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Individualized Reading Instruction with Programmed Materials in a Third Grade

Alpha Pauline Lieb
Central Washington University

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INDIVIDUALIZED READING INSTRUCTION
WITH PROGRAMMED MATERIALS
IN A THIRD GRADE

A Thesis
Presented to
the Graduate Faculty
Central Washington State College

In Partial Fulfillment
of the Requirements for the Degree
Master of Education

by
Alpha Pauline Lieb
August 1969

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John E. Davis, COMMITTEE CHAIRMAN

Byron L. DeShaw

Darwin J. Goodey

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CHAPTER I

PROBLEM AND DEFINITIONS OF TERMS USED

I. INTRODUCTION

For some time a large portion of our national population has been concerned with the state of reading in our schools and society as a whole. Concern about reading is not new. In the history of education, the importance of reading dates back to the days of the Old Testament. Reading has been of primary importance throughout all eras of written history (57:274-275).

In Colonial America, reading was given the first priority in the educational program. It has held this position throughout the history of America (57:275-276). Today, more than ever before in the history of mankind, concern and emphasis on reading has reached a new height.

This concern has been accelerated by the tremendous technological growth and advancements made in this country and throughout the world. Since the advent of the Space Age, along with the technological developments in communication, transportation, and industry in the world and the vastly increasing store of man's knowledge, reading skill has become essential for survival and advancement as a nation and as an individual. We, as a nation or as an

individual, can ill afford to have a segment of our society who are illiterate or, at best, are sub-standard in their abilities.

II. PROBLEM

Statement of the Problem

Even though reading has been stressed throughout the written history of mankind, and America in particular, there has always been a portion of the population who have not acquired adequate reading skills commensurate with their individual abilities, although they were afforded the opportunity to acquire them. It has been estimated that the average reading level of the American people ranges from third to fifth grade reading level. A great number of methods, techniques, and materials have been tried and set aside for others. No single answer has been found that will fit the needs of all the children in the classroom and guide them to successful reading achievement. Compounding this problem are several other factors. Among those factors affecting the educational situation besides the technological revolution are the population explosion, scarcity of adequately prepared teachers, the restrictions of the educational facilities, and the financial problems related to schools and education.

Generally, the basal-reading approach has been used for the last sixty years in the American schools (57:277). It was generally considered an improvement over previously used methods and materials, and it fit the needs of the time for the majority of the school population. Remedial instruction was initiated to help those children who were having severe reading difficulties. There are many children in the classroom who have reading problems not severe enough to qualify them for remedial instruction by a specialist. This is further complicated by a lack of funds to finance specialized reading instruction, thus limiting the availability of such assistance. These children need corrective assistance to overcome their reading difficulties so that they will not become more severely and permanently handicapped.

With the onset of the technological revolution and the other factors affecting education, a way must be found to meet individual children's needs in reading, assist the teacher in handling the increased class loads, and remain financially and administratively feasible.

A development of the technological age that could possibly meet these criteria is programmed instruction.

Purpose of the Study

This study was made to determine whether programmed

reading materials could correct some of the reading difficulties that develop in children more effectively than the conventional basal approach to reading. Other purposes were to evaluate (1) the financial and administrative feasibility of programmed materials, (2) their effectiveness in individualizing instruction in reading, and (3) the benefits and/or hindrances these materials were to the teacher and students while working in a self-contained classroom situation.

III. THE HYPOTHESIS

There would be no statistically significant differences in the success of reading achievement between children instructed by the standard basal reading program and those instructed in the programmed reading technique.

Importance of the Study

A sizable portion of our society spend their lives as non-readers, or at best, poor readers. In this era of technological revolution and advancement, it has become increasingly important that each individual is educated and developed to his fullest capabilities, not only for his own benefit and survival, but for those of society as a whole.

Non-reading or poor-reading adults originate from non-reading or poor-reading children. Screening examinations at a Reading Center have shown two danger points in

the elementary school child's reading progress: failure of the first or the third grade. More of these children's failures were due to poor reading achievement than any other factor (62:507). The poor readers often become frustrated and emotionally involved by their inability to succeed in reading. This in turn further complicates the process of learning to read. Jaranko further states that "perhaps the most important side effect that has been observed in the children . . . is their damaged self concept" (62:509). When the child's self concept is damaged in varying degrees, it often leads to further school failure in other subject areas and grade levels. These children frequently become the discipline problems in school and the dropouts. This in turn limits the individual's opportunities in adult life and they usually have a difficult time fitting into our ever-advancing society. If these children's weaknesses could be identified early, when they first appear, and corrected before the weakness becomes a set habit, it seems probable that it would lead to the child's greater success and enjoyment in his school experience in general, and reading in particular. Consequently, a method needs to be found that could help these children overcome their deficiencies so they may enjoy greater success in their future educational experiences.

These same children usually require a disproportionate

amount of teacher time and energies, often at the expense of the other children in the classroom. Therefore, it is also desirable to find a means by which the child can improve his reading skills without a great deal of teacher time and assistance.

IV. DEFINITIONS OF TERMS USED

Frame

The smallest unit of instructional material exposed at one time.

Prompt

A hint, "cue," or help used for insuring a correct response in the learner.

Operant Conditioning

A form of behavioral conditioning; the learner actively responding to the environment.

Overt Response

A response that is observable.

Programmed Instruction

A machine or book that contains a program of instruction having the following characteristics: the material is arranged sequentially in small steps or frames leading from the familiar to new material or concepts; continual response

is required of the student; adequate "cues" or prompts are presented to make a successful response more likely, and reinforcement is provided through immediate knowledge of the results by the learner.

Reading Difficulty

For the purposes of this study, any evidences of reading problems, principally those associated with developmental reading skills.

Limitations of the Study

This study did not take into consideration that two of the schools had available, and had used, the services of a remedial reading teacher. One school was eliminated from the study because it had a third-fourth grade combination class. Another limiting factor of the study was the grouping arrangements: some children were placed into a homogeneous class by reading ability in a continuous growth program, and other children were in heterogeneous classes throughout the entire day, while still others were homogeneously grouped for reading only by the Joplin plan.

The daily reading time with the programmed materials was limited to twenty-five to thirty minutes, usually five days a week for approximately eight months.

Other variables not considered in this study were health of the children, home environment, socio-economic

factors, classroom environment and conditions, and the control classes activities.

V. ORGANIZATION OF REMAINDER OF THE THESIS

A resume of the history and present status of the problem and a review of the selected related literature are presented in Chapter II. Chapter III contains a description of the program, methods, materials, and procedures used in the study. Chapter IV presents the results and analysis of the findings of the study. A summary of the study and the writer's conclusions and recommendations are presented in Chapter V.

CHAPTER II

REVIEW OF THE LITERATURE

The organization of this chapter begins with a brief history and present status of the problem. Following this is a review of related literature covering programmed instruction and theory, grouping, and the individualizing of instruction. Selected research reports pertinent to this study conclude this review.

