARIABLES OF SUBJECTS TRAINED BY TWO METHODS OF HANDWRITING INSTRUCTION

Grade	Group[1]	CA	N[2]	I.Q.[3]	N	R.A.[4]	N
2	Prog.	80.6	22	108.5	21	2.81	21
	Non-Prog.	80.1	20	115.5	20	2.7	20
3	Prog.	100.6	32	109.5	32	2.5	32
	Non-Prog.	100.9	29	114.4	29	3.7	29
4	Prog.	119.7	34	111.3	33	3.8	33
	Non-Prog.	112.8	31	114.1	31	3.7	31
5	Prog.	123.7	32	116.6	28	5.8	29
	Non-Prog.	124.1	29	108.8	28	5.1	29

[1]Ages of second grade children are as of Jan. 2, 1966; other children as of Sept. 15, 1966.

[2]Variable N results from incomplete data due to absences.

[3]Children of grade 2 were administered the Lorge, Thorndike Intelligence Test, May, 1965. Remainder of subjects were administered the California Test of Mental Maturity or the Kuhlmann-Anderson Test of Intelligence in the second grade.

[4]Reading age was determined by the California Achievement Test in grade two. Weekly Reader Tests were used to determine R.A. in grade three. The Gates Reading Tests and California Achievement Tests were used to determine reading ages of children in grades four and five.

DESCRIPTION OF COMMUNITIES

The cities of Saline and Ypsilanti are located in southeastern Michigan, near Ann Arbor. These communities are similar in several respects. Factory workers comprise approximately forty-five per cent of the population in each. Thirty-five per cent are engaged in administrative or office work in business and industry. The remaining twenty per cent is composed of people in the professions. The teaching field is most highly represented. Within this figure, approximately three per cent are students in attendance at local universities.

PROCEDURE

Administration of Handwriting Tests

Prior to the beginning of the study, meetings between the cooperating teachers of both schools and the investigator were arranged by the school principals. Explanations of the procedures to be followed for obtaining children's handwriting samples before and after handwriting instruction were presented to the teachers.

The teachers administered the Zaner-Bloser Handwriting Scales, the Good Scale, the Noble's Scale and the Michigan Scale on five consecutive days. All handwriting scales, paper and pencils were provided by the investigator.

Training In Handwriting

Handwriting programs were provided to 120 children

in the "programmed instruction" groups. Periods of fifteen to twenty minutes per day, four days a week, were devoted to training. The investigator emphasized to the teachers during the initial meeting that the handwriting program is self-instructional. Thus, teacher direction consists of oral instructions provided on five pages of the program, and no other help. One hundred nine subjects of the non-programmed group received instruction based on teacher interpretations of the Zaner-Bloser handwriting manual.

Evaluation of Handwriting

Description of Instruments.--The four instruments used to measure change in handwriting were mentioned above: Guiding Growth in Handwriting Evaluation Scale, (Zaner-Bloser Co.); (9) the Noble's Handwriting Scale (Noble & Noble, Inc.); (33) the Good Handwriting Scale (Economy Co); (34) and the Michigan Handwriting Scale, as described on pages 23 and 24. The latter was developed by the investigator. Data on the reliability and validity of the first three scales is not provided in the manuals.

Scoring Procedures.--Scoring procedures to be used in the three published handwriting scales vary considerably. In order to facilitate scoring and to provide a uniform frame of reference for judging handwriting samples of children, the following point system was used by the judges:

Excellent handwriting	95, 100
Good handwriting	85, 90
Satisfactory handwriting	70, 75, 80
Fair handwriting	60, 65
Poor handwriting	55 . . . 0

Samples on the handwriting scales appear as follows:

The Zaner-Bloser Scales offer five ranked specimens of children's handwriting on each grade level. These are specified on the scale from high to low. Each sample was assigned a score, as in the table above; e.g., medium was considered 70-80.

The Noble's Handwriting Scale presents one sample of children's handwriting on each grade level. This sample is labled on the scale as satisfactory and a score of 70-80 was assigned to it. Judges had to determine, from the one sample on the Noble's Scale whether children's handwriting ranked higher or lower than satisfactory, in accordance with the table above.

The Good Handwriting Scale presents three examples of handwriting on each grade level. These are ranked as superior, satisfactory and unsatisfactory. It was suggested by the publishers that finer ratings than these three might be determined by judges. The rating of satisfactory was designated as a score of 70-80 by the investigator; 95-100 was considered superior and 55-0 was considered poor.

Handwriting tests were administered according to directions on each scale. Sentences were practiced and tests were timed. Subjects on each grade level wrote for

two minutes on the papers to be judged. Although tests were timed, rate of writing was not considered in this study.

Handwriting Evaluation.--Three teachers, two elementary and one business education, served as judges. Judges were unaware of the purpose of the study. One judge taught in Marquette, Michigan, one in Bedford, Michigan, and the third was a graduate student at the University of Michigan.

Each judge received a packet of the handwriting samples. These were rated and scores were recorded on specially prepared sheets. The score sheets were returned to the investigator upon completion of the rating by each judge. At no time did the judges have an opportunity to collaborate on scores.

Handwriting samples taken before instruction consisted of 229 second, third, fourth and fifth grade subjects. Samples were taken from the three published handwriting scales, making a total of 687 handwriting samples. After handwriting instruction, the same tests were administered and the same judges rated the handwriting samples. A total of 1374 samples were evaluated.

