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Programmed Reading Instruction Versus Traditional Reading Instruction and Their Relation to Science Achievement

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PROGRAMMED READING INSTRUCTION VERSUS TRADITIONAL READING INSTRUCTION AND THEIR RELATION TO SCIENCE ACHIEVEMENT

by

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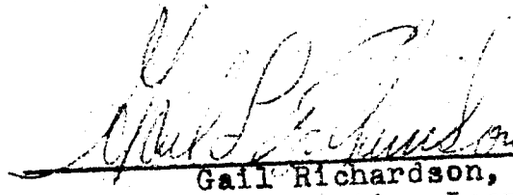

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ABSTRACT

This doctoral research was conducted to determine if there was a statistical difference in achievement between fourth grade students who were instructed through a programmed reading approach and those fourth grade students who were instructed in the traditional reading methods with a basal text series. Secondly, whether the same fourth grade students who were instructed by the programmed reading method would achieve significantly higher gain scores in fourth grade science than those students who were instructed in the traditional reading method.

Analysis of variance was used to analyze the results and the level of significance was set at the 0.05 level. The following conclusions were drawn. The specific factors found to be non-significant between the programmed reading group and the traditional reading group were: sex, intelligence quotient, sex and intelligence quotient, sex and experimental group, intelligence quotient and experimental group, and sex by intelligence quotient by experimental group.

One factor was found to be significantly different. This factor was the experimental group.

The same procedure was used for programmed and traditional science classes. Factors found to be non-significant were: sex, experimental group, sex and experimental group, intelligence quotient and experimental group, and sex by intelligence quotient by experimental group.

Two factors were found to be significantly different. They were: intelligence quotient, and sex and intelligence quotient.

ACKNOWLEDGMENTS

The author wishes to express his gratitude to the officials of the Cumberland Elementary School. Without the coordinating efforts of these people this study would have been impossible to implement. They were extremely helpful in providing various types of assistance not only to their teachers, but to this researcher as well.

Officials

Mr. Billy Pat Smith, Principal
Mr. William Flottman, Guidance Counselor

To the classroom teachers involved my deepest gratitude is expressed. It was this group which carried the greatest burden throughout this experiment.

Teachers

Mrs. Sharon Burgess, Programmed Reading
Mrs. Margaret A. Garner, Science
Mrs. Rosilee Chancellor, Traditional Reading

During the data analyzing stage of this study, the assistance of Dr. Gail Richardson, President, Prescription Learning Corporation, was invaluable. Without his help in providing computer analysis this phase of the work would have been impossible.

Finally, I express my appreciation to Maryanne Brown who did such an excellent job in preparing this manuscript for printing.

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CHAPTER I

INTRODUCTION

Factors other than intelligence which influence the academic performance of students have been investigated in a number of studies in recent years. Some of these factors analyzed have been social class, home conditions, peer relations and aspiration levels.

Most studies which have been conducted are in relation to culturally, socially or educationally disadvantaged students and have taken place in a metropolitan or suburban context or have emphasized the effects of racial differences upon the pupil's academic achievement. These approaches neglect the problem of disadvantaged students in a rural all white community.

This author suspects that all the above problems which are apparent in the metropolitan and suburban areas also exist in the rural communities. The present research is intended to discover the relationship between programmed reading instruction versus traditional reading instruction and the effect this instruction has upon science achievement in the fourth grade at Cumberland Elementary School.

Cumberland Unit District #77, hereafter referred to as Cumberland, is a district located in Cumberland County, Illinois, in the east central part of the state.

Cumberland has an enrollment of 1400 students in grades kindergarten through twelve. The enrollment figure includes students enrolled in special education courses in the Eastern Illinois Special Education District. The educational level of the students in the district is considered to be average. This assumption is based upon data obtained from the Stanford Achievement Test Scores administered to all students within the unit.[1] The district contains 196 square miles of territory made up of farms and three small towns. One town has a population of 1500, another 1000, and the third 300. The campus comprises two buildings, a K-8 center which houses 1000 students and a 9-12 center which houses 450 students. Both buildings are located on a 40 acre campus triangularly centered in the county between the three towns. The school population has been stable the past few years.

The new elementary school was first occupied in the 1967-68 school term. Each grade K through 8 has four sections of students. Beginning with the third grade, each grade is departmentalized into four subject matter areas: language arts, science, social studies, and mathematics. Additional time is scheduled for art, music, library, and physical education under certificated instructors. This method of departmentalization allows each instructor to teach all four sections of their respective grades.

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[1] Harcourt, Brace and World, Stanford Achievement Test. (Chicago, Illinois), 1967.

The fourth grade is a transitional grade where students first begin to pick up individual subject matter in a separate text situation under a departmentalized program. The first four years of school at the school district, kindergarten through third grade, are not departmentalized, but are designed to introduce the student to school, and to provide a reading, writing, and mathematics program. This is not to say that social studies, science and other subject matter is not taught during this period, but merely to point out that it is at the fourth grade level where the abrupt shift from a reading centered program to a subject centered curriculum first occurs. It is at this point where each subject is first given equal emphasis.

Since the research which has been done on programmed reading has been conducted at other grade levels, a programmed reading program was initiated during the 1970-71 school year to help fourth grade students who were found to be performing below their indicated grade level according to their achievement and intelligence tests which were administered by the school district, and who in the opinion of their instructors required supplemental educational help.

This programmed reading class was established as the experimental group in this research. A control group of fourth grade traditional reading students was also selected, and both groups were allotted the same number of minutes per week for reading instruction. The relationship

of the reading instruction to science achievement was also examined within the two reading classes. As in the two reading classes, both science classes were allotted the same number of minutes per week for science instruction.

Statement of the Problem

The purpose of this study was to determine if there was a significant statistical difference between fourth grade students who were instructed through a programmed reading approach and those fourth grade students who were instructed in the traditional reading methods with a basal text series. Secondly, whether the same fourth grade students who were instructed by the programmed reading method would achieve significantly higher gain scores in fourth grade science than those students who were instructed in the traditional reading method.

This writer feels that the systematic approach used in programmed reading should develop study habits and organizational habits which will carry over into science and show as a significant gain score achievement in the science class which was instructed by the programmed reading method.

These hypotheses will be tested by analysis of variance for the factorial experiment, and the level of the factors will be selected because of their experimental interest. They are regarded as fixed and not as representing

a random sampling from a larger population level. Under these conditions and with the randomized group design, the appropriate mean square for all tests of significance will be within the treatment mean square.

If a significant gain score is established in the programmed reading class and in the science class which had programmed reading instruction, or in the programmed reading class alone, the district can formulate long range plans better designed to meet the needs of children within this unit.

Definition of Terms

For the purposes of this study the following definitions of terms were used.

Programmed reading was the name applied to the fourth grade reading instruction method which used a reading laboratory consisting of study carrels, Craig Readers, Craig Tape Recorders, Hoffman Projectors, and Language Master machines.

Traditional reading was the term applied to the fourth grade reading instruction method which used a basal reading textbook series with workbooks to accompany each of the different texts in the series.

The term departmentalized was used in this study to indicate the division of students into subject matter areas where specially trained teachers were teaching in their major field of teacher training preparation. The

four major areas of departmentalization were language arts, science, mathematics, and social studies.

Each science class was taught from the same textbook, by the same instructor, and with the same methods of presentation of the material. However, for the purpose of identification, the programmed reading group was labeled programmed science, and the traditional reading group was labeled traditional science.

Organization of the Program

For the purposes of this study, two heterogeneous groups of fourth grade students were selected. One group was taught by the traditional method using the Scott Foresman Basal Reading Series.[1,2,3] One group was taught using a programmed reading approach, and both groups were taught science from the same text, Concepts in Science, Harcourt, Brace and World.[4] Both of the science classes had the same instructor.

A departmentalized program schedule was used with each teacher teaching in the area of their greatest strength.

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[1] Helen M. Robinson, and others, Ventures (Chicago: Scott Foresman and Co., 1965), 512 p.

[2] Helen M. Robinson, and others, Open Highways (Chicago: Scott Foresman and Co., 1965) 480 p.

[3] Helen M. Robinson, and others, Wide Horizons (Chicago: Scott Foresman and Co., 1965) 512 pp.

[4] Paul F. Brandwein, and others, Concepts in Science (New York: Harcourt, Brace and World, 1966), 312 pp.

All teachers were experienced teachers, and with the exception of the programmed reading instructor, had been teaching in the same situation for at least four years. The programmed reading instructor had been teaching reading prior to the initiation of this program for the past three years. The science teacher had a Master's Degree and fourteen years' teaching experience. The teacher using the Scott-Foresman traditional series had a Bachelor's Degree and nine years' teaching experience, and the teacher using the Programmed Reading approach had a Bachelor's Degree and four years' teaching experience.

Significance of the Study

The importance of the study can best be described in the following manner. The philosophy of education at Cumberland is to educate the whole child to the extent of his capabilities. The significance of the current research, therefore, lies in the establishment of proof that programmed reading is superior to traditional reading in a subject centered curriculum, and that students who have been taught under a programmed reading situation developed a system of study habits which carried over into their science classes and enabled them to achieve more than students who were taught reading in the traditional manner.

No attempt will be made to identify or analyze these study habits. This alone would be a subject for another study. The purpose of this study is to determine whether or

not such a situation exists. If it does, the significance becomes apparent, and programmed reading for improved achievement in reading and science becomes another tool in the educational field which can be used to raise the achievement of the fourth grade student.

Limits and Delimits of the Study

This research is subject to limitations of four types: geographic, basic materials available, factors of investigation, and teachers available. Since the scope of the research was limited by the geographic boundaries of the School District, the findings were also limited to this area or to areas with similar socio-economic characteristics. These two major characteristics were a rural area and an all white school population.

The limitations as to factors of investigation are individual differences, grade level, and subjects. Of the many areas of investigation which could have been considered, it was decided to employ only those factors found to be most common to other studies conducted in this general field of investigation. The limitations as to factors of investigation are explained in detail in the chapter on the review of literature.

The limitations as to teachers and materials available are accounted for by the fact that materials available, textbooks and workbooks, were a part of the adopted curriculum of this district and a change in science or reading textbooks

would have disrupted the continuity of the curriculum in these two subjects. All teachers involved were tenure teachers, and with the exception of the programmed reading teacher, all teachers have been teaching in the same department and at the same grade level as assigned in this research study.

The "source of information" was delimited by the researcher for several reasons. All necessary information to investigate the selected factors was available from the school records, teachers' observations, and the knowledge of the researcher. In order to prevent adverse parental reaction, no attempt was made to secure additional information from the students or parents. The source of information delimitation, therefore, restricts the data utilized to that readily available from the records and the personnel of the school district. However, this researcher does not believe that this is a significant limitation since in a small district situation contacts are such that information about students is both available and accurate.

The author further delimited this study by grade, by subject and by achievement level. The fourth grade was selected for this study because it is a transitional grade where students first begin to study individual subject matter in a separate text situation under a departmentalized program. Programmed reading was selected as an experimental program for the low achievers because the present method of reading instruction has not been successful in raising the reading gain scores of the low achievers in this district.

Another factor effecting the author's decision to delimit this study to the fourth grade reading and science classes was the fact that the effectiveness of programmed reading is still questioned by many researchers.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Overview

If one were to search the literature to answer the question, "How effective is programmed instruction in the teaching of reading?" he would be hard put to find conclusive research bearing directly on this question. In fact, this question remains unanswered.

The research which has been conducted on programmed instruction has been done at grade levels other than grade 4, which is the level of the study group. There seems to have been no work conducted on the relationship of programmed reading to science at the fourth grade level. The Director of Research Division, National Education Association, Glen Robinson indicated the Research Division does not have a bibliography of research studies relating to the topic of this doctoral dissertation. Research through ERIC[1] and various university libraries have revealed the same negative results.

The author has discovered much literature on programmed reading versus regular reading at various other levels.

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[1]U.S. Department of Health, Education and Welfare, Educational Resources Information Center (ERIC), Washington, D.C.

Historically programmed instruction seems to have burst upon us in relative recent times, but it has had an uncertain and unsteady progress. Since Pressey first published his article in 1926, very few other works were done in the area of teaching machines or programmed instruction. The present cycle of activity began in 1954, with Skinner's article and interest in teaching machines and programmed learning seems to have a kind of peak about 1963.[1]

Corey in his 1967 article has given us a good index of activity by simply counting the number of entries in the Educational Index for two-year periods beginning in 1959.[2] He carried his count through 1965 and this researcher extended four more years. He found that by combining the two subject matter headings of Programmed Teaching and Teaching Machines, that in 1959-61, there were 130 articles. In a two-year period of 1961-63, there were 440 articles. This steadily declined, and in the 1963-65 period there were 342 articles but during the 1965-67 period the number had dropped to 232. The 1967-69 count showed a total of 162. Corey found a similar curve in entries in the Psychological Abstracts with the peak year being 1964. There was a similar though

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[1]R. F. Skinner, "The Science of Learning and the Art of Teaching," Harvard Ed. Review 24 1954, pp. 86-97.

[2]Stephen M. Corey, "The Nature of Instruction," Programmed Instruction, Sixty-sixth Yearbook of the National Society for the Study of Education, Part II (Chicago, Ill.: University of Chicago Press, 1967), pp. 334.

later curve in the Subject Guide to Books in Print, U.S.A., issues of 1966 and 1967. The list of Reading Programmed Learning materials in Text Books in Print showed no change between the years 1967-68; there were eight series or individual programs. A larger number of programs, many from small publishing houses, can be found in Programmed Instruction Guide, compiled by Northwestern University.[1]

Duncan stated in 1965, while speaking about the experiences of the British armed forces and their use of programmed instruction, that glittering prizes were offered to those who introduce programmed instruction into educational and training situations. He noted that there has been no shortage of good reasons why programmed instructions must be, in principle, superior to conventional classroom instruction, and that the first empirical studies in the British armed forces seemed to promise drastic improvements in learning rate. More recent work, however, has tended to indicate something nearer parity between programmed instruction on one hand and conventional classroom instruction on the other.[2]

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[1] Programmed Instruction Guide, (Compiled by Northwestern University), Newburyport, Mass: Entelek Press, 1967.