I. HISTORY AND DEVELOPMENT OF PROGRAMMED INSTRUCTION

Programmed instruction has had a long laborious birth since its inception. Today it is still in its infancy of projected development, even though, as Herrick pointed out:

In this decade, programmed instruction in both mechanical and non-mechanical formats has commanded more attention from educational researchers than any other innovation in education to this time (61:695).

The seeds of programmed instruction may be found deep in the theory of education and the psychology of learning. Socrates is regarded as having been one of the greatest teachers in the historic world. He functioned usually as a private tutor, asking questions of his students and guiding them in sequential steps throughout the lesson,

thus causing active participation by the students, with Socrates providing continual "feedback" (61:41). Parallel steps are found in programmed instruction. About five hundred years ago, Comenius tried to specify a kind of education that would cause a student to "learn more, and the teacher to teach less" (38:18).

In 1809, H. Chard was granted a patent by the United States Patent Office for a device designed to teach reading. Another device designed to teach spelling was patented in 1866 by Halcyon Skinner. This, according to B. F. Skinner, was the first real teaching machine. Still another device, designed to train the sense of touch, was patented in 1914 by Maria Montessori (22:8).

During this same period, Angell and Cattell were working with the theory of functional psychology, which was a predecessor of behaviorism. As Garner stated:

Behaviorism began about 1913 with Watson, a student of Angell's, who recommended that not only animal but human psychology be limited to the study of behavior. . . . Its theoretical goal was the prediction and control of behavior (22:6).

In 1902, Pavlov conducted experiments involving conditioned responses in dogs. Pavlov's and Watson's ideas have been enlarged upon by modern psychologists who hoped to bring about "desired behaviors through operant conditioning" (22:6). Another nineteenth century psychologist,

Edward L. Thorndike, developed the "law of effect," which is now known as the reinforcement theory.

The pioneer of modern day teaching machines is generally considered to be Sydney L. Pressey, who, in the early 1920's, developed a teaching machine that would test as well as teach. He experimented and published his results, but became very discouraged by the lack of interest and enthusiasm on the part of educators and psychologists. Pressey's machine was designed to teach, test, and record the responses made by the learner. The student was immediately informed of the correctness or incorrectness of his response and Pressey found that students learned and could transfer this learning to other problems dealing with similar principles (9:9-11). A dejected Pressey set aside his work for several decades.

In the years 1940 through 1950, with the impetus of war, the military services of the United States experimented and tried various programming techniques (39:19-20). In 1943, B. F. Skinner and two colleagues first saw programming when they taught a pigeon by operant conditioning (22:8-9). However, nearly thirty-five years had elapsed from Pressey's time before Skinner, after several decades of studying the learning process, established "important principles that apply to all learning" (69:2).

II. VARIATIONS IN PROGRAMMING TECHNIQUES

Interest was revived in 1954 by Skinner's paper, "The Science of Learning and the Art of Teaching," which described the practical use of these principles and related them to classroom learning and teaching. The basic difference between Pressey's method and Skinner's is in the Skinner format; the learner must make a freely constructed response (61:44).

A third important figure in the development of programmed instruction was Norman A. Crowder. In 1955, he became involved in the production of programmed learning devices. Crowder developed the "scrambled textbook" or "branching" program, which is distinguished generally by larger steps and longer frames. When the student responds, he is permitted to progress forward if the response is correct; however, if there is an error, the error is explained and the student is recycled through a certain portion of the program (9:10-11). A form of corrective branching, not as elaborate as the Crowder type, may be incorporated in the linear-type programs (9:43).

At the same time that Skinner and Crowder were doing their work, other research was being conducted at the University of Illinois by Gordon Pask, an electronics engineer from Britain. Pask decided an adequate manual skills program

should respond to student changes of attitude, interest, and fatigue which occur during the learning process. Pask and John Senders developed a machine "which 'learned' the behavior pattern of students and which constructed their own programs on the basis of this information" (45:13-21).

The three different systems of programming developed from the philosophical basis of the works of Skinner, Crowder, and Pask are now known as linear, branched or "intrinsic," and adaptive programming (45:13). Adaptive machines are presently very expensive and considered to be in their very early development. However, they may be indicative of one important aspect of programmed instruction in the future (45:22).

Currently, the two major constructed-response type programs are known as linear or Skinner-type and the "branched" or Crowder-type programs. Pipe listed four basic characteristics found in either type of programmed instruction to date as:

1. Small steps. The material to be learned is presented in what have been called "optimally sized increments"
2. Active participation. The student continually is being made to interact with the program. With each small step, a response is required of the student; in some programs, he cannot make headway until he has made the correct response.
3. Immediate knowledge of results. As soon as a student has made a response, he discovers whether he was right or wrong

4. Self-pacing. Each student has his own copy of the program. His rate of progress is determined by the speed at which he works his way through the program; he is not forced to wait for those slower than himself nor is he left standing by those more apt . . . (35:6).

Cook and Mechner describe a fifth characteristic as, "low error rate for the individual learner, as a consequence of the effective operation of the first four principles. . ." (69:3). In other words, programmed instruction is a device that serves as a private tutor in a given curricular area. As Sorenson and Kincaid of the Stanford Research Institute stated:

. . . Programed instruction makes good sense. . . . Programed-instruction procedures employ widely accepted principles of learning such as the following:

- a. Learning motivated by success tends to be more effective than learning motivated by fear of failure.
- b. Active participation by a learner usually leads to faster and more effective learning than does passive reception of information.
- c. Materials and tasks that make sense to the learner are mastered more readily than nonsense materials or tasks that are not understood.
- d. Immediate information or "feedback" about the nature of a good performance--knowledge of mistakes or successful results--makes for more effective learning (30:145).

Wilbur Schramm suggested that it makes little difference whether a student's guide is a teaching machine or a programmed textbook. Specifically, Lottich quoted Schramm as saying, "The machine or book is little more than a case to hold the program. The program is the important thing. . ." (61:42). Another feature common to all programs is that

they are tested and retested as often as necessary with actual students and revised or changed on the basis of the responses and achievements made by the students, until the terminal objectives of the program have been acquired (9:4-5). Lysaught related the procedures followed in developing all programs as:

1. The subject matter to be programmed must be selected . . .
2. The learners must be defined . . .
3. The objectives for the program must be stated. . . in behavioral terms what the student will do at the end of instruction that will demonstrate satisfactory attainment of the material.
4. The paradigm or model for programming must be selected.
5. Individual program items must be written and then ordered into sequences.
6. Initial testing and revision.
7. Field testing and evaluation (66:785).

Herrick included two other characteristics necessary for a good program, these being motivation of the learner and satisfaction, by the learner, that he is learning (61:695).

The philosophy of programmed learning differs from conventional classroom methods in several ways. First, the learner is required to accept more responsibility for his learning and may proceed at his own rate. The student is required to respond actively, mentally and/or physically, and he is provided with immediate confirmation. The student is insured of frequent success, due to the low error rate designed into the programs, which enhances motivation, and lastly, the material is presented in such a manner that the

student's learning is shaped to the desired terminal objectives of the program (45:12). These terminal objectives should be tested. As Garner pointed out:

. . . The distinction between criterion test items and final frames of the course is an important one: The criterion test items should test transfer, by providing test materials not used previously (22:12).