1. Inter-rater agreement.

In order to establish inter-judge scoring agreement, coefficients of correlation were derived using the total number of samples (Table 4). Inter-judge agreement ranges from .433 to .761 with a median of approximately .68. There appears to be a slight tendency for higher agreement on post-test results than on pre-test.

TABLE 4

INTER-RATER AGREEMENT OF THREE JUDGES ON THREE HANDWRITING SCALES--PRE- AND POST-TRAINING

Scales	Judges					
	1 v. 2		1 v. 3		2 v. 3	
	Pre	Post	Pre	Post	Pre	Post
Zaner-Bloser	.433	.575	.761	.658	.620	.694
Good	.505	.651	.700	.660	.653	.664
Noble's	.438	.679	.748	.667	.644	.713

2. Intra-rater agreement.

For the purpose of determining intra-judge reliability in the scoring of handwriting samples, thirty pre-tests, randomly selected, were returned to each of the three judges eight weeks after the first scoring (Table 5). Coefficients ranged from .473 to .838 with a median of .70. In general then, judges agree with themselves over time to the same extent as they agree with each other at a given time on these scales. The magnitude of the coefficients raise doubts as to the usefulness of the scales, at least among these judges.

TABLE 5

INTRA-JUDGE RELIABILITY ON THIRTY HANDWRITING SAMPLES

Scales	Judge 1	Judge 2	Judge 3
Zaner-Bloser Scale	.762	.473	.806
Good Scale	.838	.636	.783
Noble's Scale	.700	.693	.654

Procedure for Evaluating the Michigan Handwriting Scale

Pre-tests of both programmed and non-programmed groups were scored blind by the investigator. As a check on her competency, five judges were asked to rate forty handwriting samples taken from the pre-tests. The sixth judge was the investigator. Six weeks after the original ratings, each of the five re-rated eight samples while the investigator re-rated forty samples. Their agreement is indicated by the coefficients reported in Table 6.

TABLE 6

INTER-JUDGE AND INTRA-JUDGE AGREEMENT (N=40) AND INTRA-JUDGE AGREEMENT (N=8) ON THE MICHIGAN HANDWRITING SCALE**

Judge	1	2	3	4	5	6
1	(.981)	.885	.810	.857	.890	.894
2		(.961)	.816	.890	.904	.923
3			(.876)	.828	.788	.833
4				(.972)	.883	.901
5					(.961)	.874
6						(.959)*

** ( ) Indicates intra-judge coefficients.
* Based upon forty samples, rather than eight.

Coefficients of inter-judge agreement ranged from .788 to .923 with a median of .883. Intra-judge coefficients ranged from .876 to .981 with a median of .961.

RESULTS

The following contention was advanced: programmed handwriting based on an analysis of the handwriting task will provide an effective and efficient method for teaching cursive handwriting. To evaluate that contention, primary grade children received a cursive handwriting program while control groups received instruction in the Zaner-Bloser method, commonly used in public schools. The comparative effectiveness of the method is demonstrated in Table 7.

The mean pre-test score for grade two, programming method, was 60.45% over the three published scales and the post-test score was 71.23%, a significant change. The non-programmed method also reflects a significant change, from 58.2% to 61.0%. The magnitude of the changes are quite different, 11% to 3%. On the Michigan Scale, the difference is more pronounced, from a pre-test mean of 18.57 to a post-test mean of 27.00, a difference of 8.43. The conventional method produced no change on the scale, 18.50 to 18.44.

For grade three, results are similar though less extreme. A gain of 5.8% from 66.8% to 72.85% was registered by the programming group while a gain of 2.93%, roughly half as great, was provided by the conventional method. Again, the Michigan Scale showed a substantial

TABLE 7

CHANGES ON FOUR HANDWRITING SCALES AMONG CHILDREN IN GRADES 2-5 RECEIVING NON-PROGRAMMED AND PROGRAMMED INSTRUCTION FOR FOUR WEEKS

Grade	Group	N*	Scale	Pre-Test Mean %	Pre-Test S.D.	Post-Test Mean %	Post-Test S.D.	Mean Difference %	t	p<
2	Programmed	19	Zaner-Bloser	61.05	8.30	71.58	8.55	10.53	4.01	.01
		20	Good	61.00	12.46	73.25	6.65	12.25	5.63	.01
		19	Noble's	59.30	10.75	68.86	6.79	9.56	5.59	.01
			Mean	60.45		71.23		10.78		
		21	Michigan**	18.57	6.13	27.00	5.05	8.43	8.56	.01
2	Non-Programmed	18	Zaner-Bloser	60.09	6.17	64.54	10.56	4.45	3.56	.01
		20	Good	57.83	8.90	61.58	7.03	3.75	2.71	.01
		20	Noble's	56.67	10.56	56.92	8.57	.25	.20	N.S.
			Mean	58.20		61.01		2.80		
		18	Michigan	18.50	5.37	18.44	9.27	.56	.04	N.S.

* Number of subjects varies due to absences.

** Michigan Scale results are reported as raw scores.

TABLE 7--Continued

Grade	Group	N*	Scale	Pre-Test Mean %	Pre-Test S.D.	Post-Test Mean %	Post-Test S.D.	Mean Difference %	t	p <
3	Programmed	32	Zaner-Bloser	66.25	10.34	70.57	6.35	4.32	3.75	.01
		32	Good	65.63	8.23	73.65	8.43	8.02	6.60	.01
		30	Noble's	68.83	11.46	74.33	7.73	5.50	4.00	.01
			Mean	66.87		72.85		5.80		
		32	Michigan	21.91	5.61	33.94	4.14	12.03	14.92	.01
3	Non-Programmed	31	Zaner-Bloser	69.63	7.51	70.81	5.67	1.18	1.04	N.S.
		30	Good	66.83	6.53	73.00	6.90	6.17	5.39	.01
		31	Noble's	70.00	7.72	71.45	7.71	1.45	1.17	N.S.
			Mean	68.82		71.75		2.93		
		31	Michigan	26.81	4.58	25.77	4.77	-1.03	1.04	N.S.