[2] K. D. Duncan, "Programmed Learning in the Army," Programmed Learning, XXXI (October, 1965), pp. 31-39.

Dale in his article, "Historical Setting of Programs" in the 1967 NSSE Yearbook noted that Edward Thorndike almost gave us a prescription for programmed books in 1912.[1] Thorndike noted that books could be written giving data, directions for experiments and problems with the data, and questions about the inferences. He pointed out that a student could be instructed to read each helping piece of information, then suggest questions only after he had spent a certain amount of time in trying to do for himself what he was directed to do. If by a miracle of mechanical ingenuity a book could be so arranged that only to him that had done what was directed on page 1, would page 2 become visible, much that now requires personal instruction could be managed by print.[2]

Thorndike also gave a classic argument for automation. He stated that a human being should not be wasted doing what forty sheets of paper and two phonographs could do.[3]

Dale discussed the similarity between some modern programmed instruction books and the catechism-type of question and answer books used by the ancient Greeks.

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[1]Edgar Dale, "Historical Setting of Programmed Instruction," Programmed Instruction, Sixty-Sixth Yearbook of the National Society for the Study of Education, Part II (Chicago, Ill.: University of Chicago Press, 1967), pp. 28-54.

[2]Ibid., p. 36.

[3]Ibid., p. 40.

Although there is something less than unanimous agreement on the principles involved in a programmed instruction situation, there are some principles that most people would agree upon:[1] (1) The subject matter is broken up into small units called frames. In actual practice, these frames usually vary in size from a short sentence to several small paragraphs. (2) At least part of the frame requires some type of response from the student. He must answer a question or fill in a blank. Active participation on the part of the student is required. Generally, it is desired that the activity also demonstrate understanding of the material. (3) The student is provided immediate feedback reinforcement. He is told the correctness of his answer, which has the advantage of immediately reinforcing the activity or immediately correcting a misunderstanding. Since many programs are written in such a way that the student is right a high percentage of the time, the act of telling the student that he is correct becomes a reward or reinforcement. Thus programs have a much higher amount of reward or reinforcement than most ordinary teaching situations. (4) The units are arranged in careful sequence. Because of the subject matter being broken into small bits, the author must think

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[1]Edward B. Fry, Teaching Machines and Programmed Instruction, (New York: McGraw Hill Book Company, 1963), pp. 26-32.

carefully about the learning steps involved, and the result is a much better sequence of presentation. Careful sequence also embodies the notion of shaping or gradually leading the student toward the desired goals by rewarding him for activity that more and more closely approximates those goals. (5) Programs are aimed at specific goals. This has the desirable effect of making those involved in training evaluate their goals much more carefully and specifically. (6) Revisions are based on student responses. Because the student's behavior can be recorded for each frame, a knowledge of his understanding of each part of the lesson can be easily obtained. Thus, if a student is making many errors on one section, the program obviously is not teaching well and must be revised. Here, then is another cardinal principle of programming; namely, that the student is the final authority in determining whether or not the program is good. In traditional curriculum materials an "expert" often determines the final presentation, but in programming, the approach is more student-centered. Programs are also more carefully aimed at a particular ability-level student, based on experimentation, not on opinion. (7) The student is usually free to vary his own rate of learning. A student may work through a program rapidly or slowly. He is completely independent of others in the class. Traditional methods such as lectures or motion pictures force every student to proceed at the same rate, which might be too fast for some and too slow for others.

Types and Aspects of Programmed Instruction

Programs are usually divided into two main types, depending on the kind of response demanded of the student.[1] The constructed-response type of program requires the student to write an answer to a question put before him by the programmer. The multiple-choice type of program requires the student to select one of a number of alternate answers to a given question. The constructed-response program asks the student to frame his own answer to an "open-ended" question: The multiple-choice program asks for a choice among alternate answers. The former clearly depends more upon the student's ability to recall data; the latter on the ability to recognize it.

Gillooly in 1968, has shown after a review of his own and other studies, that if you expect to have the student learn to make constructed responses (the criterion task of writing the answer) then you must train him with a constructed-response-type program, but if the student is only expected to make a selection of multiple choices, then training on a multiple choice program is satisfactory.[2]

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[1]William B. Gillooly, and James Furukawa, "The Effect of Familiarization and Response Mode on the Programmed Learning of Foreign Language Vocabulary," (Paper presented to the American Education Research Association, Chicago, Ill., February, 1968).

[2]Ibid.

This superiority of constructed responses is particularly important in teaching novel terms.

There are at least four major aspects of computer-assisted instruction that seem to offer great potentiality for education at all levels. The first and most important is concerned with the psychological variable that is often claimed to represent the best-known psychological generalization, namely the definite and clearly significant existence of individual differences.[1] It is a fact that children enter school with remarkably different abilities to work at different rates and different levels of accuracy and understanding. It is easy to say that we intend to educate the whole child to the extent of his capabilities, but for reasons of economic necessity, we are not actually able to offer a curriculum program to each child according to his needs. The economic reasons are obvious. A school cannot afford that many teachers. In practice, in the first three grades, because of the primary importance of reading, some attempt is made to diversify reading into three or four groups. Often this is successful, but it is not possible to accommodate individual differences in any deep and serious way. Computer technology provides the only serious hope for accommodation of individual differences in subject matter learning.

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[1] C. M. Lindvall and John Bolvin, "Programmed Instruction in the Schools: An Application of Programming Principles in 'Individually Prescribed Instruction'," Programmed Instruction, Sixty-Sixth Yearbook of the National Society for the Study of Education, Part II (Chicago, Ill.: University of Chicago Press, 1967), pp. 217-254.

It also takes into account the important matter of correcting responses, keeping records, relieving the teacher of routine, so that she may teach her class as she would like to do. In computer-assisted programmed reading this can be done automatically, easily and simply, and the teacher is relieved of an enormous chore.

Systematic and straightforward introduction of many of the standard skills is the third aspect of computer assisted instruction. While the introduction of the standard skills are being handled by the computer, the teacher can move to the more important task of trouble-shooting, of helping those children who are not making the grade with the material given to the bulk of the children.

The fourth potential is that for the first time we have the opportunity to gather data in adequate quantities, and under sufficient uniform conditions, to take a serious and deep look at subject-matter learning. With the enormous data gathering capacity, we can now begin to conduct real analysis of how students learn to read.

Effectiveness of Programmed Instruction

One of the chief areas of interest to researchers has been the comparison of learning attained by students taught by programmed instruction with the learning of students taught by conventional methods. Research reported in the area seems fairly evenly divided between "no significant difference" and differences which favor the programmed method.

Robert Ruddell did one of the largest and most controlled studies on the teaching of reading by programmed instruction. This was a first grade study sponsored by the United States Office of Education. He was interested in determining if certain linguistic-type supplements to both basal reading texts and programmed reading books would aid in reading instruction, but he also included in his study one group of classrooms which used the Sheldon Basic Readers and another set of classrooms which used the Buchanan Programmed reading method.[1] At the end of the first grade, there was no significant difference in the reading achievement of the students taught by the Sheldon Basic Readers.

In 1967, Sigler made an attempt to measure growth in reading of thirty-six remedial high school readers. After nine forty-five minute sessions using the Lessons for Self Instruction Basic Skills, students had lost a tenth of a year in scores on the Gates Reading Survey between Form One and Form Two.[2]

Another study where the exact same content had been programmed and presented in text form was conducted in the New York City Schools in 1963-64. Gotkin and others became

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[1]Robert B. Ruddell, "The Effect of Four Programs of Reading Instruction with Varying Emphasis of the Regularity of Grapheme-Phonome Correspondences and the Relation of the Language Structure to the Meaning on Adjustment on First Grade Reading," (Report of Research Project #2699, University of California, 1965).

[2]Doris Sigler, "A Study of the Use of Programmed Materials with Retarded Readers in the Ninth Grade," (Unpublished Masters Thesis, Rutgers University, 1967), pp. 1-23.

involved with this population in 1963, in the Reading Improvement Project of the Center for Programmed Instruction. During the two years with this project, they wrote and tested programmed instruction lessons directed at teaching a number of skills designed to upgrade the reading ability and subject-matter vocabulary of seventh and eighth graders who were reading at the fourth grade level. In terms of the goals of the project, they failed to produce a significant amount of programmed materials capable of modifying the critical aspects of the reading behavior of their target population.[1]

In the Denver Studies, seven first grade classes (N = 152) in two schools participated in the experiment using Sullivan Program. Ten first grade classes were chosen randomly from similar schools to serve as a control group (N = 325), using a basal reading program. The two groups had identical mean ages (77 months) and nearly identical mean intelligence quotient scores (E = 93, C = 95).[2]

At the end of one year of instruction, all students were tested on the Metropolitan Primary Reading Test, with sub-test scores for Word Knowledge, Word Discrimination,

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[1] Lassar G. Gotkin and Joseph F. McSweeney, "Learning from Teaching Machines," Programmed Instruction, Sixty-Sixth Yearbook of the National Society for the Study of Education, Part II (Chicago, Ill.: University of Chicago Press, 1967), pp. 255-278.

[2] The Denver Studies, A Report of Eight Studies Comparing Programmed Reading with Other Reading Instruction Systems in Grades One and Two, (New York: McGraw-Hill Book Co., 1967), pp. 1-6.

and Reading Comprehension. The experimental group did significantly (.001) better on all three areas of the test. A further breakdown of performance of both groups by intelligence quotient into low, middle and high subgroups revealed that of the nine scores, (3 groups, 3 test variables), comparisons showed that middle and high ability groups benefitted proportionately more from the programmed materials. Older children did slightly better than younger children, but there were no significant differences in performance between boys and girls.

The Stanford-Brentwood Computer-Assisted Instruction Project began in the Ravenwood School District in 1965. This project used the IBM 1500 system, and computer-assisted instruction was provided in initial reading.[1] Fletcher's and Atkinson's rationale assumed that the two major aspects of reading were communication and decoding.

The communication aspect of reading seemed best presented in the classroom by a human teacher in some sort of dialogue mode, and the decoding aspect of reading seemed best presented by a computer in a consistent drill or practice mode.

The major emphasis on this study was on reading as decoding. Fletcher and Atkinson defined decoding as the

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[1]John D. Fletcher and R. C. Atkinson, "Computer Based Instruction in Reading K-3," (Paper presented at the International Reading Association Conference, Anaheim, California, May 6-9, 1970).

rapid, if not automatic, association of phonemes or phoneme groups with their graphic representations.[1]

Students received instruction for the exercises by means of a digitized audio message, and they input their responses on a teletype keyboard. When they had completed their response, pressure on the space bar returned control to the computer for a response evaluation.

In May, 1969, the Ravenwood School District administered the Metropolitan Reading Tests to its kindergarten students and in November, before computer-assisted instruction was begun in the district, the reading project staff administered the Metropolitan Reading Test to about 450 first grade students. From this data it was possible to match, on the basis of the May Metropolitan Reading Test Scores, 20 boys and 22 girls, half of whom (the experimental group) had accumulated about three months exposure to the computer-assisted instruction reading in the spring and summer of 1969 and half of whom (the control group) had completed kindergarten and the special summer session with no exposure to computer-assisted instruction in reading. The mean Metropolitan Reading Test score gain of the 10 experimental group boys was 12.50, as opposed to a mean gain of 7.00 for the 10 control group boys. The mean Metropolitan Reading Test score gain of the 11 experimental group girls was 9.18, as

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[1]John D. Fletcher and R. C. Atkinson, "Computer Based Instruction in Reading K-3," (Paper presented at the International Reading Association Conference, Anaheim, California, May 6-9, 1970).

opposed to a mean gain of 5.00 for the 11 control group girls. Overall, the Metropolitan Reading Test performance of the experimental group (N = 21) improved significantly more than that of the control group (N = 21), t = 3.16, p = .01. It should be noted that the November post-test was administered four months after the last exposure of the experimental group to computer-assisted instruction reading.[1]

It is interesting to note that the improvement in average gain for experimental over control boys (5.50) is greater than the improvement in average gain for experimental over control girls (4.18). This result is similar to that of Atkinson who also obtained greater performance gains by boys than by girls in a computer-assisted instruction initial reading program.[2] This result opposes the usual expectancy of superior performance gains by girls than by boys in initial reading.

Fletcher and Atkinson also arrived at what they termed three unsupportable conclusions. The first of these being that for a time, the philosophy in computer-assisted instruction seemed to be the more hardware the better. They now believe that the major lesson which they have learned is the utility of attempting only what can be done well and inexpensively and of building on that.

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[1]John D. Fletcher and R. C. Atkinson, "Computer Based Instruction in Reading K-3," (Paper presented at the International Reading Association Conference, Anaheim, California, May 6-9, 1970).

[2]R. C. Atkinson, "Computerized Instruction and the Learning Process," American Psychologist, XXIII July 1968, pp. 225-239.

The second unsupportable conclusion which they arrived at was that having developed language-related computer-assisted instruction programs which necessarily state behavioral objectives on a second to second basis, they are now of the opinion that behavioral objectives alone cannot and should not comprise all the goals of a curriculum. They believe that the whole of reading cannot be taught efficiently by computer and that the role of the teacher becomes essential precisely where behavioral objectives leave off.

The third unsupportable conclusion which Fletcher and Atkinson arrived at was that in spite of the argument that often comes up that the last thing culturally deprived children need is less contact with human beings, they now believe that exactly the opposite is true. In their unsupportable conclusion they believe that for many aspects of the cognitive domain, computers, with their absolute imperturbability and objectivity, represent the best means of reaching these children.