Most classroom instruction, regardless of the media used, is designed for the hypothetical "average" student, who may indeed be non-existent. The rapid learner is frequently held back, while the slower learner or the learner lacking readiness, who might be a good student if afforded the time and maturity, is pushed beyond his capabilities for successful achievement. As Bradley stated, "Failure in an educational program is cumulative in that it feeds upon itself" (37:156). If a learner has trouble with one lesson or concept, the following lessons that are dependent upon the previous lesson or concept, will likely cause even more difficulty for the learner. This, in turn, can lead to decreased desire and motivation on the learner's part. Deterline emphasized that, "Anxiety, an emotional reaction, or frustration will often develop in a student who has had an unsuccessful experience in learning or understanding" (9:28). This also interferes or obstructs subsequent learning.

III. ORGANIZATIONAL PLANS OF INSTRUCTION

The vast variety of individual differences encountered in the classroom is not new to educators. In an attempt to meet individual differences effectively, various forms of administrative and classroom organization and techniques have been and are presently being tried to solve this ever-enduring problem. The types of grouping encountered in this study are herein briefly discussed.

Forms of Grouping

The heterogeneous class, with intra-class ability grouping, is a common form of grouping at the present time. The heterogeneous group is often the basis of a self-contained classroom. The children are generally placed into the class by chronological age or by the number of years spent in school up to that time.

The two types of homogeneous groupings involved in this study were the Joplin plan and the continuous growth or levels plan. The Joplin plan is a cross-grade or inter-class ability grouping method of attempting to meet individual differences in reading instruction. It has been used in some form since 1929, and possibly earlier. In this plan, the classes are grouped heterogeneously except for reading instruction. Reading becomes departmentalized and reading grade level is the basis for the placement of the

student. Children of different ages and grade levels may be placed together for the purposes of reading instruction. Research has shown this grouping to be as effective as ability groupings within a heterogeneous self-contained classroom (70:162).

The continuous growth plan is another form of homogeneous grouping. The classroom is usually self-contained, with the children placed into it by their reading level, and they remain in that classroom for the entire day. However, there may be further ability grouping within this homogeneous class for reading purposes. Justman, in reviewing reading growth, concluded that reducing the range of ability in classes was "not associated with increased achievement in reading" (64:334). He continued by saying:

It would appear that school administrators who utilize "homogeneous grouping" as an administrative device, in the hope of improving pupil achievement, will find that such a process will be of little value unless definite programs are specifically designed for the several ability levels into which their classes are grouped. Grouping by itself, without curricular modification as a concomitant, will not give rise to the desired outcome of improved pupil performance (64:334).

These and other grouping procedures also produce some problems. Deterline pointed out that ". . . assigning students to groups on any basis which does not permit individual attention appropriate to each student's current needs and levels of ability and preparation . . ." will continue to

avoid the solution to the problem of meeting individual differences effectively (9:74).

Forms of Individualizing

Individualized plans of instruction were in existence before 1900. However, adoptions of these methods were not successfully used on a large scale until the Winnetka Plan in 1919 and the Dalton Plan in 1920 were put into operation. In these plans, students progressed at their own rate and the mastery of a unit was necessary before promotion to the next unit was permitted (22:4).

The individualized reading program is an innovation that has been developed by classroom teachers who were concerned and sought better ways to teach children to read. The acceptance of this program has been slow, but it has gradually gained greater popularity and many teachers have tried their own particular versions of it (27:v).

Although the various grouping plans may be an improvement over the universal assignment by chronological age, many authors feel that a combination approach is best. Austin feels that "Grouping children according to their ability to read, but making some provision for individual instruction, would appear the approach most preferred . . ." (1:132). After reviewing research and classroom practices, Karlin concluded, "It is evident that no clearcut advantages

of one grouping plan over another or of individual over group forms have been found" (65:216). Some implications Karlin drew from these and other studies are:

1. There are times when it is feasible to teach a class of children as a whole, providing all benefit from the offering.

2. Grouping can narrow but not completely eliminate the range of reading abilities. Recognizing the difficulties in providing for individual differences, teachers might function more effectively if the range were not too great.

3. Combinations of individual and group instruction seem to be more productive than either alone. Teachers can take advantage of any organizational patterns which assist them in meeting the learning requirements of all their pupils.

4. No organizational plan will insure reading success. The "know-how" the teacher brings to the plan is what counts.

Dependence upon inter-class grouping, intra-class grouping, pupil teams, or other plans to solve instructional problems fails to take into account differences in pupils and in teachers. Some pupils and some teachers function better under one set of conditions than another. A plan of organization is not a method of teaching. It is a facilitator of method, perhaps, but no more (65:216).

Programmed instruction is another approach to individualizing instruction. It too has had a slow acceptance. Some educators have cautiously experimented with it, but many are hesitant to explore its potentialities. Some of the reasons, given by several authors, for this hesitancy are: a tendency by teachers and administrators to cling to previous methods and techniques, lack of understanding by teachers and administrators of the theory of programmed instruction, lack of teacher training, cost of materials

and/or equipment, and lack of research (45; 22; 37; 52; 30; 9; 47).

Some present disadvantages of programmed instruction, cited by several authors, are: premature emphasis on teaching machines instead of on the program, hurried rate of introduction since Skinner's presentation, expectations of teachers and administrators too high, capitalization on the innovation by entrepreneurs, premature hardening of the program format and use, logistics, the time and expense required to write the programs, and lack of cheating control in the programmed textbook format (47; 37; 38; 22; 30; 21).

In contrast to these disadvantages, several authors have cited some advantages of programmed instruction, other than those of self-pacing, low error rate, feedback or immediate knowledge of results, subsequent reinforcement, and active participation on the part of the learner. Some of these advantages are: increased responsibility of the student for his own learning; efficiency, economy, and speed of instruction; rapid determination of a student's learning problem; ability of the teacher to focus on the learning process; reduction of group pressure for the child; instruction based on scientific principles and theories of learning and research; program which is learner oriented; quantification and specification of concepts and materials; improvement of morale, motivation and retention of learning;

more flexibility of instruction and assurance of success (45; 38; 9; 37; 30; 22; 69; 44).

IV. REVIEW OF SELECTED RESEARCH REPORTS

During the ten year period of 1954 through 1964, approximately 190 reports of original research on programmed instruction had appeared. Of these, 165 had appeared since 1959. Nearly half of these reports dealt with presentation variables and approximately one-third dealt with response modes. The remainder of the reports, or about two-fifths, included a number of evaluative tests and special applications of programs. A few were concerned with the special objectives of transfer and discovery training. Most reported research to date has been done with linear programs and variances of them. College students have been the major subjects of these experiments, with secondary-school children and adult or military samples ranking second. A very few studies dealt with primary-school children and still fewer with pre-school samples (39:1-3).