* Number of subjects varies due to absences.

TABLE 7--Continued

Grade	Group	N*	Scale	Pre-Test Mean %	Pre-Test S.D.	Post-Test Mean %	Post-Test S.D.	Mean Difference %	t	p<
4	Programmed	32	Zaner-Bloser	70.83	4.95	69.22	5.27	-1.62	-.74	N.S.
		31	Good	66.88	8.40	71.88	7.09	5.00	4.00	.01
		32	Noble's	72.81	8.63	77.81	8.77	5.00	3.45	.01
			Mean	70.18		72.97		2.79		
		31	Michigan	24.68	6.32	31.77	6.09	7.09	8.22	.01
4	Non-Programmed	29	Zaner-Bloser	72.36	5.54	72.13	5.50	-.23	-.41	N.S.
		28	Good	68.21	8.20	72.38	8.27	4.17	4.20	.01
		27	Noble's	69.20	9.28	74.82	8.15	5.62	4.67	.01
			Mean	69.92		73.11		3.19		
		27	Michigan	27.22	4.56	24.85	3.96	-2.37	-2.43	

* Number of subjects varies due to absences.

TABLE 7--Concluded

Grade	Group	N*	Scale	Pre-Test Mean %	Pre-Test S.D.	Post-Test Mean	Post-Test S.D.	Mean Difference %	t	p<
5	Programmed	32	Zaner-Bloser	74.43	6.45	73.39	4.39	-1.04	-1.39	N.S.
		32	Good	65.52	7.54	70.26	5.32	4.74	7.26	.01
		29	Noble's	69.60	7.14	70.75	6.19	1.15	1.72	N.S.
			Mean	69.85		71.43		1.62		
		31	Michigan	28.03	4.84	30.74	5.59	2.71	3.22	.01
5	Non-Programmed	26	Zaner-Bloser	70.77	7.47	73.98	5.77	3.21	3.79	.01
		23	Good	65.87	10.36	69.13	8.00	3.26	2.45	N.S.
		26	Noble's	66.22	9.62	69.55	7.20	3.33	2.72	.01
			Mean	67.62		70.89		3.27		
		28	Michigan	27.14	6.21	27.39	6.23	.25	.30	N.S.

* Number of subjects varies due to absences.

change, 21.91 to 33.94, or a raw gain of 12.03 while the control showed no change, 26.81 to 25.77.

In grade four, the children who were in the programming group and the children in the non-programming group displayed approximately the same amount of gain, except that the latter was slightly higher. A gain of 2.79%, from 70.18% to 72.97% was recorded for the programming group, while the non-programming group gained 3.19%, 69.92% to 73.11%. On the Michigan Scale, significant changes were registered for both groups but in different directions. A pre-test mean of 24.68 to a post-test mean of 31.77, or a gain of 8.22 was significant ($p < .01$) for the programming group. The group who used conventional methods showed a significant reduction on the Michigan Scale, 27.22 to 24.85, or a loss of 2.43 ($p < .05$).

The handwriting of fifth grade children who received instruction by conventional methods, as measured by the three published scales, registered a greater gain from pre-tests to post-tests than did children who were in the programming group. A pre-test mean of 69.85% to a post-test mean of 71.43%, or 1.62% gain was noted for children of the programming group. Children of the non-programming group gained 3.27%, or from 67.62% to 70.89% ($p < .01$). On the Michigan Scale, the programming group gained a mean of 2.71, from 28.03 on the pre-test to 30.74 on the post-test ($p < .01$). Children who did not receive programmed instruction gained .25, 27.14 to 27.39, not significant.

DISCUSSION

The findings, in terms of mean gains between groups of children on various class levels in the elementary school, may be summarized as follows:

(1) Five to six hours of programmed handwriting instruction over a four week period by second and third grade children resulted in handwriting scores on the Michigan Scale equivalent to those of fourth and fifth grade children.

(2) However, such programmed handwriting instruction based on visual discrimination training prior to handwriting practice, is not effective in grades four and five when measured by three published handwriting scales, although it is effective when measured by the Michigan Scale.

(3) Mean gains of the non-programmed groups, as determined by three published handwriting scales, improved at each grade level; 2.80% in the second grade, 2.93% in the third grade, 3.19% in the fourth grade and 3.27% in the fifth grade (Table 7).

(4) Changes in handwriting skill of the non-programmed groups, as determined by the Michigan Scale, are not significant, except on the fourth grade level where a significant loss in skill occurred.

The results support the contention that a more effective and efficient method of teaching cursive handwriting can be developed.

The highly significant gains in the second and third

grades indicate that children who have received little or no handwriting training are more likely to benefit from systematic visual discrimination training prior to handwriting training than will children in fourth and fifth grade levels. It is probable that the young child has not had the opportunity to learn the constituent skills, e.g., space and form discrimination.