McNeil tested the hypothesis that teachers behave differently toward boys and girls and that such teacher behavior is related to performance in beginning reading.[1] Kindergarten pupils were taught 40 words by an auto-

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[1] John D. McNeil, "Programmed Instruction Versus Usual Classroom Procedures in Teaching Boys to Read," American Educational Research Journal, March 1, 1964, pp. 113-119.

instructional approach, and word recognition measures were then tested on word recognition skills after four months of instruction with female teachers in first grade. When reading was taught by female teachers, girls were superior on the word recognition measures. However, contrary to the usual expectations of female superiority, the boys outperformed the girls when auto-instructional techniques were employed. This finding was consistent with the findings of the computer-assisted instruction project conducted in the Ravenwood School District and suggests that consideration should be given to the appropriateness of traditional classroom procedures in teaching reading to boys.

Lindvall and Bolvin have explained a programmed Curriculum called individually prescribed instruction.[1] They found that the reading achievement of children in this project is at least as good as that of children in other types of programs.

Jones found that primary children using programmed materials made consistently more gains than those using the basal method.[2]

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[1]C. M. Lindvall and John Bolvin, "Programmed Instruction in the Schools: An Application of Programming Principles in 'Individually Prescribed Instruction'," Programmed Instruction, Sixty-Sixth Yearbook of the National Society for the Study of Education, Part II (Chicago, Ill.: University of Chicago Press, 1967), pp. 217-254.

[2]Shuell H. Jones, "Programmed Reading Report: So Far, So Good," Nation's Schools, (July, 1966), pp. 39-40.

Moore's talking typewriter project has been expanded into the Edison Responsive Environment, which according to Gotkin and McSweeney, surrounds the learner electronically with the modern equivalents of the tape recorder, slide projector, electric typewriter, and classroom chalkboard complete with pointer.[1] They also indicated that because the child was spoken to and given instructions by a warm rythmic voice there was no dehumanizing effects of machines.

Yet with all of these articles, the lack of evidence about the effectiveness of programmed instruction, particularly in the field of reading, is striking. Silberman was able to write a whole chapter entitled, "Reading and Related Verbal Learning" in the National Education Association sponsored book Teaching Machines and Programmed Learning II without getting down to the comparison or effectiveness problem.[2]

The National Society for the Study of Education printed an entire yearbook called Programmed Instruction in 1967, which has very little about the effectiveness of programmed instruction and nothing about the effectiveness

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[1] Lassar G. Gotkin and Joseph F. McSweeney, "Learning from Teaching Machines," Programmed Instruction, Sixty-Sixth Yearbook of the National Society for the Study of Education, Part II (Chicago, Ill.: University of Chicago Press, 1967), pp. 255-278.

[2] Harry F. Silberman, "Reading and Related Verbal Learning," Teaching Machines and Programmed Learning II (Washington, D.C.: National Education Association, 1965), pp. 508-545.

of reading instruction. The National Society for the Study of Education Yearbook in the following year, 1968, put out a volume on reading entitled Innovation and Change in Reading Instruction in which programmed instruction was mentioned by the authors; none of them gave any data as to its effectiveness.[1]

Publishers have some glowing testimonials and even quotes of small unpublished studies, but in the regular literature, there is very little. Perhaps it is unfair to ask this of programmed instruction when we do not ask it of basal texts or supplementary instructional materials, but programmed instruction was developed in the psychological laboratories where testing is the order of the day and somehow most people had greater expectations for its empirical justification.

Summary of Related Literature

Historically the present cycle of activity in programmed instruction began in 1954 with Skinner's article on the science of learning and the art of teaching and has continued to the present time.

The major types of programmed reading instruction reviewed by this author are the constructed response type of program which requires the student to write an answer

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[1]Helen M. Robinson, Innovation and Change in Reading Instruction, Sixty-Seventh Yearbook of the National Society for the Study of Education, (Chicago: University of Chicago Press, 1968), pp. 397-430.

to a question put before him by the programmer and the multiple choice type of program which requires the student to select one of a number of alternate answers to a given question.

The effectiveness of programmed instruction has been questioned by various researchers. Ruddell found no significant difference between the achievement of first graders taught in the traditional manner with a basic text and the achievement of those taught with programmed materials.

Gotkin's findings were similar to Ruddell's when he used programmed lessons to improve the reading ability and subject matter vocabulary of seventh and eighth graders who were reading at the fourth grade level.

In contrast with Ruddell's findings, the Denver Studies found a significant gain in achievement of the first grade pupils who had been instructed with the programmed reading method. In addition to the "significant" achievement gain of the experimental group the Denver Studies also found that middle and high ability groups benefitted proportionately more from programmed materials than did the low ability groups. This study found no significant difference in the performance between boys and girls.

The Stanford-Brentwood Computer-Assisted Project's findings were similar to the Denver Studies findings in that they also discovered that their first grade students who received computer-assisted instruction did significantly better than those who had not been exposed to programmed

instruction. Unlike the Denver Studies, the Stanford-Brentwood Project found that average gain for experimental over control boys was greater than the average gain for experimental over control girls.

Atkinson also found greater performance gains by boys than by girls in his experiment with computer-assisted instruction initial reading program.

McNeil's findings that boys outperformed girls agreed with the Stanford-Brentwood Project and the findings of Atkinson.

Lindvall and Bolvin found that programmed material resulted in achievement at least as good as that of children in other types of programs.

Further analysis of the above findings revealed variables in each of the researchers' studies. Ruddell's major goal was to study effect of varying emphasis of the Grapheme-Phonome correspondence and the relation of the language structure to the meaning on adjustment on first grade reading.

Gotkin and Sigler both worked with remedial students. Gotkin's experiment dealt with remedial seventh and eighth grade students reading at the fourth grade level. Sigler's work was done with remedial high school students. The intelligence quotient variable and the remedial aspect of these two studies both implied a relationship to this author's study.

The Denver Studies and the Stanford-Brentwood Project were the two projects more closely related than any others. However, there was a time lapse of four months before the post-tests were administered to the experimental group of students who participated in the Stanford-Brentwood Project. The difference in performance of the three ability groups, and the lack of significant difference in performance of boys and girls in the Denver Studies as opposed to a significant difference in performance of boys and girls in the Stanford-Brentwood Project made these studies relevant to this research.

McNeil based his experiment on the hypothesis that teachers behave differently toward boys and girls and that such behavior is related to performance in beginning reading. He was the only researcher whose project was geared specifically toward teacher attitude.

Fletcher and Atkinson in their unsupportable conclusions indicated the variability of the amount of hardware used, the role of the teacher as opposed to programmed behavioral objectives, and the classroom teacher's attitude as opposed to the imperturbability and objectivity of a computer. Gotkin and McSweeney contrasted this last conclusion of Fletcher and Atkinson by first stating that there was no dehumanizing effects of machines because the child was spoken to and given instructions by a warm rythmic voice.

Regarding prospects for the future, concerning subject matter, without any question it is the skill subjects

that can be handled most easily. These are the ones that we understand how to teach in this environment. We can bring these subjects under control in a deep and organized way and can present them to the student in a way that makes a great deal of sense from a psychological standpoint as well as from a curriculum standpoint. The skill subject that would be particularly important is reading.

Other subjects will undoubtedly be handled successfully in a computerized environment; but the skill subjects that constitute a rather large part of elementary teaching at all levels will be the first on which we can make real headway. Also important to mention is the upgrading and raising of standards that this writer thinks we can expect in those aspects of elementary subjects that are concerned with drill and practice. From a psychological standpoint, there is no doubt that the kind of variables learning theorists have talked about for decades can be controlled in a much deeper and more substantial way, because of the relative completeness of control of the environment, particularly of timing variables.

The first and foremost pressing problem of programmed computerized reading instruction is reliability. The machines must work and they must work right. Chaos is introduced if over a sustained period children are put into the terminal environment and the program and machines do not perform as they should. There is no other problem as

important in the initial work with the computer-assisted program as the problem of reliability.

The second problem is one that plagues all of us working curriculum, not just those in computer-assisted instruction. It is the problem of curriculum preparation and programming. Because it is new, it is sometimes easy to forget the aspects of interest and complexity.

The third problem is that of stimulus deprivation. There is no doubt, other things being equal, the children have an enormous initial interest in using the equipment that is a part of computer-assisted instruction, so there should be no problem on the short haul. The question is whether or not we can overcome problems of stimulus deprivation and the associated problems of motivation over a two or three year span.

The fourth problem is how to make the cost reasonable for use on a very wide basis in schools throughout the country. Costs will have to come down before computer terminals can be made available to the majority of elementary school pupils.

Some of the many conflicting findings of researchers in this field which will stimulate continuous vigorous activity in the area of programmed instruction are: (1) The various findings of "no significant difference" and differences which favor the programmed method. (2) The findings of some researchers which indicated more significant growth for boys than girls in

programmed reading suggests a whole new area of research since traditionally boys are slower in average achievement than girls in a traditional reading classroom. (3) Inconclusive evidence of successful achievement with lower ability students suggests the possibility of special programs written at their level. (4) Significant achievement gains with average or above average ability students suggests the adaptability of programmed instruction for this group as well as special programs for gifted pupils.

The very fact that findings of researchers in the area of programmed reading have been "significant," "inconclusive," "conflicting," and "no significant difference," indicates a need for further research in this area and stimulates researchers to further exploration.

CHAPTER III

RESEARCH TECHNIQUES

Description of Sample

The subjects who made up the group in this study were children who were participating in the regular school curriculum of the Cumberland Elementary School during the 1970-71 school year. The children came from grade four, and had originally been placed in the program based upon their advancement through the graded school system of vertical organization and the heterogeneous horizontal placement based upon the chronological sequence of their original enrollment. The total population of the entire group was seventy students. Of this number, thirty-five were included in the programmed reading sample, and thirty-five were included in the traditional reading group.

The programmed reading group and the traditional reading group were matched on the basis of two factors: sex and grade level. The actual distribution of both the programmed reading class and the traditional reading class is presented in Table 1.

TABLE 1

DISTRIBUTION OF SUBJECTS BY SEX IN BOTH PROGRAMMED AND TRADITIONAL READING GROUPS

PROGRAMMED		TRADITIONAL	
Male	18	Male	21
Female	17	Female	14
Total	35		35

The match of sex was done to insure more comparable sample and to avoid sex bias. The total of thirty-five students in each group makes a total of seventy students used in the study. The subjects were all Caucasian.

The class divisions indicated in Table 1 were the same divisions used in the science classes so no other identification was necessary for those two groups.

Individual students within the group were identified by number. Programmed reading students were numbered consecutively one through thirty-five, and the same number applies to these students in programmed science.

Traditional reading students were also numbered consecutively one through thirty-five, but they have the prefix "P" placed in front of the number. The same number applies to these students in the traditional science class. In both cases, identification of students by number made it possible to trace them through all phases of the experiment.

The programmed reading teacher was given intensive training on the use of the programmed equipment and materials prior to the actual start of the program. A substitute was trained at the same time in case of illness or absence on the part of the regular teacher. In addition to the training given to the regular teacher, the substitute was brought in at regular intervals and kept abreast of the program at all times. This precaution proved unnecessary because the regular teacher was not absent during the time of this experiment.

The same precautions were taken with the regular reading instructor. The course was outlined with objectives established as prescribed by the basal series. The instructor was absent three days at widely separated intervals. The widely spaced intervals between absences negated any significant effect of the absences on the results.

The science teacher was also required to pre-plan and organize her objectives for the course to be taught to the two classes. However, there was one difference between her preparation and that of the two reading instructors. She was not told that she was going to be a part of the experiment. The author felt this would help to avoid any tendency toward bias on the part of the science teacher since science is a subject which lends itself to the "scientific method" of instruction. This teacher was absent only one day.

Research Instrument

The actual research instrument used was a programmed reading laboratory consisting of twenty study carrels and with Craig Readers, Crair Tape Recorders, Hoffman Projectors, and Language Master Machines. Programmed materials, consisting of pre-tests workbooks, slides tapes and records were available with these machines. (See Appendix A).

The objectives of this laboratory were to provide to individual teachers the capability of diagnosing, accurately and quickly, the individual deficiencies and strengths of their students. The second step was to prescribe an individualized learning approach, known as a prescription, that specifically laid out a learning program for that student, based on his or her needs. The third step was to provide a facility, known as a laboratory, into a classroom where the prescription or learning program could be carried out by the teacher.

There have been, for a great many years, many tests of different types used in school districts. However, there have been few tests and assessment tools that are used in direct correlation with the learning program. Tests or assessments in the past have been utilized more often than not, at the end of a year as an attempt to clarify how well the total overall school district is doing in comparison to national norms and the records are then put in a cumulative folder and are used as guidelines or interpretive measures

for students. The essential differences for this approach and the programmed learning laboratory used by this researcher is, for the first time, relatively short assessment tools were used with students that were using the laboratory and, there was an immediate feedback and profile that could identify accurately to the teacher the specific deficiencies and learning disabilities that affected this student. The assessment tools were designed to give as much information as possible about how the teacher could work with this student to improve his or her reading ability.

All teachers and reading consultants, in the past, have laid out in their own mind a method or approach to help a student to improve their reading ability. However, today, with the wealth of material, different approaches, demands on teachers' time and many levels of materials that are available, it has become a very difficult job to map out an accurate, individual program that will be geared for that particular student. The purpose and basis for this Programmed Reading Laboratory is that, over a period of time it has been realized that when certain students have certain deficiencies at certain levels they should be matched up with certain learning programs and procedures that will minimize their deficiencies. This Laboratory has been recording these experiences into a computer bank so that the computer can continually remember failures and successes so that each prescription will be significantly improved. The matching of needs and prescriptions by the

computer is much like a master teacher would do in her own mind. However, the computer prescribes, impartially and effectively, analyzed results based on past experiences. Therefore, each prescription for each individual student was the accumulation of many hundreds of programs. (See Appendix B).