One of the problems encountered in reviewing original research in this field is that, due to its newness, many of the reports have never been published. Also, there is often a time lag between the actual research and subsequent publication (39:3).

In 1964, Schramm recorded thirty-six reports of studies which compared programs with conventional classroom instruction. He notes that, of these reports, "sixteen of them were done in colleges, four in secondary school, five in primary school, ten with adults, and one with retarded children" (39:5). Half of these comparisons showed no significant difference when measured by the same criterion test. The other half, with the exception of one, showed a significant growth for those students who worked with the program.

Porter, in a study comparing the effectiveness of a teaching machine and conventional classroom instruction, used 45 second grade, 63 fourth grade, and 37 sixth grade children as subjects. The program was a linear spelling program. He concluded that students learned as much from one technique as the other, but the programmed instruction subjects learned this amount in about one-third of the time. Greatest gains were made "by students in the lower-IQ half of the teaching machine groups, the least gains by individuals in the comparable groups taught by the teacher" (39:86).

McNeil studied 132 kindergarten children for two years. His study was concerned with the sex differences in reading performance of students taught by programmed instruction and those taught by female teachers. Results

of the study showed that "boys scored significantly higher than girls under programed instruction, but significantly lower than girls in the classroom under female teachers" (39:82-83).

McNeil, in another study using programmed instruction in reading as a research tool with 188 kindergarten children, found that oral responding produced significantly greater learning. Further results showed that males achieved more than females with programmed instruction, children wanted to read more, and programmed instruction was especially effective for children with lower IQ's (68:37-42).

Goldstein and Gotkin, in reviewing eight research studies on teaching machines compared with programmed textbooks as presentation modes in spelling for fourth graders, found no significant differences in learning of the subject matter between these two modes. However, in four out of five studies concerned with the variable of time, the programmed text was favored significantly (59:29-36).

Burkott and Clegg compared the effectiveness of Buchanan and Sullivan's Programmed Reading with the Betts Basal Readers in a remedial situation. The forty primary grade subjects were tested in silent and oral reading and in spelling. These investigators found no significant differences in the reading ability of the subjects taught

by the two reading methods. They concluded, however, that Programmed Reading could be added to the repertoire of methods used for teaching remedial reading (53:745-748).

Calder, in a study of sixty-two fifth grade pupils, compared the reading achievement of students using programmed instruction to supplement the basic reading program with those using only the basic reading program. The experiment lasted twenty-seven weeks. Calder found no significant differences in reading achievement between the experimental and control groups. The subjects using the self-directed materials did indicate a more favorable attitude toward reading (54:248-252).

Fry reported that one of the largest and most carefully controlled studies of programmed instruction was done in 1965 at the University of California at Berkeley, by Robert Ruddell. This study was sponsored by the U. S. Office of Education. Ruddell used the Buchanan Programmed Reading series in six first grade classrooms and the Sheldon basic readers in six others. The 132 children in each group of classrooms were given the Stanford Achievement Test from which Ruddell reported the raw scores for four subtests that related to reading. Ruddell found no statistically significant differences between the means of the two groups in paragraph meaning, word study skills, and spelling as measured by the Stanford Achievement Test. However, he

found a significant difference between the means at the .05 level in word reading and in oral reading of a list of phonetically regular words, each favoring the programmed instruction (19:212-215).

Harry Silberman, as reported by Fry, made an extensive review of research and theoretical articles related to reading and verbal learning, which was published in 1965 by NEA. Silberman described a study using Buchanan Programmed Reading materials at the Crittendon School in Mountainview, California. The subjects were fifteen children in a remedial class, ranging from first through fourth grades. The program lasted only three weeks. The subjects were tested by the Gates Reading Test and showed a mean gain of four months. Silberman concluded that from the evidence available, the study was poorly documented and controlled. The research design was faulty and there was "not enough time to use a standardized reading test and measure any gain at all . . ." (19:215).

From the studies reviewed here and others in the literature, several conclusions have been formed by the writer. Most studies dealing with a time variable favor programmed instruction. Studies comparing programmed instruction with conventional classroom methods in reading are few and the results are about equal at the present time. As indicated previously in this review, there have been only

a few studies dealing with programmed instruction at the primary grade level. Several authors have indicated a need for field research. Potential combinations of programmed instruction with other teaching needs to be studied. Research is needed to find where programs can be used to best advantage over other ways of teaching (38:72). Austin, in a study investigating seventy-four colleges and their improvement of reading programs and practices, found that:

. . . a substantial majority of those interviewed believed that future improvement in reading would result largely from increased research in the field. The area in which most of them saw a need for further investigation was that of adjusting instruction to the individual child, with special emphasis . . . on those readers who may, from a variety of causes, be termed "disabled." This would include research to determine . . . methods by which the poor or non-reader can better learn the techniques necessary to assure ease in handling written material. In the latter instance, research to determine what kind and degree of reading disabilities can be handled properly and successfully within the normal classroom was particularly emphasized (1:69-70).

Foltz indicated a need for more experimentation to determine whether programmed instruction is any better than the conventional methods (30:219). Schramm feels that "schools must make more imaginative applications of programmed instruction, accompanied by developmental research and testing" (38:39). Due to the apparent needs for further field research, this study was undertaken.

CHAPTER III

PROCEDURES OF THE STUDY

I. PROGRAM

Scope of the Study

The period of this study was eight months, beginning in October, 1967, and terminating in May, 1968. The location was the Eastmont School District in East Wenatchee, Washington. East Wenatchee is a community of about eight hundred fifty people, located beside the Columbia River in the central portion of the state and in Douglas County. The industries of this area include farming, primarily orchards and wheat, and a few industries such as the Aluminum Company of America, Keokuk, and various fruit servicing firms. Residents in the Eastmont School District range from non-employed welfare cases to management and engineer personnel in the industries, as well as professional people such as doctors and teachers. The majority of people in this area would be considered socially and economically average middle-class, with a small portion being in the upper and lower classes.

The elementary schools selected for this study included Kenroy, Robert E. Lee, Grant, and East Wenatchee. Rock Island Elementary School was not included because the

third grade was a combination class. These class included a total of approximately 250-300 third grade children. From this number, a total of forty-two third grade children were selected for this study.

The program used by the experimental group in this study was Programmed Reading by Cynthia Buchanan, Program Director of Sullivan Associates, and published by the Webster Division, McGraw-Hill Book Company, St. Louis, in 1964. A description of the program is found in the Teacher's Guide to Programmed Reading for Series I and II. Recommended procedures for the students and teachers are also found in these sources, plus a section in the Guide for Series I, of suggestions from other teachers, which was also of considerable value to the investigator. The investigator followed these guides and recommendations as closely as possible. Scott Foresman Basal Readers, 1960 edition, were used for basic reading instruction by the other third grade classes in the district.