High gains by children on all grade levels in the programmed groups as determined by the Michigan Scale indicate that the programmed materials, in their present form, tend to teach details of spacing of letters, height of letters, letter formation, alignment of letters and slant of letters in individual letters and words rather than in sentences or paragraphs. While this omission is not an important factor during the early stages of learning to write, it becomes of major importance as the child begins to use handwriting as a tool. For example, of a possible 50 points on the Michigan Scale, 43 was the highest score attained on the post-test. Upon completion of the program 90% of the subjects should have reached 48 out of the possible 50 points. Therefore, it seems apparent that the program must be extended to teach higher level skills.

Such skills include the discrimination of common errors in words appearing in context and provision for production of such words in sentences and paragraphs. The kinds of paper commonly used, with the usual variations in texture and spacing of lines, may need to be provided in order to

facilitate the transfer of handwriting skills to classroom activities. Capital letters and digits have yet to be included.

SUMMARY

This study was based on the assumption that an effective and efficient method of handwriting instruction can be produced by using the strategies of programmed learning. A program, based on an analysis of the handwriting task, was developed by the investigator.

Eight groups of children, a programmed and a non-programmed learning group in grades two, three, four and five, were tested for handwriting ability prior to training by a conventional (Zaner-Bloser) and a programmed curriculum. Upon completion of training four weeks later, the children were again tested. The same handwriting scales, the Zaner-Bloser Scale, the Good Scale, the Noble's Scale, and the Michigan Scale, were administered at both testing sessions.

The handwriting samples derived from the use of the three published scales were rated by three judges; samples from the Michigan Scale were rated blind by the investigator.

Results of the study indicated that programmed handwriting instruction is highly effective in grades two and three; it is not effective in grades four and five, as measured by three published handwriting scales, but is effective as measured by the Michigan Scale, designed to accompany the instructional material.

Conventional handwriting instruction, on the other hand, produced small though significant gains at each grade level.

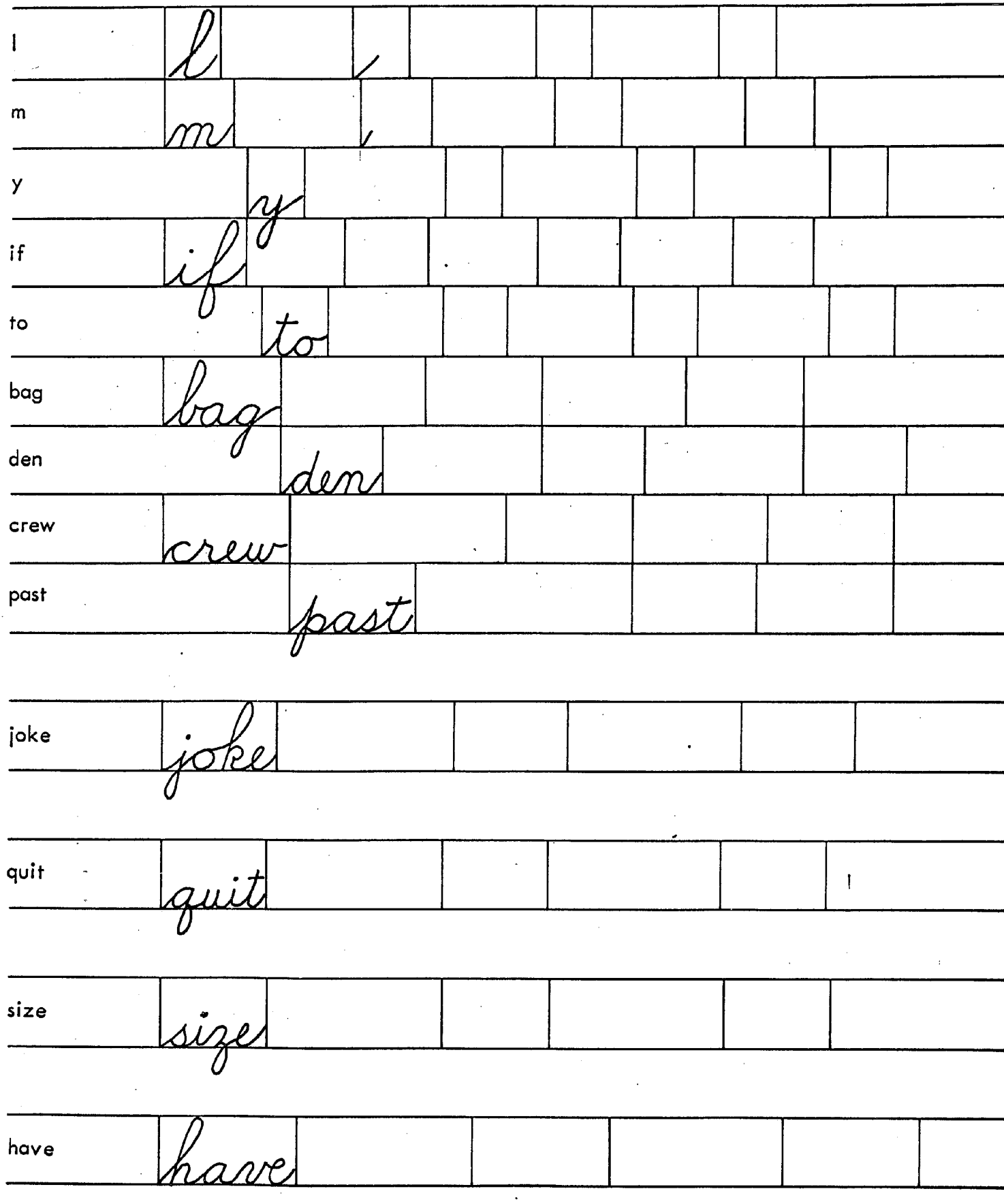
Higher level skill thought to be required for grades three, four and five include:

1. Production of capital letters and digits;
2. Use of common styles of paper;
3. Discrimination and correction of common errors in words within sentences (copy-editing).