The Traditional Reading Class used the Curriculum Foundation Series of Scott Foresman, consisting of Ventures,[1] Open Highways,[2] and Wide Horizons,[3] with Think-and-Do Workbooks to accompany each. Progress charts and reference material as suggested in the teachers editions of the above volumes were also used as indicated.

The two science classes both used the publication of Harcourt, Brace and World, Concepts in Science as their basic text.[4] Along with the basic text, the accompanying tests and activity books as suggested in the teacher's manual were also used.

The actual organization and function of the traditional reading program in Cumberland was as follows: Pupils were scheduled in groups of not more than six and

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[1]Helen M. Robinson, and others, Ventures (Chicago: Scott Foresman and Co., 1965), pp. 1-512.

[2]Helen M. Robinson, and others, Open Highways (Chicago: Scott Foresman and Co., 1965) pp. 1-480.

[3]Helen M. Robinson, and others, Wide Horizons (Chicago: Scott Foresman and Co., 1965) pp. 1-512.

[4]Paul F. Brandwein, and others, Concepts in Science (New York: Harcourt, Brace and World, 1966), pp. 1-312.

given reading instruction once a day, each day of the week. The reading periods were at least forty minutes in duration. The program was well balanced, and included guided recreational reading, direct teaching of reading skills and lessons, and planned study lessons in recreational, instructional, and study-type reading. Every student received specific instructional help in all of the skill areas of reading, including the fundamentals of reading such as comprehension and critical thinking, evaluation, vocabulary and word analysis, and the development of a versatile approach.

The materials used in the reading program included a set of basal readers, phonic text workbooks, and library books. Flexibility is an asset to any program but the basal reading program, because of its relationship to the overall school program, covered a major part of the period. After the basic reading exercises were finished, the rest of the period was used to work with the other materials or to engage the pupils in phonetic word games.

Teaching techniques in the class were designed to develop within the students an ability to survey their reading, to ask specific questions, and to answer those questions by their reading. The basic study skill objectives may be classified into three main categories; organizational skill such as classifying, noting sequence, outlining, listing, identifying, coordinating, and note taking; library skill such as using card catalogues, and making use of the atlas; and interpretation skills such as

map reading, understanding diagrams and understanding graphs.

The reading skill objectives of the program can be grouped into two main categories, word recognition skills and vocabulary development. Within the word recognition skill area, teachers were concerned with developing auditory discrimination which includes listening for rhyme context, listening for consonant sounds, initial positions, final positions, medial positions, consonant blends, and diagrams. Emphasis was also placed on developing the student's ability to hear and discriminate long and short vowels, word variance, to recognize syllables, and listen for accent and inflection within words. Visual discrimination, motor coordination, structural analysis, phonetic analysis, and the use of the dictionary were other important elements within the word recognition skill area. There was provision for vocabulary development of such comprehension skills as finding main ideas, recognizing word details, and developing overall understanding.

Table 2 reveals that thirty-five students were assigned to the traditional reading class. Of these thirty-five pupils, twenty-one were boys and fourteen were girls. The mean intelligence quotient for the entire group was ninety-six, with a spread of from seventy-five to one hundred thirteen. All students were pretested with the Stanford Achievement Test, Intermediate, Form W, 1964, prior to the beginning of the experiment thus obtaining a reading

grade placement score and a science grade placement score. The reading grade placement scores of this group ranged from two years and five months to three years and seven months. The reading grade placement mean for the entire group was three years and nine hundredths of a month. At the conclusion of the experiment nine months later, all students were post-tested with the Stanford Achievement Test, Intermediate, Form X, 1964. A different form was used on the post-test in order to avoid any bias due to familiarity with the test. The reading grade placement of the post-test scores ranged from two years and three months to four years and seven months. The post-test mean reading grade placement was three years and three months. This was a mean reading grade placement increase of two and six tenths months.

Further analysis of these scores indicated that pupils with intelligence quotients ranging from seventy-five to ninety-five achieved less than those ranging from ninety-six to one hundred thirteen.

TABLE 2

TRADITIONAL INSTRUCTION
GRADE PLACEMENT SCORES IN READING

Student Number	I.Q. Scores	Pre-test Scores	Post-test Scores	Net Gain or Loss
T-1	105	2.7	3.2	.5
T-2	110	3.5	3.9	.4
T-3	95	2.8	3.0	.2
T-4	102	3.6	4.7	1.1
T-5	107	3.1	3.5	.4
T-6	113	3.4	3.8	.4
T-7	106	3.6	3.8	.2
T-8	84	3.3	3.5	.2
T-9	110	3.0	3.3	.3
T-10	88	2.6	3.0	.4
T-11	97	2.7	3.2	.5
T-12	101	3.6	3.9	.3
T-13	100	3.7	2.7	-1.0
T-14	83	2.7	3.0	.3
T-15	75	2.7	2.9	.2
T-16	97	2.8	3.2	.4
T-17	101	3.3	3.3	.0
T-18	101	3.1	3.4	.3
T-19	86	2.5	2.3	-.2
T-20	89	3.0	3.4	.4
T-21	81	3.0	3.2	.2
T-22	105	3.0	3.0	.0
T-23	87	3.1	3.4	.3
T-24	91	2.5	3.0	.5
T-25	97	2.9	2.7	-.2
T-26	91	3.1	2.7	-.4
T-27	93	2.9	2.9	.0
T-28	102	3.7	4.0	.3
T-29	102	3.6	4.3	.7
T-30	85	2.6	3.0	.4
T-31	96	3.6	4.6	1.0
T-32	96	3.1	3.5	.4
T-33	91	2.6	2.8	.2
T-34	89	3.1	3.2	.1
T-35	91	3.7	4.2	.5
Mean	95.6	3.09	3.35	.26

Table 3 represents boys in the traditional reading class. Information in this table is extracted from Table 2.

TABLE 3

TRADITIONAL INSTRUCTION GRADE PLACEMENT SCORES OF BOYS IN READING

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
T-1	105	2.7	3.2	.5
T-3	95	2.8	3.0	.2
T-8	84	3.3	3.5	.2
T-9	110	3.0	3.3	.3
T-10	88	2.6	3.0	.4
T-11	97	2.7	3.2	.5
T-12	101	3.6	3.9	.3
T-13	100	3.7	2.7	-1.0
T-15	75	2.7	2.9	.2
T-17	101	3.3	3.3	.0
T-19	86	2.5	2.3	-.2
T-20	89	3.0	3.4	.4
T-23	87	3.1	3.4	.3
T-24	91	2.5	3.0	.5
T-27	93	2.9	2.9	.0
T-28	102	3.7	4.0	.3
T-29	102	3.6	4.3	.7
T-31	96	3.6	4.6	1.0
T-33	91	2.6	2.8	.2
T-34	89	3.1	3.2	.1
T-35	91	3.7	4.2	.5
Mean	93.95	3.08	3.33	.25

Boys' intelligence quotients ranged from seventy-five to one-hundred-ten with a mean quotient of ninety-four. Pre-test reading grade placement scores ranged from a low of two years and five months to a high of three years and seven months. The mean reading grade placement for boys was three years and one month. Post-test reading grade placement scores for boys showed a low of two years and three months to a high of four years and six months. The new reading grade placement mean for boys was three years and three months. This was a mean reading grade placement increase of two months in traditional reading for boys.

Table 4 represents girls in the traditional reading class. Information in this table was extracted from Table 2.

Girls' intelligence quotients ranged from eighty-three to one-hundred-thirteen, with a mean quotient of ninety-eight. Pre-test reading grade placement scores ranged from a low of two years and six months to a high of three years and six months. The mean reading grade placement for girls was three years and one month. Post-test reading grade placement scores for girls showed a low of two years and seven months to a high of four years and seven months. The new mean reading grade placement for girls was three years and four months. This was a mean reading grade placement increase of three months in traditional reading for girls.

TABLE 4

TRADITIONAL DISTRIBUTION GRADE
PLACEMENT SCORES OF GIRLS IN READING

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
T-2	110	3.5	3.9	.4
T-4	102	3.6	4.7	1.1
T-5	107	3.1	3.5	.4
T-6	113	3.4	3.8	.4
T-7	106	3.6	3.8	.2
T-14	83	2.7	3.0	.3
T-16	97	2.8	3.2	.4
T-18	101	3.1	3.4	.3
T-21	81	3.0	3.2	.2
T-22	105	3.0	3.0	.0
T-25	97	2.9	2.7	-.2
T-26	91	3.1	2.7	-.4
T-30	85	2.6	3.0	.4
T-32	96	3.1	3.5	.4
Mean	98.14	3.11	3.38	.27

Table 5 contains all the students assigned to the traditional science class. Since this is the same group of students listed in Table 2, Traditional Reading Students, the student identification numbers and intelligence quotients are the same. As with the Traditional reading class, all students were pre-tested with the Stanford Achievement Test, Intermediate, Form W, 1964, prior to the beginning of the experiment thus obtaining a science grade placement score. The science grade placement scores for this class ranged from two years and eight months to five years and four months. The mean for the entire group was three years and five months. At the conclusion of the experiment, all students were post-tested with the Stanford Achievement Test, Intermediate, Form X, 1964. A different form was used on the post-test in order to avoid any bias due to familiarity with the test. The post-test science grade placement scores ranged from two years and nine months to six years and nine months. The post-test mean science grade placement was four years. This was a mean traditional science grade placement increase of five months.

Further analysis of these scores indicated that pupils with intelligence quotients ranging from seventy-five to ninety-five achieved less in traditional science than those pupils with intelligence quotients ranging from ninety-six to one-hundred-thirteen.

TABLE 5

TRADITIONAL INSTRUCTION
GRADE PLACEMENT SCORES IN SCIENCE

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
T-1	105	3.7	4.2	.5
T-2	110	3.7	3.8	.1
T-3	95	3.1	3.1	.0
T-4	102	3.8	5.1	1.3
T-5	107	3.6	4.4	.8
T-6	113	3.6	4.7	1.1
T-7	106	4.2	4.5	.3
T-8	84	3.2	3.4	.2
T-9	110	3.1	3.5	.4
T-10	88	3.8	3.2	-.6
T-11	97	3.8	4.1	.3
T-12	101	2.8	3.5	.7
T-13	100	2.9	3.8	.9
T-14	83	3.2	3.2	.0
T-15	75	3.1	3.6	.5
T-16	97	3.1	2.9	-.2
T-17	101	2.9	3.8	.9
T-18	101	3.1	3.1	.0
T-19	86	3.4	3.4	.0
T-20	89	3.4	3.4	.0
T-21	81	3.9	6.3	2.4
T-22	105	3.4	3.9	.5
T-23	87	3.3	3.4	.1
T-24	91	3.0	3.1	.1
T-25	97	3.6	3.8	.2
T-26	91	3.1	3.5	.4
T-27	93	3.4	3.1	-.3
T-28	102	4.0	6.2	2.2
T-29	102	4.2	5.2	1.0
T-30	93	3.3	3.5	.2
T-31	96	5.4	6.9	1.5
T-32	96	3.8	4.9	1.1
T-33	91	3.8	3.8	.0
T-34	89	3.6	3.7	.1
T-35	91	3.4	4.5	1.1
Mean	95.62	3.5	4.01	.51

Table 6 represents boys in the traditional science class. Information in this table is extracted from Table 5.

TABLE 6

TRADITIONAL INSTRUCTION GRADE PLACEMENT SCORES OF BOYS IN SCIENCE

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
T-1	105	3.7	4.2	.5
T-3	95	3.1	3.1	.0
T-8	84	3.2	3.4	.2
T-9	110	3.1	3.5	.4
T-10	81	3.8	3.2	-.6
T-11	97	3.8	4.1	.3
T-12	101	2.8	3.5	.7
T-13	100	2.9	3.8	.9
T-15	75	3.1	3.6	.5
T-17	101	2.9	3.8	.9
T-19	86	3.4	3.4	.0
T-20	89	3.4	3.4	.0
T-23	87	3.3	3.4	.1
T-24	94	3.0	3.1	.1
T-27	93	3.4	3.1	-.3
T-28	103	4.0	6.2	2.2
T-29	102	4.2	5.2	1.0
T-31	96	5.4	6.9	1.5
T-33	91	3.8	3.8	.0
T-34	89	3.6	3.7	.1
T-35	91	3.4	4.5	1.1
Mean	93.93	3.49	3.94	.45

Boys' intelligence quotients ranged from seventy-five to one-hundred-ten with a mean quotient of ninety-four. Pre-test science grade placement scores ranged from a low of two years and nine months to a high of five years and four months. The mean traditional science grade placement for boys was three years and five months. Post-test traditional science grade placement scores for boys showed a low of three years and one month and ranged to a high of six years and nine months. The new traditional science grade placement mean for boys was three years and nine months. This was a mean traditional science grade placement increase of four months for boys.

Table 7 represents girls in the traditional science class. Information in this table was extracted from Table 7.

Girls' intelligence quotients ranged from eighty-three to one-hundred-thirteen, with a mean quotient of ninety-eight. Pre-test traditional science grade placement scores ranged from a low of three years and one month to a high of four years and two months. The mean traditional science grade placement for girls was three years and five months. Post-test traditional science grade placement scores for girls showed a low of two years and nine months and a high of six years and three months. The new mean traditional science grade placement was four years and one month. This was a mean traditional science grade placement increase of six months for girls.