II. METHODS

Preliminary Procedures of the Study

Cooperation and permission to conduct this study were obtained from Mr. A. M. Janssen, Assistant Superintendent of Schools, now Superintendent of Schools, in the Eastmont School District in East Wenatchee, Washington. Further

cooperation was obtained from Mr. W. G. Anderson, Principal of the investigator's school, as well as from the principals and third grade teachers throughout the Eastmont School District. Mr. George Laird, Eastmont School District Psychologist, also assisted in giving the Lorge-Thorndike Intelligence Tests to all the third grade classes in the district used in this study. Materials were ordered and received by the investigator.

A pilot study was conducted for five months, January through May of the 1966-1967 school year, in the investigator's classroom with the new materials, to determine specific problems that might arise with their use, as well as problems in the experimental design.

The main study was conducted during the 1967-1968 school year. It was initiated in October with a pre-test of the Iowa Tests of Basic Skills in reading vocabulary and comprehension given to all the third grades in the study, before the introduction of the programmed materials. The study was terminated at the end of May, 1968, after a period of eight months, by a post-test of the Iowa Tests of Basic Skills, using alternate forms, and again given to all third grade classes in the study. Following the termination of the study the Lorge-Thorndike Intelligence Tests, Multi-level Edition, verbal and non-verbal forms, were administered and the data were compiled from these measures.

Selection of the Subjects

The investigator's class was used as the experimental group. The class was a homogeneously grouped third grade in a continuous growth plan, having been placed by reading level. The investigator had the lower level students, there being only two third grade classes in the school. There were twenty-four students in the original group. Three moved away and were consequently eliminated from the study, leaving twenty-one students for the purposes of this study.

The control group was a composite of subjects from five other third grade classrooms in the district. Originally, there were nine classrooms other than the one used as the experimental group in this study. However, four classrooms were eliminated because of insufficient data.

Subjects for the control group were selected by matching the individual students in the experimental group on three factors: sex, age, and Intelligence quotient. A variance in age of plus or minus two months was allowed. In six cases, the variance was greater than two months in order to match subjects; three subjects were three months difference, two subjects were four months difference, and one subject was five months difference. The mean age difference was 1.71 months greater for the control group. A variance of plus or minus five points in intelligence quotient was allowed for matching purposes. Here again, the

variance in six cases was necessarily greater than five points in order to match subjects; one subject was four-teen and one-half points difference, one was fourteen points difference, one was eleven and one-half points difference, one was ten points difference, one was eight points difference, and one was six points difference. The mean intelligence quotient difference was 2.36 points greater for the control group. The control subjects had been taught reading under various grouping plans, which were: ability groupings in heterogeneous classes, homogeneous groupings by the Joplin plan, and homogeneous groupings by the continuous growth plan. The subjects were accepted with the above conditions.

Procedures with the Experimental Group

The program was presented to the subjects following the completion of the pre-test with the Iowa Tests of Basic Skills. The subjects were given the diagnostic placement examination. Preparatory to entrance into the Programmed Reading books, the investigator checked the subjects' knowledge of the following items:

1. The names of the letters of the alphabet (capital and small)
2. How to print all the capital and small letters
3. That letters stand for sounds
4. What sounds to associate with the letters a, f, m, n, p, t, th, and i, which are used as the points of departure for the programmed readers
5. That letters are read from left to right

6. That groups of letters form words
7. The words yes and no by sight, how to discriminate the words ant, man, and mat from one another, and how to read the sentence, I am an ant (77:3).

After determining that all subjects had this knowledge, the program was presented to the subjects, using Programmed Reading Book 1 as suggested by the program. Each subject was given a copy of the book, an acetate overlay and a cardboard slider. Each subject used his own crayons for marking pencils and paper towels to erase the crayon marks. The purposes of each of these items was explained. The investigator then followed the teacher's text in the Teacher's Guide to Programmed Reading for Series I and worked through the first seventeen pages with the subjects as suggested, making sure the subjects established good work habits and understood the format of the program. The test on the following page of Book 1 was explained. The subjects worked on the test independently. The investigator checked each subject's test. None of the in-book tests were graded, as recommended by the program.

Following the presentation, the subjects were placed in the Programmed Reading Book indicated by the placement examination. Sufficient additional information was given to ensure adequate background for working in the various books. The subjects' names were written on the cardboard sliders for identification. Each subject saved and reused

the acetate overlay and slider with his name on it with each successive Programmed Reading Book. Those children placed in Programmed Reading Books 1 and 2 wrote in their books, as recommended by the program.

As the subjects commenced work in their individual books, the investigator walked around giving assistance as needed, checking and reinforcing the establishment of the following work habits recommended by the program:

1. The child covers up the answer column before looking at each page.
2. He makes a written response before he pulls his slider down to check his answer.
3. He checks each response as soon as he has written it.
4. He stops his slider at each black line.
5. He checks the text to be sure that he hasn't omitted a response.
6. He looks carefully at the picture which accompanies the text, and then makes a thoughtful response.
7. He tries to understand the reason for any error he may make (77:15).

Subject Procedures. For clarification, a typical subject's procedure is described. The subject opened his assigned book on the side marked with a large 1, and read through the right-hand pages, writing a response to each frame. At times there was an item of choice, for which he chose and circled a response, and at other times he filled in a missing letter or wrote a whole word, as required by the program. A cardboard slider covered an answer column on the left side of each page. The slider had been placed

in a pocket of an acetate overlay, making the book non-consumable. Immediately following the written response, the subject moved the slider down to the black line in the answer column, thus revealing the correct response for that frame. The subject checked his response carefully, noting its correctness or incorrectness. Upon completion of side 1, the subject turned the book over to the side marked 2 and again read through the right-hand pages to the end of that book, checking each response as he progressed. The subject completed in-book tests, which were spaced regularly throughout each book, and which the investigator checked with the subject. Any incorrect response on the test was corrected by the subject.

When the subject finished a Programmed Reading book, he read the storybook or storybooks that corresponded to the programmed readers. The subject then completed the corresponding test in the test booklet. In Series I, the subject viewed and read a corresponding filmstrip to the succeeding reader. The subject then proceeded with the next Programmed Reading book, following the same sequence throughout the program, as described.

The subject worked individually in the programmed materials for twenty-five to thirty minutes daily. The programmed readers were then collected and stored in stacks, by groups, for ease in subsequent distribution. All other

programmed materials were put away. The time planned for using the programmed materials was 10:00 a.m. to 10:30 a.m. daily. The subject was not allowed to read from the programmed readers at any other time of the day. However, the subject was allowed to read from other supplementary materials during the day, consisting of Scott Foresman Basal Readers, supplementary readers provided by the schools, regular classroom reading activities, and library materials of choice.

Occasionally, three to six subjects who had finished reading certain storybooks read in a small group and shared the story, usually without the help of the investigator. Four or five days weekly, the subject was involved in large group or whole class work with the investigator. These periods averaged thirty minutes and consisted of various activities such as: board work with phonetics, discriminations, writing stories, dictation, filmstrip viewing, and sound-symbol study as was needed by the subjects and/or prescribed by the program.

Investigator procedures. The investigator ascertained whether the subjects were sufficiently prepared for Programmed Reading by checking the subjects on their knowledge of the previously cited items. Any weaknesses that were discovered were corrected. The investigator administered the diagnostic placement examination to determine

the recommended book for each subject. The investigator introduced the subjects to their first Programmed Reading book corresponding to the level of individual achievement.