APPENDIX A

MICHIGAN HANDWRITING SCALE RESPONSE SHEET AND MICHIGAN HANDWRITING SCALE SCORING SHEET

Name _____ Grade _____ Age _____



MICHIGAN HANDWRITING SCALE RESPONSE SHEET

Directions to be read to students:

Look at the letter "l" in the first box.

Skip the space to the right of the letter and finish the "ℓ" started for you.

Skip another space and make an "l".

Skip another space and make an "l".

Look at the letter "m" in the first box of the second line.

Finish the letter "m".

Skip a space and make an "m".

Skip a space and make an "m".

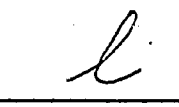
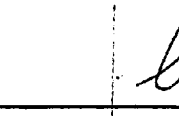
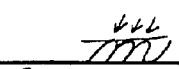
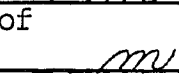
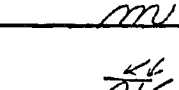
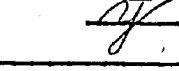
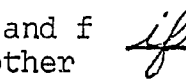
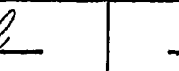
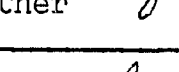
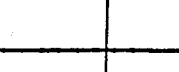
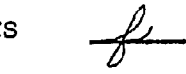
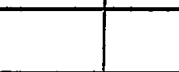
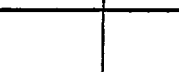
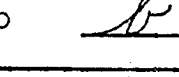
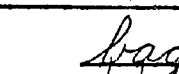
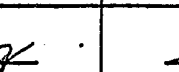
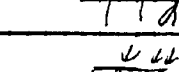
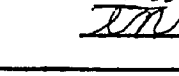
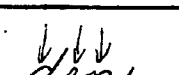
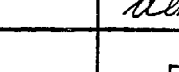
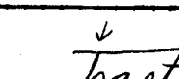
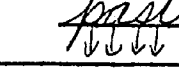
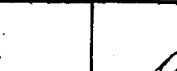
Do the rest by yourself.

MICHIGAN HANDWRITING SCORING SHEET

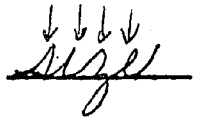
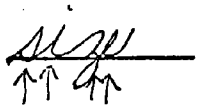
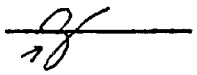
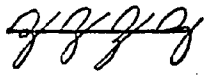
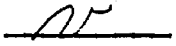
Scoring Procedure

1. Look at the students' responses to item 1. Score only the last two responses.
2. Award <u>one</u> point for each "correct response," "correct" as defined on the scoring sheet.
3. The score equals <u>total</u> points.

Name _____ Handwriting Evaluation Grade _____

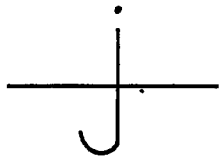
		Correct	Wrong	I
l	upstroke crosses downstroke 1/4-1/3 height of letter			
m	consistent height of overstrokes			
	alignment of 4 points of letter on base line			
y	equal height of overstroke & right st upstroke			
if	consistent slant of i and f in relation to one another			
f	point of upstroke meets base line			
o	alignment on base line			
b	loop and point of second upstroke in relation to first upstroke			
bag	spacing			
en	consistent height of 3 points in two letters			
den	spacing			
r	point of left is definite			
past	spacing consistent height of p and t			
as	alignment of connecting stroke between a-s on base line			
pt	consistency of slant			
joke	alignment on base line			
k	peakiis too close or too far from downstroke			
q	correct direction of descender			
u	consistent height of two upstrokes			
s	point on letter is 1/32-1/64"			
Total				

Name_____

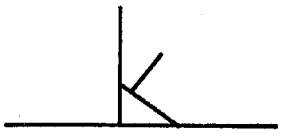
		correct	wrong	I
SIZE	spacing			
z	point of z touches base-line point must be definite and no longer than 1/64"			
h	overstroke is no higher or lower than approxi-mately 1/3 height of the letter			
v	curve must be definite			
TOTAL	PAGE ONE			
TOTAL	PAGE TWO			
COMPLETE TOTAL				

APPENDIX B

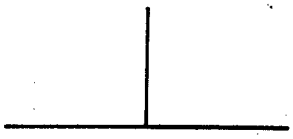
SAMPLE FRAMES FROM THE MICHIGAN SUCCESSIVE DISCRIMINATION HANDWRITING PROGRAM (BOOK D)



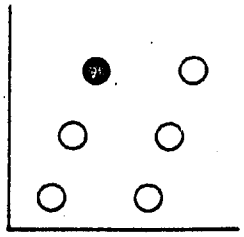
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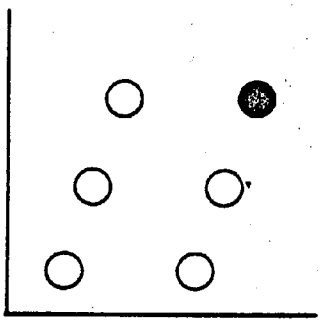