TABLE 7

TRADITIONAL INSTRUCTION GRADE
PLACEMENT SCORES OF GIRLS IN SCIENCE

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
T-2	110	3.7	3.8	.1
T-4	102	3.8	5.1	1.3
T-5	107	3.6	4.4	.8
T-6	113	3.6	4.7	1.1
T-7	106	4.2	4.5	.3
T-14	83	3.2	3.2	.0
T-16	97	3.1	2.9	-.2
T-18	101	3.1	3.1	.0
T-21	81	3.9	6.3	2.4
T-22	105	3.4	3.9	.5
T-25	97	3.6	3.8	.2
T-26	91	3.1	3.5	.4
T-30	85	3.3	3.5	.2
T-32	94	3.8	4.9	1.1
Mean	93.14	3.53	4.11	5.8

Table 8 indicates that thirty-five students were assigned to the programmed reading class. Of these thirty-five pupils, eighteen were boys and seventeen were girls. The mean intelligence quotient for the entire group was one-hundred, with a spread of from sixty-two to one-hundred-fourteen. All students were pretested with the Stanford Achievement Test, Intermediate, Form W, 1964, prior to the beginning of the experiment thus obtaining a reading grade placement score and a science grade placement score. The reading grade placement scores of this group ranged from nine months to three years. The mean reading grade placement for the entire group was two years and two months. At the conclusion of the experiment, all students were post-tested with the Stanford Achievement Test, Intermediate, Form X, 1964. A different form was used on the post-test in order to avoid any bias due to familiarity with the test. The programmed reading grade placement of the post-test scores ranged from one year and eight months to five years and four months. The post-test mean programmed reading grade placement was three years and one month. This was a mean programmed reading grade placement increase of nine months.

Further analysis of these scores indicated that pupils with intelligence quotients ranging from sixty-two to one-hundred-one achieved more than those pupils with intelligence quotients ranging from one-hundred-two to one-hundred-fourteen.

TABLE 6

PROGRAMMED INSTRUCTION
GRADE EQUIVALENT SCORES IN READING

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
1	101	.9	2.3	1.4
2	114	1.3	2.1	.8
3	103	1.4	2.4	1.0
4	100	1.5	1.4	-.1
5	84	1.6	2.5	.9
6	98	1.6	2.1	.5
7	97	1.7	4.4	2.7
8	95	1.7	3.0	1.3
9	83	1.8	2.3	.5
10	100	1.8	1.3	-.5
11	93	1.8	2.1	.3
12	97	1.9	2.0	.1
13	92	1.9	2.4	.5
14	109	2.1	2.7	.6
15	62	2.1	4.5	2.4
16	98	2.1	3.0	.9
17	101	2.3	3.2	.9
18	85	2.4	2.7	.3
19	92	2.4	3.0	.6
20	107	2.5	3.3	.8
21	106	2.5	1.9	-.6
22	103	2.5	3.1	.6
23	93	2.6	3.9	1.3
24	101	2.6	1.8	-.8
25	92	2.6	3.0	.4
26	103	2.6	4.2	1.6
27	96	2.6	3.3	.7
28	113	2.6	3.1	.5
29	103	2.7	3.5	.8
30	114	2.7	4.4	1.7
31	104	2.7	4.7	1.9
32	112	2.8	3.1	.3
33	114	2.8	3.1	.3
34	109	2.9	5.4	2.5
35	105	3.0	5.0	2.0
Mean	100.02	2.19	3.07	.87

Table 9 represents boys in the programmed reading class. Information in this table was extracted from Table 8.

Table 9

I.Q. SCORE, DISTRIBUTION GRADE
PLACEMENT SCORES OF BOYS IN READING

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
1	101	[illegible]	2.3	1.4
[illegible]	[illegible]	1.[illegible]	2.1	.8
5	84	1.6	2.5	.9
9	83	1.8	2.7	.9
12	97	1.9	2.0	.1
15	62	2.1	4.5	2.4
16	96	2.1	3.0	.9
19	92	2.4	3.0	.6
21	106	2.5	1.9	-.6
23	98	2.5	3.9	1.4
24	101	2.6	1.8	-.8
26	10[illegible]	2.6	4.2	1.6
29	106	[illegible]	3.5	.8
30	[illegible]4	2.[illegible]	4.4	1.7
31	10[illegible]	2.[illegible]	4.6	1.9
32	11[illegible]	2.[illegible]	3.1	.3
34	109	[illegible]	5.[illegible]	2.6
35	10[illegible]	3.0	5.0	2.0
Mean	90.94	2.27	3.33	1.06

Boys' intelligence quotients ranged from sixty-two to one-hundred-fourteen with a mean quotient of one hundred. Pre-test reading grade placement scores ranged from a low of nine months to a high of three years. The mean reading grade placement for boys in this programmed reading class was two years and three months. Post-test reading grade placement scores for boys in programmed reading showed a low of two years and three months and a high of five years. The new programmed reading grade placement mean for boys was three years and three months. This was a mean programmed reading grade placement increase of one year for boys.

Table 10 represents girls in the programmed reading class. Information in this table was extracted from Table 6.

Girls' intelligence quotients ranged from eighty-four to one-hundred-fourteen, with a mean of one-hundred-one. Pre-test reading grade placement scores ranged from a low of one year and four months to a high of two years and eight months. The mean reading grade placement for girls was two years and one month. Post-test programmed reading grade placement scores for girls showed a low of one year and three months and ranged to a high of four years and four months. The new mean programmed reading grade placement for girls was two years and eight months. This was a mean programmed reading grade placement increase of seven months for girls, in the programmed reading class.

TABLE 10

PRE-PROGRAM INSTRUCTION GRADE PLACEMENT SCORES OF GIRLS IN READING

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
3	103	1.4	2.4	1.0
4	10[illegible]	1.5	2.4	.9
6	98	1.6	2.1	.5
7	[illegible]	1.7	4.4	2.7
8	95	1.7	3.0	1.3
10	106	1.8	1.3	-.5
11	98	1.8	2.1	.3
13	102	1.9	2.4	.5
14	10[illegible]	2.1	2.7	.6
17	101	2.3	3.2	.9
18	84	2.4	2.7	.3
20	107	2.5	3.3	.[illegible]
22	103	2.5	3.1	.[illegible]
25	92	2.6	3.0	.4
27	96	2.6	3.3	.[illegible]
28	11[illegible]	2.6	3.1	.5
33	11[illegible]	2.8	3.1	.3
Mean	101.17	2.10	2.80	.69

Table 11 contains all the students assigned to the programmed science class. Since this is the same group of students listed in Table 9, Programmed Reading Students, the student identification numbers and intelligence quotients are the same. As with the programmed reading class, all students were pre-tested with the Stanford Achievement Test, Intermediate, Form X, 1964, prior to the beginning of the experiment thus obtaining a science grade placement score. The science grade placement scores for this class ranged from two years and nine months to four years. The mean for the entire group was three years and four months. At the conclusion of the experiment, all students were post-tested with the Stanford Achievement Test, Form X, 1964. A different form was used on the post-test in order to avoid any bias due to familiarity with the test. The post-test science grade placement scores of this group ranged from three years and one month to four years and seven months. The post-test mean science grade placement of this programmed reading group was three years and six months. This was a mean science grade placement increase of two months for the programmed reading group.

Further analysis of these scores indicated that pupils with intelligence quotients ranging from sixty-two to one-hundred-one achieved less in science than those pupils with intelligence quotients ranging from one-hundred-two to one-hundred-fourteen.

TABLE II

PROGRAM INTERVENTION
GRADE EIGHTEEN STUDENTS IN SCIENCE

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
1	101	3.1	3.6	.5
2	114	2.9	3.3	.4
3	113	3.7	4.1	.4
4	100	3.1	3.4	.3
5	84	3.7	3.7	.0
6	98	3.4	3.3	-.1
7	97	3.5	3.8	.3
8	98	3.5	4.0	.5
9	83	3.1	3.1	.0
10	106	2.9	3.5	.6
11	98	3.6	3.5	-.1
12	97	3.0	3.3	.3
13	102	3.4	3.6	.2
14	109	3.1	3.0	-.1
15	62	3.6	3.9	.3
16	98	3.5	2.8	-.7
17	101	4.0	4.1	.1
18	81	3.2	3.6	.4
19	92	3.2	3.8	.6
20	107	3.3	3.1	-.2
21	105	3.5	3.3	-.2
22	103	3.5	3.6	.1
23	95	3.1	3.7	.6
24	101	3.4	3.8	.4
25	92	3.6	4.1	.5
26	103	3.2	3.1	-.1
27	96	3.1	3.4	.3
28	113	3.2	3.6	.4
29	106	3.0	3.9	.9
30	104	3.3	4.7	1.4
31	104	3.3	3.8	.5
32	114	3.5	4.1	.6
33	114	3.6	4.0	.4
34	109	3.7	4.0	.3
35	105	3.8	3.9	.1
Mean	100.02	3.38	3.64	.26

Table 12 represents boys in the science class. These same boys were used in the programmed reading class. Information in this table was extracted from Table 11.

TABLE 12

PROGRAMMED INSTRUCTION GRADE PLACEMENT SCORES OF BOYS IN SCIENCE

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
1	101	3.1	3.6	.5
2	114	2.9	3.3	.4
5	84	3.7	3.7	.0
9	83	3.1	3.1	.0
12	97	3.0	3.3	.3
15	62	3.6	3.9	.3
16	98	3.5	2.8	-.7
19	92	3.2	3.8	.6
21	106	3.5	3.3	-.2
23	98	3.1	3.7	.6
24	101	3.4	3.8	.4
26	103	3.2	3.1	-.1
29	95	3.3	3.9	.6
30	104	3.3	4.7	1.4
31	104	3.3	3.8	.5
32	114	3.5	4.1	.6
34	109	3.7	4.0	.3
35	105	3.8	3.9	.1
Mean	99.94	3.34	3.65	.31

Boys' intelligence quotients ranged from sixty-two to one-hundred-fourteen with a mean quotient of one hundred. Pre-test science grade placement scores ranged from a low of two years and nine months to a high of three years and eight months. The mean science grade placement of this group of boys was three years and three months. Post-test science grade placement scores for boys in the programmed reading class showed a low of two years and eight months and a high of four years and seven months. The new science grade placement mean for boys out of the programmed reading class was three years and six months. This was a mean grade placement increase of three months for boys out of the programmed reading class.

Table 13 represents girls in the science class and are the same girls used in the programmed reading class. Information in this table was extracted from Table 11.

Girls' intelligence quotients ranged from eighty-four to one-hundred-fourteen with a mean quotient of ninety-nine. Pre-test science grade placement scores of this group ranged from a low of two years and nine months to a high of four years. The mean science grade placement for girls out of the programmed reading class was three years and four months. Post-test science grade placement scores for these girls showed a low of three years and a high of four years and one month. The mean post-test grade placement score was three years and six months. This represented a mean grade placement increase of two months for girls out of the programmed reading class.

TABLE 13

PROGRAMMED INSTRUCTION GRADE PLACEMENT SCORES OF GIRLS IN SCIENCE

Student Number	I.Q. Scores	Pre-Test Scores	Post-Test Scores	Net Gain or Loss
3	103	3.7	4.1	.4
4	100	3.1	3.4	.3
6	98	3.4	3.3	-.1
7	97	3.5	3.8	.3
8	95	3.5	4.0	.5
10	108	2.9	3.5	.6
11	98	3.6	3.5	-.1
13	102	3.4	3.6	.2
14	109	3.1	3.0	-.1
17	101	4.0	4.1	.1
18	84	3.2	3.6	.4
20	107	3.3	3.1	-.2
22	103	3.5	3.6	.1
25	92	3.7	4.1	.4
27	96	3.4	3.4	.0
28	113	3.2	3.6	.4
33	114	3.6	4.0	.4
Mean	101.17	3.41	3.62	.21

Data Collection

The data were collected by the students' classroom teachers and the researcher. These individuals met and evaluated each child. This evaluation consisted of completing a class list showing the pre-test grade scores, the intelligence quotient, and the post-test grade scores on each student in the programmed reading class, the traditional reading class and the science classes.

The information for this list was all numerical in nature. One set of pre-test grade scores and one set of post-test grade scores were used in the programmed reading class, the programmed science class, the traditional science class and the programmed science class. Pre-test scores were obtained from the Stanford Achievement Test, Form W, Intermediate, 1964, and the post-test scores were obtained nine months later from the Stanford Achievement Test, Form X, Intermediate, 1964.[1]

Statement of Hypotheses

A. Programmed and Traditional Reading

Hypothesis 1: There is no significant difference in reading gain scores between boys and girls in the experimental reading classes.

Hypothesis 2: There is no significant difference between reading gain scores based on intelligence quotients in the experimental reading classes.

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[1] Harcourt, Brace and World, Stanford Achievement Test. (Chicago, Illinois), 1967.

Hypothesis 3: There is no significant difference in reading gain scores between the programmed reading students and the traditional reading students.

Hypothesis 4: There is no significant relationship of the interaction between sex and intelligence quotient for the programmed reading class and the traditional reading class.

Hypothesis 5: There is no significant relationship of the interaction between sex and experimental group for the programmed reading students and the traditional reading group.

Hypothesis 6: There is no significant relationship of the interaction between sex, intelligence quotient, and experimental group for the programmed reading class and the traditional reading class.

B. Programmed and Traditional Science

Hypothesis 1: There is no significant difference in science gain scores between boys and girls in the experimental science classes.

Hypothesis 2: There is no significant difference between science gain scores based on intelligence quotients in the experimental science classes.

Hypothesis 3: There is no significant difference in science gain scores between the programmed science students and the traditional science students.

Hypothesis 4: There is no significant relationship of the interaction between sex and intelligence quotient for the programmed science class and the traditional science class.

Hypothesis 5: There is no significant relationship of the interaction between sex and experimental group for the programmed science students and the traditional science students.

Hypothesis 6: There is no significant relationship of the interaction between sex, intelligence quotient, and experimental group for the programmed science class and the traditional science class.