The investigator presented the program to the entire group following the directions in the Teacher's Guide to Programmed Reading for Series I. Following the initial presentation of the program, the individual subjects worked with their programmed readers as described above. Two thirty-minute periods were recommended by the program writers. This was modified to one thirty-minute individual work session and one thirty-minute group work session as described above.

As the subjects worked individually and independently, the investigator checked the subjects' tests, tutored those needing it, assisted and encouraged others, and listened to various subjects read a few sentences aloud. The investigator continually checked the work habits recommended by the program to make certain they became well established.

As the independent work of the program was initiated, especially in the beginning books, the investigator was almost frantically busy. Several subjects needed assistance, while others had finished tests which the investigator then checked. This was a critical period for the program and the investigator. The investigator showed interest in each subject's work and reinforced the subject's efforts with praise

and encouragement. As the subjects worked alone in their readers, many needed constant, interested attention from the investigator. The investigator usually gave the entire class, at the end of each reading session, an opportunity to tell about what they had read. The investigator maintained the attitude that reading is exciting fun and shared the subjects' joy in their new discoveries.

At the beginning of each unit, the investigator looked over the chart-form of vocabulary, sound progressions, and phonetic organization of the programmed reader, and the sight words and new concepts the subjects would encounter. Exercises were presented in the unit guides which the investigator used flexibly and in a variety of ways to best meet the demands of this particular group. The investigator used the oral exercises with the whole class, with additional work in small groups and with individual subjects as needed.

As the investigator checked subjects' in-book tests, they were discussed with the individual subject. The cause or causes of any errors was clarified. At times, if the error-rate became higher than twenty-five to thirty per cent, the subject and the investigator discussed it. If the subject felt it would help him to try again, the subject was permitted to work through the previous section again. This usually produced improved skills, attitudes, and motivation

on the subjects' part because they were then successful and understood the presented material and concepts better.

After the initial two or three weeks, the subjects began to spread out in the programmed books, each subject progressing at his own rate. This eased the pressure of subject need and demand upon the investigator, and facilitated the investigator's working with the individual subjects.

The investigator worked with the whole group for approximately thirty minutes four or five days weekly. The time scheduled for this work was 9:00 a.m. through 9:30 a.m. The subjects and investigator worked in this manner on various phonetic exercises, discriminations, sound-symbol relationships, creative writing, and dictation as recommended by the program. The subjects were then allowed a lavatory break and a recreation period. At 10:00 a.m., the individual subjects' programmed readers were distributed and worked in for thirty minutes, until 10:30 a.m. For reasons of control in this study, the subjects were restricted to the above use and not allowed to read from the programmed readers at any time during the day, as recommended by the program.

The above described process was followed for an eight month period. There were occasional interruptions in the program, due to vacations and the illnesses of

individual subjects. These were not difficult to cope with because of the individualized, self-pacing nature of the program.

At the end of the eight month instructional period, the investigator administered the alternate form of the Iowa Tests of Basic Skills for reading vocabulary and comprehension as a post-test for the study. Following this, the investigator, with the assistance of the school psychologist, administered the Lorge-Thorndike Intelligence Tests, Multi-level Edition, verbal and non-verbal forms. Data were compiled on the individual subjects and recorded from these measurements.

Procedures with the Control Group

The subjects in the control group used the Scott Foresman Basal Series for reading instruction. The investigator found, through interviewing the teachers of the other third grade classes, that the control subjects' reading instruction time totaled approximately an hour daily. Half of this time was usually spent in group instruction and the other half in workbook activities as recommended by the basal series. Reading instruction in the control classes was scheduled during the morning hours, and were approximately the same as in the experimental group. The control subjects were also allowed to read in other supplementary readers and library books provided by the district.

The control group received the same pre- and post-tests, using alternate forms, of the Iowa Tests of Basic Skills and the Lorge-Thorndike Intelligence Tests, Multi-level Edition, as the experimental group received.

The means from these data were analyzed with the Fisher t-test to determine whether there were any statistically significant differences in reading achievement of the experimental and control groups.

III. SUMMARY

This chapter presented a description of the program materials, the population, the scope of the study, and the methods recommended and used in this study.

CHAPTER IV

AN ANALYSIS OF THE STUDY

I. RESULTS

This experiment was conducted for the purpose of determining whether programmed reading materials could correct some of the reading difficulties that develop in children better than the conventional basal approach to reading. Other purposes were to evaluate (1) the financial and administrative feasibility of these programmed materials, (2) their effectiveness in individualizing instruction in reading, and (3) the benefits and/or hindrances these materials presented to the investigator and subjects while working in a self-contained classroom situation.

The materials used by the experimental group in the study were the Sullivan Programmed Reading Series and supplementary materials. The basal series used by the control group was the Scott Foresman Series, 1960 edition. Forty-two students were selected as subjects and were matched for the study from approximately 250-300 third grade students. The control subjects were taught by five different teachers located in four elementary schools in the district. The investigator's class was used as the experimental group.

Statistical Findings of the Study

Evaluation of the study was determined by scores obtained from the pre-test in October, 1967, and the post-test in May, 1968, of the Iowa Tests of Basic Skills in reading vocabulary and comprehension, using alternate forms. Intelligence quotient scores were obtained at the close of the study from the Lorge-Thorndike Intelligence Tests, Multi-level Edition, verbal and non-verbal batteries. Scores from these measuring instruments were recorded for the individual subjects as shown in Tables I and II.

Subjects from the experimental group were matched with subjects from various control classes, on sex, age, and intelligence quotient scores. Mean scores for the two groups on age, which were converted to months, intelligence quotient, reading vocabulary and reading comprehension pre- and post-tests, which were converted to grade level, were computed. The mean age of the experimental group was 106.57 months and the mean age of the control group was 108.28 months, a mean difference of 1.71 months greater for the control group. The individual subject's intelligence quotient was determined by converting the verbal and non-verbal raw scores and his chronological age to intelligence quotient by consulting the Table of Norms provided in the Manual for Administration of the Lorge-Thorndike Intelligence