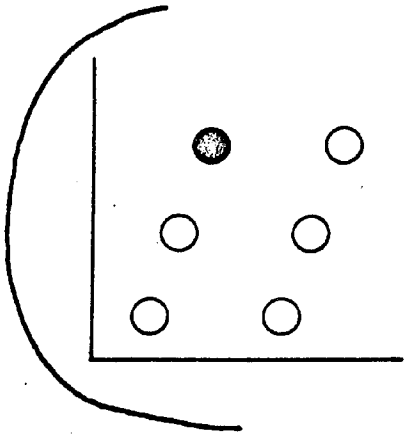
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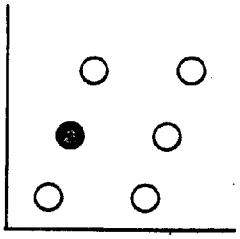


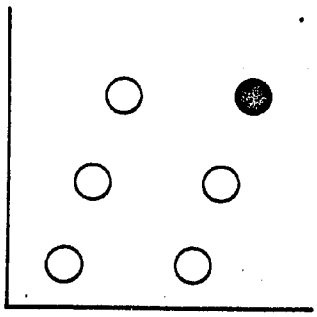
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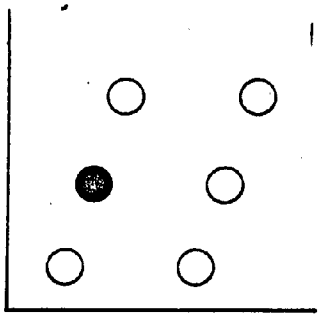