Treatment of the Data

The hypotheses were tested by means of analysis of variance for the 2^3 factorial experiment.[1] The level of the factors were selected because they were of experimental interest. They were regarded as fixed and not as representing a random sampling from a larger population level. This author was not concerned with being able to generalize beyond the particular times actually investigated. Under these conditions and with the randomized group design, the appropriate mean square for all tests of significance will be within the treatment mean square.

The level of significance selected for acceptance or rejection of each hypothesis was set at 0.05. Each F in the following tables is based on 1 and 62 degrees of freedom, and a finding of 3.99 or greater for F indicates significance at the 0.05 level.

The hypotheses which have been stated have been derived as a result of the three way analysis of variance. The analysis relevant to experimental interest are the main effect of intelligence quotient, the main effect of experimental group, the interaction effect of intelligence quotient and experimental group, and the interaction effect of sex and experimental group.

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[1] Allen L. Edwards., Experimental Design in Psychological Research, (New York: Holt, Rinehart, and Winston, Inc., 1968), pp. 200-229.

CHAPTER IV

PRESENTATION OF FINDINGS

Chapter III listed the hypotheses to be tested in this research paper. The collected data were tested by means of analysis of variance as presented in Tables 14 and 15.

The summary of the complete analysis of variance for the two reading classes is presented in Table 14. The values for F that have been entered in the table were obtained by dividing each of the mean squares that was to be tested for significance by the error mean square. Each F in the table is based on 1 and 62 degrees of freedom.

TABLE 14

ANALYSIS OF VARIANCE FOR
PROGRAMMED AND TRADITIONAL READING

Source of Variation		Sum of Squares	d.f.	Mean Squares	F*
S	Sex	.20	1	.20	.56
I	I.Q.	.12	1	.12	.33
E	Exp. Gp.	6.80	1	6.80	18.89
S X I	Sex X I.Q.	.80	1	.80	.22
S X E	Sex X Exp. Gp.	.52	1	.52	1.44
I X E	I.Q. X Exp. Gp.	.51	1	.51	1.41
S X I X E	Sex X I.Q. X Exp. Gp.	1.27	1	1.27	3.52
Error	Within treatments	22.43	62	.36	
		32.65	69		

*Significance for α = 0.05 since F (1,62; .05) = 3.99

Main Effects for Reading

From the table of F, it was determined that for 1 and 60 degrees of freedom a value of F equal to 3.99 was significant with $\alpha = .05$. Of the main effects, sex, intelligence quotient and experimental group, only the experimental group mean square was found to be significant.

Since the sex mean square was not significant, the results of the analysis of variance failed to show that there was any significant difference as to boys' and girls' achievement in the experimental reading classes. Therefore null hypothesis A1 which states there is no significant difference in reading gain scores between boys and girls in the experimental reading classes was retained.

The null hypothesis A2 stated that there was no significant difference between reading gain scores based on intelligence quotients in the experimental reading classes. The intelligence quotient mean square was found to be not significant, therefore, the analysis of variance did not show that intelligence quotient was a significant factor in the achievement of the students in the experimental reading classes. Null hypothesis A2 was retained.

Since the experimental group mean square was significant, the analysis of variance showed that there was a significant relationship between the achievement of the pupils in the programmed reading class and those in the tradition reading class. A one-tailed test was used to test the significance of the difference of gain score

between programmed reading and traditional reading. The mean of the programmed reading group was significantly greater than the mean of the traditional reading group, thus rejecting the null hypothesis A3 which stated that there was no significant difference in reading gain scores between the programmed reading students and the traditional reading students.

Two Factor Interaction Effects for Reading

Since the interaction between sex and intelligence quotient produced a non-significant mean square, the analysis of variance failed to show that interaction effect between sex and intelligence quotients had any significant relationship on the achievement of the students in the experimental reading classes. Therefore null hypothesis A4 which stated that there was no significant relationship of the interaction between sex and intelligence quotient for the programmed reading and the traditional reading class was retained.

The sex by experimental group mean square was not significant. Therefore the analysis of variance failed to show a significant interaction between sex and experimental group. It was concluded that the sex effect was independent of the experimental group effect. Null hypothesis A5 which stated that there was no significant relationship of the interaction between sex and experimental groups for the programmed reading class and the traditional reading class was retained.

Three Factor Interaction Effects for Reading

Since the interaction between sex, intelligence quotient, and experimental group failed to produce a significant mean square, the analysis of variance did not show that interaction effect between sex, intelligence quotient, and experimental group had any significant relationship on the achievement of students in the experimental reading classes. Null hypothesis A6 which stated that there was no significant relationship of the interaction between sex, intelligence quotient and experimental group for the programmed reading class and the traditional reading class was retained.

TABLE 15

ANALYSIS OF VARIANCE FOR
PROGRAMMED AND TRADITIONAL SCIENCE

Source of Variation		Sum of Squares	d.f.	Mean Squares	F*
S	Sex	0.00	1	0.00	0.00
I	I.Q.	1.37	1	1.37	3.71
E	Exp. Gp.	1.06	1	1.06	4.42
S X I	Sex X I.Q.	1.37	1	1.37	5.71
S X E	Sex X Exp. Gp.	.57	1	.57	2.38
I X E	I.Q. X Exp. Gp.	.68	1	.68	2.83
S X I X E	Sex X I.Q. X Exp. Gp.	.17	1	.17	.71
Error	Within treatments	14.87	62	.24	
		20.09	69		

*Significance for α = 0.05 since F (1,62; .05) = 3.99

Main Effects for Science

Table 19 contains the results of analysis of variance for the two science classes. From the table of F, it was again determined that for 1 and 62 degrees of freedom a value of F equal to 3.99 was significant with $\alpha = 0.05$. Of the main effects, sex, intelligence quotient, and experimental group only the sex effect was found not to be significant.

Since the sex mean square was not significant, the results of the analysis of variance failed to show that there was any significant difference as to boys' and girls' achievement in the experimental science classes. Therefore null hypothesis B1 which states there is no significant difference in science gain scores between boys and girls in the experimental science classes was retained.

Null hypothesis B2 stated that there was no significant difference between science gain scores based on intelligence quotients in the experimental science classes. The intelligence quotient mean square was found to be significant, therefore, the analysis of variance did show that intelligence quotient was a significant factor in the achievement of the students in the experimental science classes. Null hypothesis B2 was rejected.

Since the experimental group mean square was significant, the analysis of variance showed that there was a significant relationship between the achievement of the

pupils in the programmed science class and those in the traditional science class. A one-tailed test was used to test the significance of the difference of gain score between programmed science and traditional science. The mean of the traditional science group was significantly greater than the mean of the programmed science group. This data does not support the one-tailed test in favor of programmed science which was the authors area of prime interest. Therefore the null hypothesis H_3 which stated that there was no significant difference in science gain scores between the science group which had been instructed in the programmed reading method and the science class which had been instructed in the traditional reading method was retained.

Two Factor Interaction Effects for Science

The interaction between sex and intelligence quotient produced a significant mean square, and the analysis of variance showed that interaction effect between sex and intelligence quotients had a significant relationship on the achievement of the students in the experimental science classes. Therefore, null hypothesis H_4 which stated that there was no significant relationship of the interaction between sex and intelligence quotient for the science group which had been instructed in the programmed reading method and the science class which had been instructed in the traditional reading method was rejected.

Since the interaction between sex and experimental group produced a non-significant mean square, the analysis of variance failed to show that interaction effect between sex and experimental group had any significant relationship on the achievement of the students in the experimental science classes. Therefore null hypothesis 85 which stated that there was no significant relationship of the interaction between sex and experimental group for the science class which had been instructed by the programmed reading method and the science class which had been instructed by the traditional reading method was retained.

Three Factor Interaction Effects for Science

Since the interaction between sex, intelligence quotient, and experimental group failed to produce a significant mean square, the analysis of variance did not show that interaction effect between sex, intelligence quotient, and experimental group had any significant relationship on the achievement of students in the experimental science classes. Null hypothesis 86 which stated that there was no significant relationship of the interaction between sex, intelligence quotient, and experimental group for the two science classes was retained.

A total of twelve hypotheses were tested by use of analysis of variance. Six hypotheses were tested for the two fourth grade reading classes and six were tested for the two fourth grade science classes. Analysis of variance was used to test for significance, and the level of significance selected for acceptance or rejection of each hypothesis was set at 0.05. Chapter V will discuss and treat the conclusions drawn from these hypotheses. The chapter will also include a summary of the study and recommendations for further study.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study was conducted to establish statistical evidence that the fourth grade students in the Cumberland Elementary School who were instructed through a programmed reading approach would achieve significantly higher gain scores than those fourth grade students who were instructed in the traditional reading methods with a basal text series, and that these same fourth grade students who were instructed by the programmed reading method would also achieve significantly higher gain scores in fourth grade science than those students who were instructed in the traditional reading method. The study was conducted in a small community in east central Illinois in a school district with 1000 elementary students. The student population was all white rural youths. Two groups of students from grade four were involved in the research. The total population for the entire group was seventy students. Of this number, thirty-five were included in the programmed reading sample and thirty-five were included in the traditional reading sample. Each of the above groups

was assigned to the same science teacher, and each group was instructed in science from the same textbook and with the same teaching methods and lesson plans. However, for purposes of identification, the pupils labeled programmed reading students were also labeled programmed science students, and the students labeled traditional reading students were also labeled traditional science students. There was no observable difference in the method of science instruction for the two groups.

As a result of a review of literature, several factors were selected for examination. The sources of variation selected were: sex, intelligence quotient, experimental group, sex and intelligence quotient, sex and experimental group, intelligence quotient by experimental group, and sex by intelligence quotient by experimental group. These same sources of variation were used in the analysis of variance for the programmed and traditional reading and the programmed and traditional science.

The information pertaining to these factors was collected through pre-tests and post-tests, and from the permanent records of the pupils. The teachers were the primary gatherers of information for the researcher. Identical types of information were collected from both programmed and the traditional student groups to facilitate the interaction analysis.

The selected factors were stated in the form of null hypotheses. The method chosen to test the hypotheses was the analysis of variance. The level at which significance was accepted was set at 0.05.

After an analysis of the collected data by the analysis of variance technique, it was found that certain factors for the programmed and traditional reading programs did not have differences statistically significant at the 0.05 level. This meant that these factors were not found to have any significant effect upon reading gain scores in the experimental reading classes. The specific factors found to be non-significant between the programmed reading group and the traditional reading group were: sex, intelligence quotient, sex and intelligence quotient, sex and experimental group, intelligence quotient and experimental group, and sex by intelligence quotient by experimental group.

One factor was found to be significantly different at or beyond the 0.05 level. This factor was the experimental group. This meant that programmed instruction in reading did constitute an acceptable indicator that programmed reading was superior to traditional reading instruction at the fourth grade level and that the null hypothesis by which this was tested was rejected.

This hypothesis was as follows:

> There is no significant difference in reading gain scores between the programmed reading student and the traditional reading students.

The same procedure used for programmed and traditional reading was used for the programmed and traditional science classes.

The same selected factors were stated in the form of null hypotheses. The method chosen to test the hypotheses was the analysis of variance. The level at which significance was accepted was set at 0.05.

After an analysis of the collected data by the analysis of variance technique, it was found that certain factors for the programmed science and traditional science did not have differences statistically significant at the 0.05 level. This meant that these factors were not found to have any significant effect upon science gain scores in the experimental science classes. In this investigation, specific factors found to be non-significant between programmed science and traditional science were: sex, experimental group, sex and experimental group, intelligence quotient and experimental group and sex by intelligence quotient by experimental group.

Two factors were found to be significantly different at or beyond the 0.05 level in the analysis of variance for programmed and traditional science. This

meant that these factors did constitute acceptable indicators that students who had been instructed by the programmed reading method would achieve higher gain scores than those who had been given traditional reading instruction and that the null hypotheses by which they were tested were rejected. These hypotheses were as follows:

1. There is no significant difference between science gain scores based on intelligence quotients in the experimental classes.
2. There is no significant relationship of the interaction between sex and intelligence quotient for the programmed science class and the traditional science class.

Conclusions

In the interpretation of these findings, care should be exercised to generalize results only to the population from which this sample was drawn. The sample came from a small all white elementary school district located in east central Illinois with an enrollment of approximately 1000 students.

The conclusions and related discussion with regard to the hypotheses concerning sex, intelligence quotient, sex and intelligence quotient, sex and experimental group, intelligence quotient and experimental group, and sex by

intelligence quotient by experimental group in the analysis of variance for programmed and traditional reading are presented in the same order as they were presented in the previous chapter.

Null hypotheses were tested for each of the above to see if any significant interaction existed between the two reading groups for these factors. None of the hypotheses approached significance. The conclusion was drawn that within this study the factors of sex, intelligence quotient, sex and intelligence quotient, sex and experimental group, intelligence quotient and experimental group, and sex by intelligence quotient by experimental group had no significant interaction between the two reading groups. The main factor of sex indicated no significant difference in reading gain scores for boys and girls in the experimental reading classes. There was no significant difference between reading gain scores based on the intelligence quotients in the reading classes. There was no significant relationship of the interaction between sex and intelligence quotient for the programmed and the traditional reading class. No significant relationship of the interaction between sex and experimental group for the programmed reading students and the traditional reading students existed. There was no significant relationship of the interaction between sex, intelligence quotient, and experimental group for the programmed reading class and traditional reading class.

The null hypothesis related to experimental group in the analysis of variance for programmed and traditional reading was found to be significant. The fact that the experimental group factor was the only one found to be significant in the experimental reading classes would support the conclusion that programmed reading will produce significantly higher gain scores than traditional reading instruction.

The conclusions and related discussion with regard to the hypotheses concerning sex, sex and experimental group, intelligence quotient and experimental group, and sex by intelligence quotient by experimental group in the analysis of variance for programmed science and traditional science are also discussed in the same order as they appear in the previous chapter.