TABLE I
DATA RECORDED ON CONTROL GROUP FROM
IOWA TESTS OF BASIC SKILLS

Control Student	Sex	Age	IQ	Pre-test Vocabulary	Post-test Vocabulary	Pre-test Comprehension	Post-test Comprehension	Control Teacher
1	M	111	78	3.3	2.5	1.7	3.9	A
2	M	105	97.5	3.6	4.0	1.7	3.8	B
3	M	108	102	4.1	4.5	4.4	4.3	B
4	F	111	84	2.7	3.1	2.1	3.1	A
5	M	112	93.5	3.5	4.1	3.0	5.2	C
6	F	105	91	3.2	2.7	3.2	2.4	A
7	M	109	104.5	3.3	4.4	2.5	4.6	A
8	F	107	91	3.5	3.7	2.1	3.8	A
9	F	107	104	3.3	4.3	3.2	5.0	D
10	M	109	96	3.2	3.9	2.8	2.6	B
11	M	111	97.5	4.0	4.8	5.0	4.7	A
12	F	109	101.5	3.2	4.4	3.3	4.8	D
13	F	108	102.5	3.7	4.3	4.1	4.8	D
14	M	109	87.5	2.5	3.1	2.7	3.1	A
15	F	105	107.5	3.4	3.9	2.2	3.9	A
16	M	108	96.5	1.8	4.0	1.9	4.2	A
17	F	107	99.5	1.4	3.8	2.0	4.1	E
18	M	111	96.5	5.0	5.4	3.3	5.6	C
19	M	108	90.5	2.9	3.7	2.6	3.1	D
20	F	110	104	3.7	4.1	4.1	4.6	E
21	F	104	113	2.5	3.1	2.2	4.0	A
\bar{M}	N(21)	108.28	97.05	3.228	3.895	2.86	4.076	
SD		2.236	8.02	.760	.681	.907	.833	

TABLE II

DATA RECORDED ON EXPERIMENTAL GROUP
FROM IOWA TESTS OF BASIC SKILLS

Experimental Student	Sex	Age in Months	IQ	Pre-test Vocabulary	Post-test Vocabulary	Pre-test Comprehension	Post-test Comprehension
1	M	111	64	3.1	2.5	2.4	3.1
2	M	102	96	2.7	4.8	3.3	4.2
3	M	108	102	2.7	4.6	2.8	4.3
4	F	109	79	1.8	3.9	3.8	4.4
5	M	111	92.5	3.2	3.8	2.5	4.7
6	F	105	94.5	1.4	4.0	1.8	3.9
7	M	108	98.5	2.5	3.8	3.1	4.7
8	F	105	99	3.7	4.4	4.5	4.8
9	F	102	103	2.7	4.6	3.3	4.5
10	M	105	98	2.7	4.4	3.2	4.0
11	M	107	98.5	3.1	4.0	3.4	4.3
12	F	108	100.5	2.3	2.0	2.0	3.9
13	F	106	99	2.3	3.8	3.0	2.2
14	M	107	73	1.6	3.4	2.8	3.2
15	F	104	97.5	1.4	3.6	2.6	3.8
16	M	106	93	2.5	4.3	3.2	4.4
17	F	104	95.5	1.6	4.1	1.8	3.9
18	M	110	85	2.3	3.1	3.4	3.2
19	M	105	95.5	2.1	3.9	2.2	4.4
20	F	111	108	3.3	4.4	3.8	5.5
21	F	104	116.5	3.7	2.8	4.0	4.6
\bar{M}	N(21)	106.57	94.69	2.50	3.943	2.995	4.095
SD		2.716	11.25	.68	1.245	.707	.703

Tests, Multi-level Edition. The mean intelligence quotient score was then computed and recorded for each subject. The mean intelligence quotient for the experimental group was 94.69 and the mean intelligence quotient for the control group was 97.05, a mean difference of 2.36 points greater for the control group (See Tables I and II).

The mean difference in reading vocabulary of the control group, from pre-test to post-test, was .667 months during the eight month study. The mean difference in reading comprehension of the control group, from pre-test to post-test, was 1.216 years during the eight month study.

The mean difference in reading vocabulary of the experimental group, from pre-test to post-test, was 1.43 years during the eight month study. The mean difference in reading comprehension of the experimental group, from pre-test to post-test, was 1.10 years during the eight month study.

At the end of this study, the compiled data were analyzed through the application of the Fisher t-test for the purpose of determining whether statistically significant differences existed between the experimental and the control groups. The formula for the t-test used in this study was

$$SD_{\bar{x}} = \sqrt{\frac{\sum x_1^2 - \sum x_2^2}{N(N - 1)}} \quad \text{which is the formula}$$

for the difference between the means for small samples and $N_1 = N_2$ (10:140-144).

The results from the t-test analysis of data in this study have been reported with the following criteria. A "t" value of 2.086 or greater was required for evidence of statistically significant differences, at the .05 level of significance, between the mean post-test scores in reading vocabulary of the control and experimental groups. A "t" value of 2.845 or greater was required for evidence of statistically significant differences at the .01 level of significance, between the mean scores in reading vocabulary and comprehension of the two groups. A "t" value of 3.850 or greater was required for evidence of statistically significant differences, at the .001 level of significance, between the mean scores in reading vocabulary and comprehension of the two groups. The mean scores and "t" scores of the control and experimental groups are presented in Table III.

TABLE III
COMPARISON OF MEAN SCORES FOR
IOWA TESTS OF BASIC SKILLS

Group	Pre-test	Post-test	Mean diff.	t-ratio	Level of sig.
Vocabulary					
Control	3.228	3.895	.667	2.925	.01
Experimental	2.50	3.94	1.44	4.514	.001
Comprehension					
Control	2.864	4.076	1.212	4.422	.001
Experimental	2.995	4.095	1.100	4.933	.001

N = 21 for both groups

df = 20 for both groups

As shown in Table III, there were statistically significant differences between the mean scores of the pre- and post-tests for the experimental and control groups in reading vocabulary and comprehension. The control group showed, in reading vocabulary, a "t" value of 2.925, statistically significant at the .01 level of significance, and in reading comprehension, a "t" value of 4.422, statistically significant at the .001 level of significance. The experimental group showed a "t" value of 4.514 in reading vocabulary, statistically significant at the .001 level of significance, and in reading comprehension, a "t" value of 4.933, statistically significant at the .001 level of

significance. Although both groups showed statistically significant differences in reading comprehension at the .001 level of significance, as determined by the Fisher t-test, the experimental group was only .511 greater than the control group.

The mean net gain of post-test scores in reading vocabulary for the control group was .667 and for the experimental group the mean net gain was 1.440, with a difference in mean gain of .773. The experimental group showed a "t" value of 2.431, statistically significant at the .05 level of significance. The difference in the mean gain of .112 in reading comprehension between the two groups was not statistically significant (See Table IV).

TABLE IV
COMPARISON CHANGE BETWEEN CONTROL AND
EXPERIMENTAL GROUPS ON MEAN SCORES

Group	Mean Net Gain	Difference in Mean Gain	t-ratio	Level of sig.
Vocabulary				
Control	.667			
Experimental	1.440	.773	2.431	.05
Comprehension				
Control	1.212	.112	.243	NS
Experimental	1.100			

Computation of the Pearson Product-Moment Correlation Coefficient resulted in an age coefficient of the two groups of $r = .82$ and an intelligence quotient coefficient of $r = .86$. The r of $.82$ for age may seem low for pairs matched according to age, but it must be noted that the SD's for the distribution of ages for the control and experimental groups are 2.236 and 2.716. This restricted range, as reflected by the small SD, contributes to the relatively low Pearson r , since a "pair" could be only two months apart in age and yet be almost one SD apart in the distribution. The same principle applies to the r of $.86$ for IQ, where the distribution shows a SD of 8.02 for the control, and 11.25 for the experimental group. This compares to a SD of 15 for the standardized test norms. In both the age and IQ distribution, greater range would have resulted in higher correlation values, even with pairs matched with the same actual differences in age or IQ found in this study.