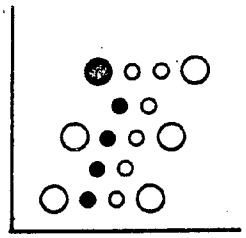


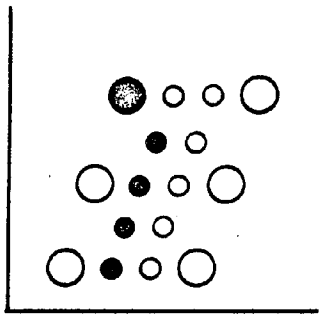


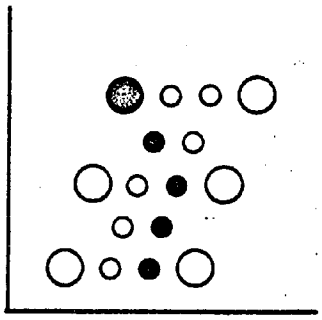


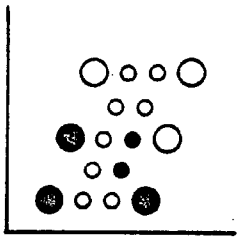


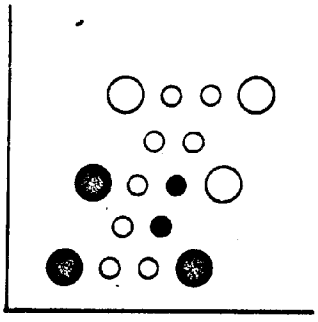


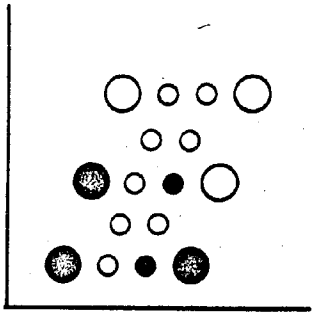


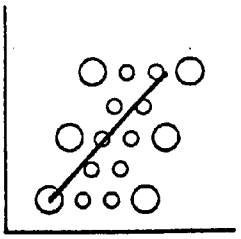


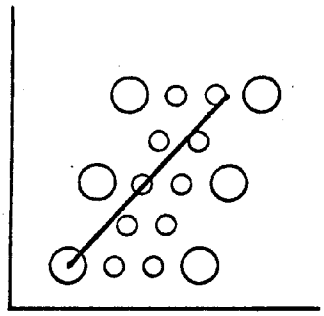


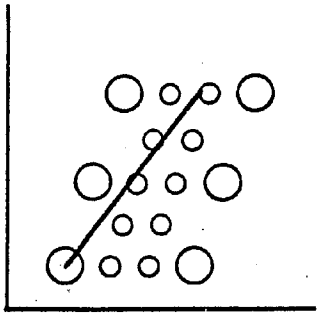


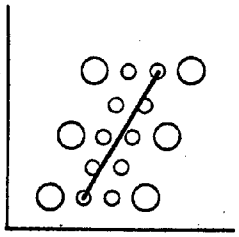


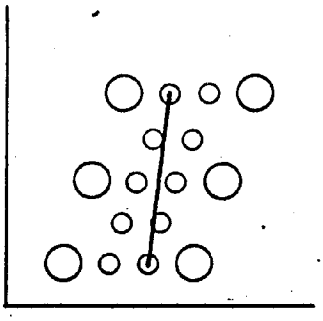


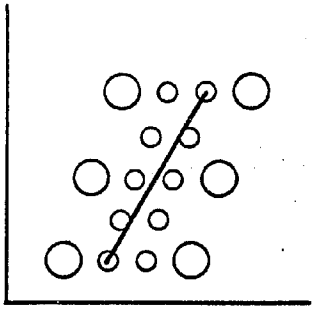


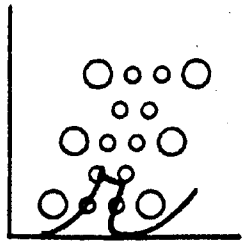


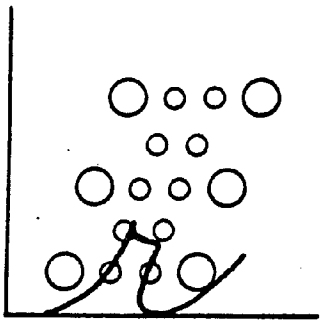


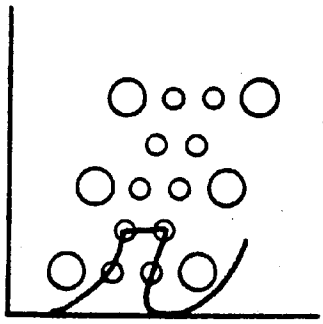


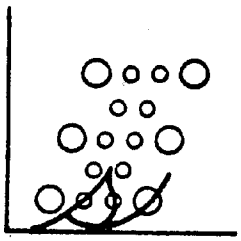


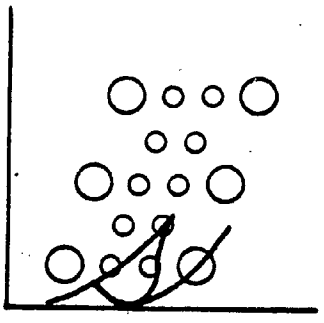


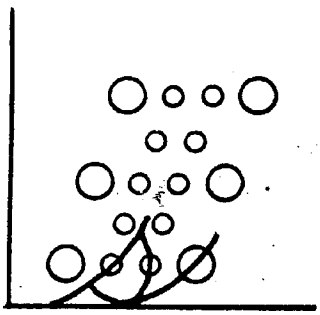