Null hypotheses were tested for each of the above to see if any significant interaction existed between the two science groups for these factors. None of the hypotheses were significant. The conclusion was drawn that within this study the above factors had no significant interaction between the two science groups. The main factor of sex indicated no significant difference between reading gain scores for boys and girls in the experimental science classes. There was no significant relationship of the interaction between sex and experimental group for the programmed science students and the traditional science students. No significant relationship of the interaction between

intelligence quotient and experimental group for the programmed science students and the traditional science students existed. There was no significant relationship of the interaction between sex, intelligence quotient, and experimental group for the programmed science class and the traditional science class.

The null hypotheses related to intelligence quotient was found to be significant. This would indicate that there is a significant difference in science gain scores based on intelligence quotients in the experimental science classes and that there was a stronger interaction based on intelligence quotients for the science classes than there was for the reading classes.

The null hypothesis related to experimental group in the analysis of variance for the programmed and traditional science was found to be significant. However, the mean growth of the traditional science group was greater than the mean growth for the programmed science class. This data did not support a one-tailed test in favor of programmed science. Therefore, significance in the analysis of variance for reading as well as science did not support the hypothesis that programmed reading does significantly affect the science gain scores.

The null hypothesis related to the sex and intelligence quotient in the analysis of variance for the science classes was also found to be significant. Since the main

factor of sex was found to be not significant, the primary force of the interaction would be dependent upon the intelligence quotient.

Although the Denver Study referred to in this paper was conducted with first graders, and this writer's experimental group consisted of fourth graders, it was interesting to note that in both cases the programmed reading groups did significantly better than the traditional groups. This finding was also consistent with that of the Stanford-Brentwood Computer-Assisted Instruction Project. Jones's findings that primary children using programmed materials made consistently more gains than those using the basal method also supported this author's findings. The Denver studies found no significant difference in the performance of boys and girls in programmed reading. Fletcher, Atkinson, and McNeil all found that the average gain for programmed reading with boys was greater than for programmed reading for girls. These findings were consistent with the findings of this researcher. Boys in the programmed reading class had a mean gain of one year and girls in the programmed reading class had a mean gain of seven months. In the traditional reading class the girls had a mean average gain of three months and the boys had a mean average gain of two months.

The author's findings were not entirely consistent with those of the Denver Study which found that middle and high ability groups benefitted proportionately more from the programmed materials. This author's findings indicated that

the mean gain for students in the intelligence quotient range from sixty-two to one-hundred-one was higher than the mean gain for those with an intelligence quotient of one-hundred-two to one-hundred-fourteen.

The initial impression of the programmed reading class was one of students working diligently. They seemed to have a clear idea of their assigned responsibility and were able to carry out these tasks with a minimum amount of teacher assistance. There was ample evidence of students working together. Children helped other children both at student invitation and by teacher assignment. Consequently, the teacher was free to work with groups and individuals more than in the conventional group. The children in the programmed reading class were noticeably less dependent upon their teacher when doing individual work than their counterparts in the five conventional classes. This observation was sustained and reinforced throughout the time of this researcher's observations.

The students in the programmed reading class worked quitely in a determined manner while their teacher went from student to student helping them with their immediate task. This is not to imply that the children in the conventional group did not work well, for this was not the case; but the programmed group were called upon to work alone for much longer periods of time.

The students in the programmed reading class were working on material which ranged from level one to

level six. There were six levels in the fourth grade program. This would mean that this programmed reading class had students ranging into sixth grade material. The programmed reading group was spread over a wider range than the traditional reading group on the same school grade. Furthermore the top students in the programmed group were working in more difficult material than their counterparts in the traditional group. This may be accounted for by the fact that the students in the programmed group could progress as fast as they were motivated to do so. The traditional group progressed at the rate of their reading group. The pace here was determined by the teacher. The traditional group spent more time listening to the oral reading of their peers and in guided reading where the teacher would ask a question, and a student would respond to her. There was little student-to-student interaction except when the students acted as "teacher".

This writer observed that all students working through the programmed reading material did so in the same sequence. The differences had to do with the rate of progress through the sequence and the amount of help they needed from the teacher or other children.

The quality and quantity of written language evident in the classroom at the time of this researcher's observations favored the programmed group. This seemed to be a major factor in influencing the traditional reading

teacher to desire to change to programmed reading. The children's writing ability also helps account for the programmed reading teacher's reluctance to return to the currently used basal reading program.

The programmed reading teacher found that the spelling program used in the school was more than adequately covered by the programmed reading material, and she no longer needed to use the conventional school spelling program.

The advantages of programmed reading as practiced in this district may be summarized as follows: Children using the programmed reading approach learned to work independently for long periods of time. Independent work in their programmed reading materials taught them new vocabulary and reading skills and also provided an opportunity for over learning. Whereas the traditional reading class required some students to use a basal text that might be somewhat easy or difficult for them, assignment to a programmed reading schedule enabled each pupil to work in a book or on materials at the appropriate level of difficulty. Rate of progress was determined by the individual's ability, rather than by group membership or by the teacher's decision. Pupils were permitted to progress as far as they could in the fourth grade programmed reading class whereas in the traditional reading class pupils were limited to some extent by the progress of the entire

group. Written work of the programmed reading students appeared to be satisfactory, and the programmed reading teacher found that the spelling program used in the school was more than adequately covered by the programmed reading materials. She no longer needed to use the conventional school spelling program.

Statistically speaking, the only proven facts of the programmed reading effects on science are those previously listed in the hypotheses, and the statistical proof of this interaction indicates that a more profitable line of research would be an investigation of programmed science versus traditional science.

Recommendations for Further Study

1. The same study should be replicated sampling a different rural population to substantiate results found in this study. Lack of positive proof from previous research makes this mandatory.

2. A follow up study for these same students should be conducted in the fifth grade to see if the significant effects continue after the novelty of the programmed materials become commonplace.

3. A detailed investigation of cost should be undertaken before this type of program can become a regular part of the regular school curriculum.

4. Teacher observations concerning the programmed reading students' independent work study habits need to be investigated further.

5. A recommendation is made for a thorough investigation of the reasons for significance of variance of some of the effect in programmed science and the lack of significance for the same effects in programmed reading.

6. Special attention should be given to the possibility of developing programs of instruction aimed at specific ability levels.

7. Detailed investigation should be made of the various reading skills involved.

BIBLIOGRAPHY

Books

Brandwein, Paul F.; Cooper, Elizabeth K.; Blackwood, Paul E.; and Hone, Elizabeth B. Concepts in Science. New York: Harcourt, Brace and World, 1966.

Brown, J. W.; Lewis, R. B., and Harcleroad, F. F. Audio-Visual Instruction, Media and Methods. New York: McGraw-Hill, 1969.

Deterline, W. A. An Introduction to Programmed Instruction. New Jersey: Prentice Hall, Inc., 1962.

Lysaught, J. P., and William, C. M. A Guide to Programmed Instruction. New York: John Wiley and Sons, 1963.

Margulies, S., and Egen, L. D. Applied Programmed Instruction. New York: Wiley and Sons, Inc., 1962.

Edwards, Allen L. Experimental Design in Psychological Research. New York: Holt, Rinehart and Winston, Inc., 1968.

Robinson, Helen M.; Artley, A. S.; Arron, Ira; Monroe, Marion; Huck, C. S.; and Weintraub, S. Ventures. Chicago: Scott Foresman and Co., 1965.

Saettler, Paul. A History of Instructional Technology. New York: McGraw Hill Book Company, 1968.

Jenkins, W. A.; Robinson, H. M.; Artley, A. S.; Monroe, M.; and Arron, I. Open Highways. Chicago: Scott-Foresman and Co., 1965.

Jenkins, W. A.; Robinson, H. M.; Artley, A. S.; Monroe, M; and Huck, C. S. Wide Horizons. Chicago: Scott-Foresman and Co., 1965.

Wallis, A. W. and Roberts, H. V. Statistics a New Approach. New York: The Free Press, 1956.

Fry, Edward B. Teaching Machines and Programmed Instruction. New York: McGraw Hill Book Co., 1963.

Fry, Edward. How Effective is Programmed Instruction in Teaching of Reading? Paper presented at the 13th International Reading Conference, April 27, 1968. Boston, Mass.

Gillooly, William B., and Furukawa, J. The Effects of Familiarization and Response Mode on the Programmed Learning of Foreign Language Vocabulary. Paper presented to the American Educational Research Association. February, 1968. Chicago, Ill.

Glaser, R. Programmed Instruction in Reading: A Research Review. Conference on Reading, University of Pittsburg Reports, 19. Pittsburg, Penn., 1963.

Ruddell, Robert H. The Effects of Four Programs of Reading Instruction With Varying Emphasis of the Regularity of Grapheme-Phoneme Correspondences and the Relation of Language Structure to Meaning on Achievement in First Grade Reading. Office of Education Cooperative Research Project #2699. U. S. Dept. of Health, Education and Welfare, 1965.

Summers, E. G. Programmed Learning and Reading Instruction. Conference on Reading, University of Pittsburg Reports, 20, 1964. Pittsburg, Penn., 1964.

Weintraub, S. Experimental Procedures in Reading: Programmed Reading Materials. Conference of Reading, University of Chicago, 1965. Chicago, Ill., 1965.

The Denver Studies. A Report of Eight Studies Comparing Programmed Reading With Other Reading Instruction Systems in Grades One and Two. Publication of McGraw Hill Book Co. New York, 1967.

Yearbooks

Corey, Stephen. "The Nature of Instruction." Programmed Instruction. Sixty-Sixth Yearbook of the National Society for the Study of Education, Part II. Chicago, Ill.: University of Chicago Press, 1967. pp. 5-27.

Dale, E. "Historical Setting of Programmed Instruction." Programmed Instruction. Sixty-Sixth Yearbook of the National Society for the Study of Education, Part II. Chicago, Ill.: University of Chicago Press, 1967.

Godkin, Lassar G. and McSweeney, J. "Learning from Teaching Machines." Programmed Instruction. Sixty-Fifth Yearbook of the National Society for the Study of Education, Part II. Chicago, Ill.: University of Chicago Press, 1967.

Lindvall, C. M. and Bolvin, John. "Programmed Instruction in the Schools: An Application of Programming Principles in 'Individually Prescribed Instruction'." Programmed Instruction. Sixty-Sixth Yearbook of the National Society for the Study of Education, Part II. Chicago, Ill.: University of Chicago Press, 1967.

Lumsdaine, A. A. "Theories of Learning and Instruction." Sixty-Third Yearbook of the National Society for the Study of Education. Chicago, Ill.: University of Chicago Press, 1964.

Robinson, Helen M. ed. Innovation and Change in Reading Instruction. Sixty-Seventh Yearbook of the National Society for the Study of Education. Chicago, Ill.: University of Chicago Press, 1968.

Articles and Periodicals

Atkinson, R. C. "Computerized Instruction and the Learning Process." American Psychologist, XXIII (July 1968), 225-239.

Atkinson, R. C. and Wilson, H. A. "Computer-Assisted Instruction." Science, CLXII (1968), 73-77.

Bannatyne, Alex. "A Research Evaluating Teaching Machines for Junior High School Use." Programmed Learning, (February 1966), 32-51.

Bundy, Robert E. "Computer-Assisted Instruction: Now and for the Future." Audiovisual Instruction, XII (April, 1967), 344-348.

Burkott, Ann P. and Clegg, Ambrose A. Jr. "Programmed vs. Basal Readers in Remedial Reading." The Reading Teacher, XXI (May 1968), 745-748.

Cook, J. O. and Spitzer, M. E. "Supplementary Report: Prompting vs. Confirmation in Paired-associate Learning." Journal of Experimental Psychology, LIX (1960), 275-576.

Coulson, John E. and Silberman, Harry F. "Effects of Three Variables in a Teaching Machine." Journal of Educational Psychology, LI (1960), 135-143.

Duncan, K. D. "Programmed Learning in the Army." Programmed Learning, XXXVII (October, 1965), 31-39.

Evans, J. L. "Teaching Reading by Machine: A Case History in Early Reading Behavior." AV Communicator Review, XIII (Fall 1965), 303-308.

Fry, Edward. "Programmed Instruction and Automation in Beginning Reading Today." Illinois School Journal, XLVII (Winter 1967), 250-258.

Guinavan, R. W. "Machine Approach to Reading Comprehension." Pennsylvania School Journal, CXV (May 1967), 44-442.

Holland, J. G. "Design and Use of a Teaching Machine Program." Paper presented as part of symposium on Automated Teaching Methods in Undergraduate Instruction and Educational Research. American Psychological Convention, Chicago, Ill., 1960.

Iverson, W. J. "Age of the Computer and Reading." Claremont Reading Conference Yearbook, XXXI (1967), 159-177.

Jones, Shuell H. "Programmed Reading Report: So Far, So Good." Nation's Schools, (July, 1966), 39-40.

McNeil, John D. "Programmed Instruction as a Research Tool in Reading: An Annotated Case." Journal of Programmed Instruction, I (Spring 1962), 37-42.

McNeil, John D. "Programmed Instruction Versus Usual Classroom Procedures in Teaching Boys to Read." American Education Research Journal, I (March, 1964), 113-119.

Robinson, H. M.; Weintraub, S.; and Smith, H. K. "Summary of Investigations Related to Reading, July 1, 1965 to June 30, 1966." Reading Research Quarterly, II (Winter 1966), 5-81.

Shay, Carlton B. "Relationship of Intelligence to Size of Step on a Teaching Machine Program." Journal of Educational Psychology, LII, 91-103.

Silberman, H. F. "Reading and Related Verbal Learning." Teaching Machines and Programmed Learning II, Washington, D. C., National Education Association, (1965), 338-345.

Skinner, R. F. "The Science of Learning and the Art of Teaching." Harvard Education Review, XXIV (1964), 86-97.