Observations of the Study

The initial order of materials for this study cost approximately \$256.00 in 1966. Additional materials and replacements, due to the consumption of Programmed Reading Books 1 and 2 during the pilot study, cost approximately \$50.00. Since most materials were non-consumable, the

total cost of approximately \$300.00 per classroom was amortized over a period of years for each student using the program. The cost of these programmed materials initially was approximately \$14.23 per student. However, after three years' service, the cost was approximately \$3.01 per student. After about five years' service, the cost was projected to be approximately \$2.00 per student.

The use of the programmed materials, as used in this study, did not require administrative or organizational changes; only adjustments, by the investigator, for storage and display of the materials was necessary.

The subjects worked at their own pace through the programmed materials, thereby being individualized to that extent. Many encountered individual reading problems which were solved, sometimes independently and at other times with the assistance of the investigator. The subjects learned the instructional sequence and were able to work and progress through that sequence independently. The subjects, however, were restricted to the content of this program, just as they had previously been restricted in the basal series.

The building of independent work habits was considered by the investigator to be a benefit of the program. Other benefits included the self-paced and individualized features of the program; subjects who were usually well

motivated by the program and were successful, which in turn improved their self-concept; subjects who enjoyed the format of the program, the pictures and stories; and finally, their noticeable enjoyment in reading which tended to affect their attitude toward reading in general.

Hindrances included the high demand on the investigator's time, especially in the initial stages; extra care of the materials necessary to prolong their usefulness; restriction of the subjects' choice of reading materials for instruction; and storage and display problems encountered with the programmed materials.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

I. SUMMARY

The student who fails to acquire an adequate level of reading achievement is handicapped in attaining his individual goals, as well as in his education and society in general. As the demands on the individual in our technological society every increase, the correction of the problem of the disabled reader becomes more urgent. Compounding this problem are the other factors of increased pupil-teacher ratio, economics of education, individual differences in the classroom, and educational facilities available to the student, to name but a few. Programmed materials offer one possible solution to some of these problems.

This study was an attempt to determine whether a programmed reading technique would facilitate more successful reading achievement in children than would a standard basal reading program, specifically, for the purposes of this study, the Scott Foresman Basal Series, 1960 edition.

Relatively little research has been done with this innovation of educational technology, especially at the

primary level. Previously reported research had shown various results, some favoring programmed materials and others against them. Other concerns of this study were the economic and administrative feasibilities of programmed materials, the individualizing aspects of them, and the benefits and/or hindrances to the students and investigator using the materials in a self-contained classroom situation.

To investigate this problem, a research design was formulated and preliminary steps necessary for initiating it were taken. A five-month pilot study was made to determine problems encountered with the materials and experimental design. The main experimental study was initiated in October, 1967, in a third grade classroom, through the cooperation of the Eastmont School District Number 206 at East Wenatchee, Washington, and lasted for an eight month period, terminating in May, 1968. Data on the forty-two subjects, selected and matched from approximately 250-300 students, were compiled and recorded from the Iowa Tests of Basic Skills, Forms 1 and 2, and the Lorge-Thorndike Intelligence Tests, Multi-level Edition. Programmed materials selected for the study were Programmed Reading Series by the Sullivan Associates. Procedures recommended for the Programmed Reading materials by the Sullivan Associates were followed as closely as possible.

An evaluation of the program was made by a statistical analysis of the data compiled, as well as by the investigator's observations. These have been recorded in this study.

II. CONCLUSIONS

The investigator, as a result of this study and a statistical analysis of the data, made the following conclusions. First, all subjects in the study made statistically significant improvement in reading vocabulary and comprehension achievement. Programmed materials used in this study were as adequate instructional materials as the Scott Foresman Basal in teaching reading comprehension. A comparison of change between the control and experimental groups on mean scores showed a difference in mean gain of .112 favoring the Scott Foresman Basal. However, this mean gain was not statistically significant. The programmed materials were more effective in promoting student achievement in reading vocabulary than the basal series, showing a difference in mean gain of .773, which was statistically significant at the .05 level of significance. Therefore, the null hypothesis that there would be no statistically significant differences in reading achievement between students using the programmed materials and those using a

conventional basal approach was rejected by the investigator.

The investigator, however, was aware that the Hawthorne effect may have affected the findings, although it was doubtful, due to the length of the study, the age of the subjects, and the efforts of the investigator to make these materials seem commonplace. Other factors that may have influenced these findings were the different approaches to reading instruction by the two programs--the conventional analytic approach of the Scott Foresman Basal series and the linguistic approach of the Programmed Reading series.

Programmed materials, for this study, when amortized over a five year period, cost approximately \$2.00 per student. The final decision regarding the economic feasibility of this program would rest with each district's particular needs, resources, and philosophy.

These programmed materials afforded a form of individualizing instruction, since the student was able to work at his own pace through the materials. They were also corrective for some reading problems such as: word attack skills and phonetic instruction, student's attentiveness to a task, development of better work-study habits and responsibility by the student, and motivation and interest in reading. This particular program, however, did have the

lock-step feature in content and sequence that is characteristic of basal readers.

An important benefit of programmed materials was the assistance it afforded the investigator, who was enabled to work more flexibly with individual students. Other individual students' instruction and work was not interrupted while the investigator worked with some other individual. The student had immediate knowledge of the appropriateness of his responses while working through the program. Self-concept of the student was increased by the low error rate provided by the program. Therefore, it was concluded by the investigator that this particular program was a valuable "teacher's aid" in the classroom. The investigator further benefited from a greater awareness of the learning principles incorporated in the program.

The frantic first weeks of introducing and working with the program were considered a hindrance. Storage, the displaying of materials, and their care also presented a problem in using the program.

The investigator further concluded that the pilot and feasibility studies were valuable in evaluating the usefulness of these programmed materials. Therefore, considering the above conclusions, recommendations for future developments and research are presented.

III. RECOMMENDATIONS

This study pointed to several areas that need to be researched and developed regarding programmed instruction and individualization of instruction. These areas involve program development, teacher education, and comparative studies investigating the uses of programmed materials. Therefore, the investigator recommended the following:

1. Research is needed that compares a linguistically structured basal series with a linguistic programmed series.
2. Colleges should provide instruction for teachers in the theories, principles, and construction of programmed materials.
3. Research is needed to develop non-consumable materials that will reduce the cost of materials and make them more durable.
4. Research is needed to develop greater flexibility in the program format.
5. Research is needed to determine the best organizational conditions for working with programmed materials, such as a team-teaching or non-graded situation.
6. Research is needed to determine the type of student that benefits the most from programmed instruction.
7. Research is needed to determine the conditions

that justify the cost of the program in relation to student learning.

8. Research is needed to determine the best combination of programmed instruction with conventional teacher instruction.

9. Programs should be field tested and evaluated before full scale adoption by a school system.

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