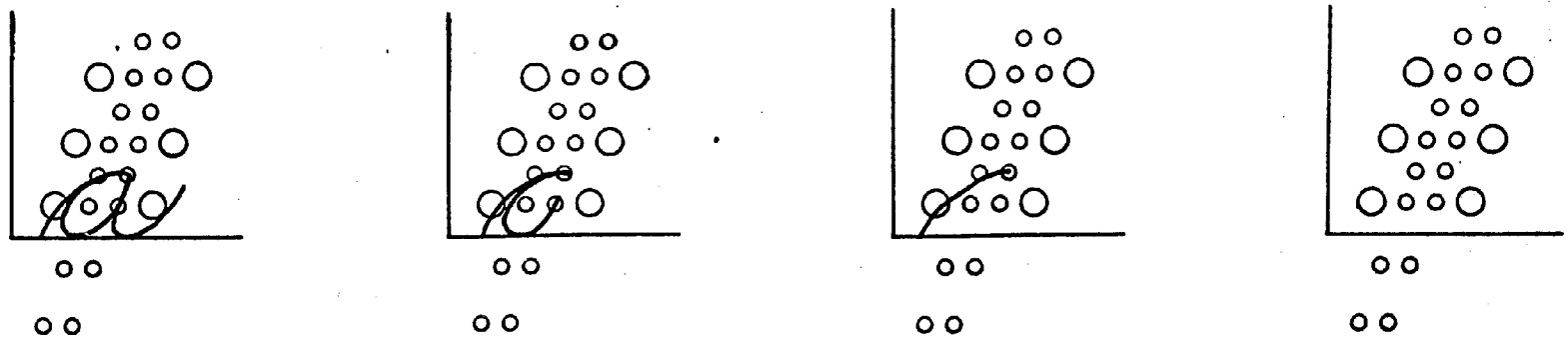


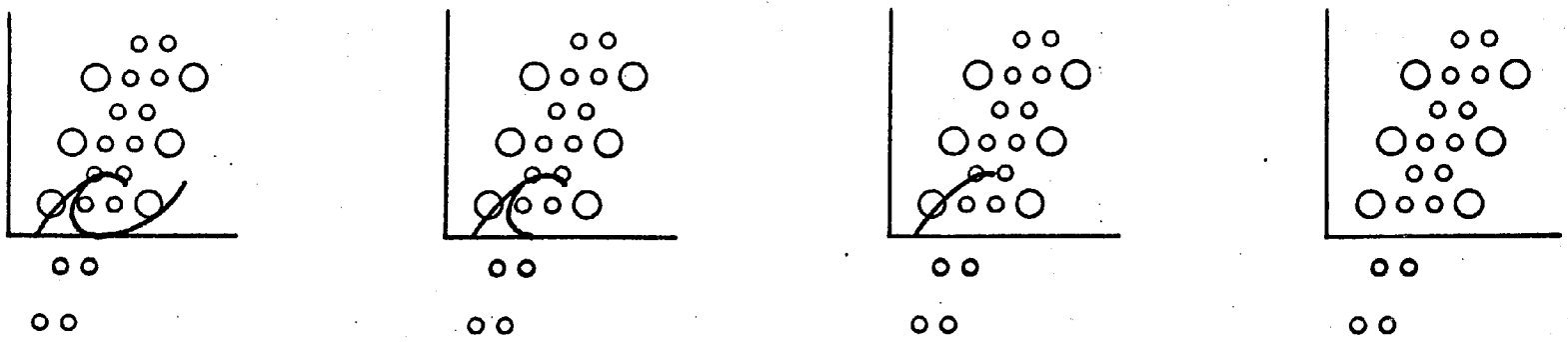


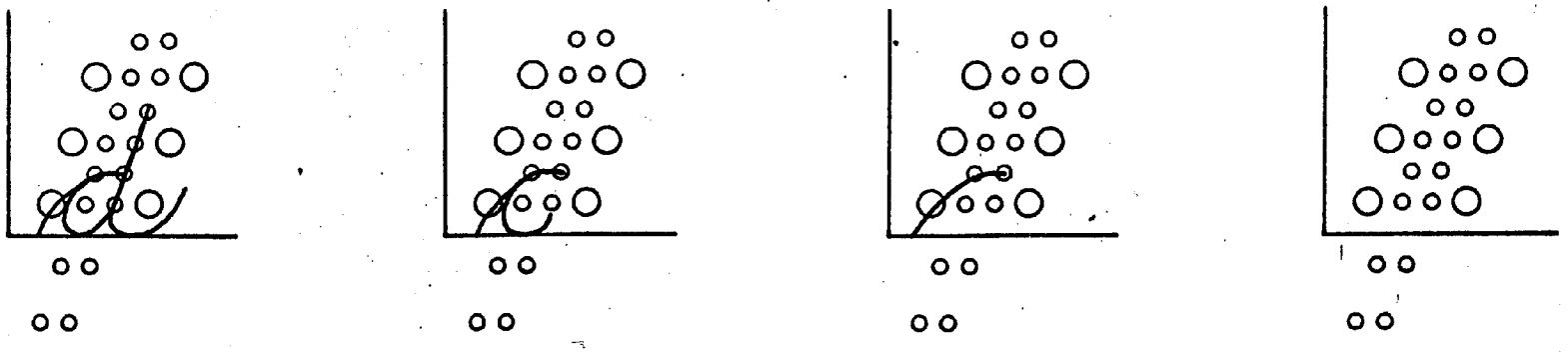


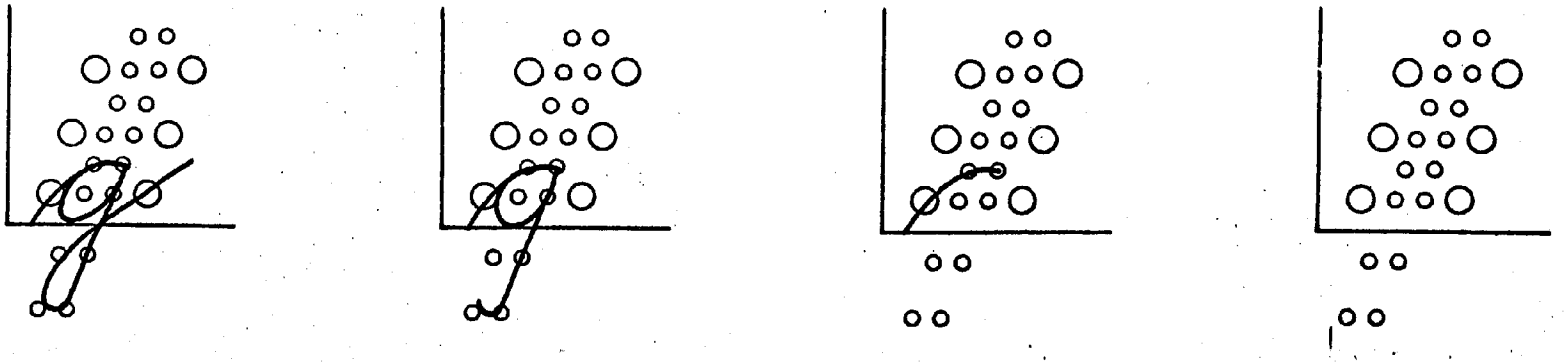


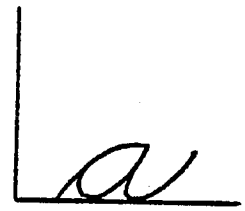




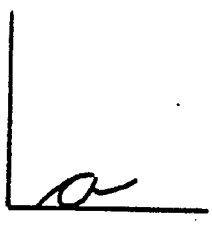




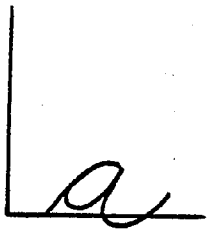




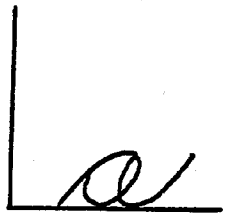




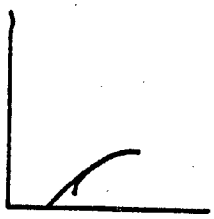


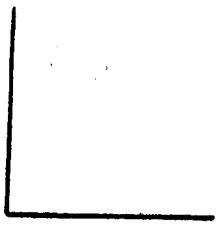


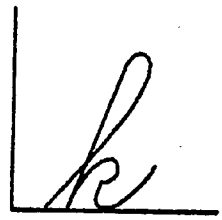


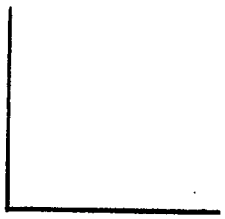


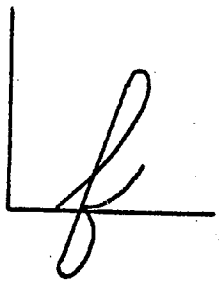


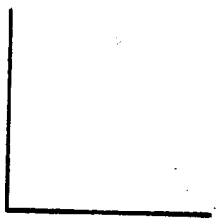


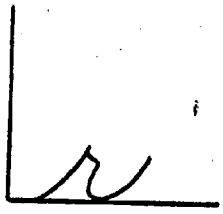


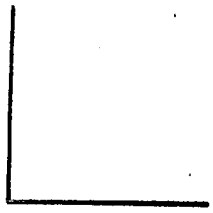












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