Suppes, Patrick. "Modern Learning Theory and the Elementary School Curriculum." American Educational Research Journal, I (March, 1964), 79-93.

Thelen, Herbert A. "Programmed Instruction: Insight vs. Conditioning." Education, 83 (March 1963), 416-420.

Unpublished Material

Fletcher, John D. and Atkinson, R. C. "Computer Based Instruction in Reading K-3." Paper presented at the International Reading Association Conference, Anaheim, California, May 6-9, 1970.

Sigler, Dora. "A Study of the Use of Programmed Materials with Retarded Readers in the Ninth Grade." Unpublished Masters Thesis, Rutgers University, January 1967.

Other Sources

Programmed Instruction Guide. Compiled by Northwestern University, Newburyport, Mass. Enteleck Press, 1967.

APPENDIX A

PROGRAMMED READING MATERIALS

Pre Reading Text A
Pre Reading Text B
Pre Reading Text C
Pre Reading Text D
Reading Text 1
Reading Text 2
Reading Text 3
Reading Text 4
Reading Text 5
Reading Text 6
Reading Text 7
Reading Text 8
Reading Text 9
Reading Text 10
Reading Text 11
Reading Text 12
Reading Text 13
Reading Text 14
Reading Text 15
Reading Text 16
Reading Text 17
Reading Text 18
Reading Text 19
Reading Text 20
Reading Text 21
Reading Text 22
Reading Text 23
Reading Text 24
Reading Text 25
Response Book I
Response Book II
Response Book III
Response Book IV
Response Book V
Response Book VI

Craig

CR2AV Reader
Tape Recorder

PROGRAMS & WORKBOOKS:

A
ASW
AI
AI-RIB
AI-SWB
B
BRB-I
BRB-2
BSW-3
C
CSW
CI
CSW-I
C2
CSW-2
C3
CSW-3
C4
CSW-4
C5
CSW-5
PEI
PWF-I
PE2
PWF-2
PE3
PWF-3
PE4
PWG-4
Reading Skills
RSSW-1
BIX 50W Bulbs

Hoffman

Mark IV Projector

PROGRAMS & WORKSHEETS:

100-1
101-1
102-1
103-1
104-1
105-1
100-10 to 19
101-10 to 19
102-10 to 19
103-10 to 19
104-10 to 19
105-10 to 19
100-2
101-2
102-2
103-2
104-2
105-2
100-20 to 29
101-20 to 29
102-20 to 29
103-20 to 29
104-20 to 29
105-20 to 29
100-3
101-3
102-3
100-3-AB
101-3-AB
102-3-AB

100-4
101-4
102-4
100-4-AB
101-4-AB
102-4-AB
100-5
101-5
102-5
100-5-AB
101-5-AB
102-5-AB
100-6
101-6
102-6
100-6-AB
101-6-AB
102-6-AB

PHONICS:

100-0
101-0
102-0
103-0
104-0
105-0
100-00 to 09
101-00 to 09
102-00 to 09
103-00 to 09
104-00 to 09
105-00 to 09

106-0 Survey Test

GAMEBOOKS:

106-00-1
106-00-2
106-01-1
106-01-2
106-02-1
106-02-2
106-03-1
106-03-2
106-04-1
106-04-2
106-05-1
106-05-2

HIS-900 Headset
BMG 100 W Bulbs
2-Input Jackbox

Imperial International

PMI 23 C

RESPONSE BOOKS:

Lesson 1
Lesson 2
Lesson 3
Lesson 4
Lesson 5
Lesson 6
Lesson 7
Lesson 8
Lesson 9
Lesson 10
Lesson 11
Lesson 12
Lesson 13
Lesson 14
Lesson 15
Lesson 16
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Lesson 40

IM456c

RESPONSE BOOKS:

Lesson 1
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Lesson 5
Lesson 6
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Lesson 10
Lesson 11
Lesson 12
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Lesson 37
Lesson 38
Lesson 39
Lesson 40

IIb Reading Kit
Form 4
Form 5
Blank Forms
Progress Charts

Language Master

#717A Language Master

Vocab. Set I - #111011
Vocab. Set II - #111012
Vocab. Set III - #111013
Word Picture I - #111021
Word Picture II - #111022
Word Picture III - #111023
Phonics I - #111061
Phonics II - #111062
Phonics III - #111063
#1022A Phonics
#1011A Build. Bas. English
Blank Cards

S.R.A.

IIIa Reading Kit
IVa Reading Kit
Ib Reading Kit

APPENDIX B

STUDENT'S PRESCRIPTION FOR PROGRAMMED READING

PRESC. NO.	DESCRIPTION	AVG HRS	TTL STDS	TTL HRS	1	2	3	4	5	6	7	8	9	OVER
	LANGUAGE													
10-010-01-0	PHONICS SET I (1-200)	4.0	26	104.0	26	0	0	0	0	0	0	0	0	0
10-010-02-0	BOOK A,B,C,D, AND 1	15.0	26	390.0	0	26	0	0	0	0	0	0	0	0
10-015-02-0	BOOK 2, 3, 4, AND 5	12.0	53	636.0	27	0	26	0	0	0	0	0	0	0
10-015-07-[illegible]	READING LAB SET IB (LEVEL 1.4)	3.0	26	78.0	0	10	0	16	0	0	0	0	0	0
10-015-07-3	READING LAB SET IC (LEVEL 1.4)	3.0	14	42.0	0	6	0	8	0	0	0	0	0	0
10-020-01-0	PHONICS SET II (1-200)	4.0	78	312.0	25	11	16	2	24	0	0	0	0	0
10-020-02-0	BOOK 6, 7	6.0	54	324.0	0	25	11	16	2	0	0	0	0	0
10-020-07-[illegible]	READING LAB SET IB (LEVEL 1.7)	3.0	6	18.0	0	0	6	0	0	0	0	0	0	0
10-020-07-3	READING LAB SET IC (LEVEL 1.7)	3.0	5	15.0	0	0	5	0	0	0	0	0	0	0
10-025-02-0	BOOK 8, [illegible]	[illegible]	78	702.0	26	0	14	22	16	0	0	0	0	0
10-025-07-3	READING LAB SET IB (LEVEL 2.0, 2.3)	6.0	2	12.0	0	2	0	0	0	0	0	0	0	0
10-025-07-4	READING LAB SET IIB (LEVEL 2.5)	3.0	34	[illegible]	0	13	0	10	11	0	0	0	0	0
10-030-01-0	PHONICS SET III (1-200)	4.0	75	300.0	24	11	15	4	21	0	0	0	0	0
10-030-02-0	BOOK 11, 12, 13	9.0	54	486.0	0	24	11	15	4	0	0	0	0	0
10-030-07-4	READING LAB SET IIB (LEVEL 2.5)	3.0	6	18.0	0	0	6	0	0	0	0	0	0	0
10-030-07-5	READING LAB SET IIC (LEVEL 2.5)	3.0	23	69.0	0	0	14	[illegible]	0	0	0	0	0	0
10-035-02-0	BOOK 14, 15, 16	9.0	66	594.0	16	0	4	22	24	0	0	0	0	0
10-035-07-2	READING LAB SET IA (LEVEL 3.0)	3.0	1	3.0	0	1	0	0	0	0	0	0	0	0
10-035-07-4	READING LAB SET IIB (LEVEL 3.0)	3.0	7	21.0	0	7	0	0	0	0	0	0	0	0
10-035-07-5	READING LAB SET IIC (LEVEL 3.0)	3.0	5	15.0	0	5	0	0	0	0	0	0	0	0
10-035-07-6	READING LAB SET IIC (LEVEL 3.0)	3.0	2	6.0	0	0	0	0	2	0	0	0	0	0
10-035-07-7	READING LAB SET IIIA (LEVEL 3.0)	3.0	4	12.0	0	2	0	2	0	0	0	0	0	0
10-040-01-0	VOCABULARY SET I (1-200)	4.0	69	276.0	29	1	15	2	22	0	0	0	0	0
10-040-02-0	BOOK 17, 18, 19, 20	12.0	47	564.0	0	29	1	15	2	0	0	0	0	0
10-040-03-0	READING SKILLS 2 WORKBOOK ONE	15.0	45	675.0	0	0	29	1	15	0	0	0	0	0
10-040-07-2	READING LAB SET IC (LEVEL 3.5)	3.0	1	3.0	0	0	0	1	0	0	0	0	0	0
10-040-07-4	READING LAB SET IIB (LEVEL 3.5)	3.0	6	24.0	0	0	0	6	0	0	0	0	0	0
10-040-07-5	READING LAB SET IIC (LEVEL 3.5)	3.0	11	33.0	0	0	0	11	0	0	0	0	0	0
10-040-07-6	READING LAB SET IIC (LEVEL 3.5)	3.0	3	9.0	0	0	0	3	0	0	0	0	0	0
10-045-07-3	READING LAB SET IC (LEVEL 4.0)	3.0	2	6.0	2	0	0	0	0	0	0	0	0	0
10-045-07-4	READING LAB SET IIC (LEVEL 4.0)	3.0	20	60.0	20	0	0	0	0	0	0	0	0	0
10-045-07-5	READING LAB SET IIC (LEVEL 4.0)	3.0	3	9.0	3	0	0	0	0	0	0	0	0	0
10-045-07-7	READING LAB SET IIIA (LEVEL 4.0)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
10-050-07-3	READING LAB SET IC (LEVEL 4.5)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
10-050-07-4	READING LAB SET IIB (LEVEL 4.5)	3.0	7	21.0	7	0	0	0	0	0	0	0	0	0
10-050-07-5	READING LAB SET IIC (LEVEL 4.5)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
10-050-07-6	READING LAB SET IID (LEVEL 4.5)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
10-055-07-5	READING LAB SET IIC (LEVEL 5.0)	3.0	6	18.0	6	0	0	0	0	0	0	0	0	0
10-055-07-6	READING LAB SET IID (LEVEL 5.0)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
10-055-07-8	READING LAB SET IIIA (LEVEL 5.0)	3.0	9	27.0	2	0	0	6	1	0	0	0	0	0
10-060-07-4	READING LAB SET IIB (LEVEL 5.5)	3.0	31	93.0	31	0	0	0	0	0	0	0	0	0
10-060-07-8	READING LAB SET IIIA (LEVEL 6.0)	3.0	3	9.0	3	0	0	0	0	0	0	0	0	0
10-065-07-4	READING LAB SET IIB (LEVEL 6.0)	3.0	4	12.0	4	0	0	0	0	0	0	0	0	0
10-065-07-5	READING LAB SET IIC (LEVEL 6.0)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
10-065-07-6	READING LAB SET IID (LEVEL 6.0)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
10-070-01-0	VOCABULARY SET II (1-200)	4.0	90	360.0	2	85	0	0	3	0	0	0	0	0
10-075-07-5	READING LAB SET IIC (LEVEL 7.0)	3.0	3	9.0	2	1	0	0	0	0	0	0	0	0
10-075-07-8	READING LAB SET IIIA (LEVEL 7.0)	3.0	2	6.0	1	1	0	0	0	0	0	0	0	0
10-085-07-8	READING LAB SET IIIA (LEVEL 8.0)	3.0	3	9.0	3	0	0	0	0	0	0	0	0	0
10-090-01-0	VOCABULARY SET III (1-200)	4.0	7	28.0	0	6	1	0	0	0	0	0	0	0
10-095-07-8	READING LAB SET IIIA (LEVEL 9.0)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
10-105-07-8	READING LAB SET IIIA (LEVEL 10.0)	3.0	1	3.0	1	0	0	0	0	0	0	0	0	0
20-040-03-0	READING C 'FIGHT FOR INDEPENDENCE'	12.0	171	2052.0	0	0	43	0	21	107	0	0	0	0
20-050-03-0	READING C-1 'WESTWARD MOVEMENT'	12.0	171	2052.0	0	0	33	43	4	25	66	0	0	0
20-060-03-0	READING C-2 'THE WAR BETWEEN THE STATES'	12.0	58	696.0	0	1	14	33	1	5	4	0	0	0
20-070-03-0	RDNG C-3 'BUILDING THE TRANSCONTINENTAL'	12.0	21	252.0	0	0	3	14	0	3	1	0	0	0
20-080-03-0	READING C-4 'NORTH TO ALASKA'	12.0	4	48.0	0	0	0	2	0	0	2	0	0	0
20-090-03-0	READING C-5 'ALASKA GOLD'	12.0	2	24.0	0	1	0	1	0	0	0	0	0	0
25-015-04-0	100-1,101-1,102-1,103-1,104-1,105-1	20.0	82	1640.0	0	0	0	0	0	32	35	15	0	0
25-025-04-0	100-2,101-2,102-2,103-2,104-2,105-2	20.0	117	2340.0	0	0	0	0	0	1	38	43	18	[illegible]
25-030-03-0	PERCEPTION I,II,III,IV	8.0	121	968.0	0	0	0	0	1	1	6	[illegible]	[illegible]	[illegible]
25-035-04-0	100(30-39), 101(30-39), 102(30-39)	7.5	134	1005.0	0	0	0	0	10	1	12	16	25	[illegible]
25-045-04-0	100(40-49), 101(40-49), 102(40-49)	7.5	127	952.5	0	0	0	0	30	10	9	15	15	48
25-055-04-0	100(50-59), 101(50-59), 102(50-59)	7.5	114	855.0	0	0	0	0	41	30	10	10	14	9
25-065-04-0	100(60-69), 101(60-69), 102(60-69)	7.5	68	510.0	0	0	0	0	10	41	6	1	8	2
26-070-03-0	READING SKILLS 1 WORKBOOK ONE	15.0	9	135.0	0	0	0	0	0	0	0	1	0	8
26-080-03-0	PRO B READING 6, 9, AND 10 GRADES	16.0	21	336.0	0	0	1	1	0	5	4	1	0	9

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