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The Programed Approach to the Teaching of Remedial Grammar

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THE PROGRAMED APPROACH TO THE TEACHING OF REMEDIAL GRAMMAR

BY

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THE PROGRAMED APPROACH TO THE TEACHING

OF REMEDIAL GRAMMAR

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Arts, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

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CHAPTER I

INTRODUCTION

The primary purpose of this study was to assess the effectiveness of using a programed textbook and multiple tests in the teaching of remedial grammar at South Dakota State University. During the Fall Semester of 1965 and again during the Fall Semester of 1966, programing was used to help incoming freshmen deficient in English eliminate their major weaknesses in understanding grammar and in recognizing basic principles of usage and punctuation. In assessing the effectiveness of these presentations, the results of various testing instruments used in each presentation were studied. In addition, the study investigated the relationship between the scores on the American College Tests in English, mathematics, social science, and natural science, and scores earned in the remedial course, English 12. This comparison was extended to include the final grade in English 113 during the 1965 investigation and the ACT composite score during the 1966 investigation.

This investigation includes a review of programed instruction, its history and its psychological justification as well as reviews of the pertinent research on programed learning. In particular, the study reports previous available considerations of programed instruction for remedial English students.

HISTORY OF THE PROBLEM

South Dakota State University is a land grant institution operating under the Morrill Act of 1862 and subsequent supplementary federal legislation to promote research, teaching and extension. As such, its main purpose is to provide liberal and practical education primarily for the industrial and agricultural classes of South Dakota. Its admissions policy is formulated on the philosophy that education on the college level should be available to all citizens of the state who can benefit from it.

With the growth in population in South Dakota, as across the nation, and with the increased pressure for most young people to achieve a college diploma, enrollment at this university has grown steadily. From a fall enrollment of 3,139 in 1961, the figure has risen to 5,013 for the fall term of 1966. By virtue of numbers alone, this rise, although not totally unexpected, has brought about many problems for administrators and departments seeking to implement the university's admission policy.

One of the major problems brought about by the increased enrollment is the lack of classroom space, particularly in small classrooms. Building programs are, of course, in operation, but they have not been able to keep pace with the need for more instructional areas.

A second factor is that an increase in staff has not kept pace with the growth in student numbers. The English department exemplifies this fact. In 1961, 15 teachers, full or part-time, taught 923 freshmen students. Included in this 15 was one teacher engaged

full-time in working with remedial students. Another teacher worked part-time in this area. Together they handled 122 students not included in the 923. In 1966, 18 instructors, full or part-time, taught 1231 students enrolled in freshman English. In addition, 1 teaching assistant was in charge of 361 remedial English students not included in the above total.

A third problem is the serious deficiency in English skills exhibited by many enrollees who hope to earn degrees or who, no matter what their hopes, present themselves for admittance. Characteristic of such students are the conservative speech habits found in many rural South Dakota communities and the general failure to recognize the importance of a knowledge of the mechanics of English. One may also find a tendency to dismiss all knowledge or skill which does not seem immediately practical and an unwillingness to face deficiencies. Though the answer to the refusal to view deficiencies realistically lies in judicious counselling, one teacher cannot cope with this need in a single semester. Certainly, however, the teacher must keep these characteristics in mind no matter what method is used to help these enrollees overcome their deficiencies.

Because the administration of South Dakota State University supports the land grant philosophy of providing an opportunity for higher education to all who desire it and have the capability of achieving it, efforts have been and are being made to give the student a chance to overcome his weaknesses in English so that he may make use of the opportunity for a college education.

In the past, the English department has used the small section method of conventional classroom teaching to offer remedial instruction. Using this approach, one teacher could at most, work with one hundred to one hundred twenty-five students. With an average of twenty-four to twenty-five students in a section, ten small classrooms were needed for a week's instruction. The enrollment in remedial English in the Fall Semester of 1966 would have required twenty-eight to thirty-two small classrooms a week. The lack of this small-classroom space, however, and the small staff available to handle a remedial service have necessitated a search for efficient methods of presenting remedial English to large numbers of students in a section.

Throughout the nation, two popular approaches to the problem of handling large numbers of students with comparatively small staffs are televised instruction and instruction by programed textbook or programs developed for special machines. At South Dakota State University, the freshman English courses English 113 and English 123, as well as course offerings in mathematics and nursing, are now being handled through televised instruction. The nursing department is utilizing Audiographic and Didak teaching machines for programed instruction in operating room technique. Since 1965 the English department has been using programed textbooks to offer instruction in composition and grammar for remedial students.

In 1965, one hundred eighty-two students were enrolled in the remedial English course under the direction of one teaching assistant; in 1966 three hundred sixty-one students were enrolled in this course,

again under the direction of one teaching assistant. If the lecture-discussion approach had been used in 1966, fourteen to sixteen sections of remedial English would have been required and three to four full-time instructors. Thus, programing has saved both space and staff at South Dakota State University.

NEED FOR THE STUDY

The primary aim of the remedial English program at South Dakota State University, however, is to help students overcome their deficiencies in certain areas of English. Even though the program now in operation appears effective when judged by observation, there is a need to further investigate its effectiveness. For this reason, a study was begun during the Fall Semester of 1965 and continued through the Fall Semester of 1966 to prove the worth of the programed method in helping students to overcome their weaknesses in the area of English grammar and mechanics. This paper reports on the findings of this study.

DEFINITION OF TERMS

Several terms used in this study which may appear obscure or ambiguous are defined below.

Programed Instruction

Hereafter programed instruction denotes auto-instruction either by means of a workbook-type textbook or by means of a teaching machine.

Inherent in programing is the theory that instructional material should be arranged in an orderly progression of small steps each utilizing the question-answer format. The characteristics of the method include individualized pacing, the overt response of the student, and the immediate reinforcement of the correct response.

Programed Textbook

A programed textbook as hereafter referred to is a workbook based on the Socratic technique of teaching and learning. An orderly sequence of material is presented with the correct responses readily available so that the student can immediately check the correctness of his answers whether overt or covert.

The more popular arrangements of material in a programed textbook are horizontal, vertical, and branching or scrambled. The format of the horizontal textbook places the material either across both pages with one frame or unit of instruction on the left side and the succeeding frame on the right side or across all the right hand pages first and then all of the left. In both cases the answer to one frame appears next to the succeeding frame. In the branched or scrambled arrangement, the answer the student gives determines to which page he will turn for the next question or for a discussion of a problem. If his answer is correct, he continues with the program. If it is not, he is directed to more detailed questioning or to discussion of his incorrect response.

English 3200

English 3200 is a programed textbook written by Joseph C. Blumenthal and published in New York by Harcourt, Brace & World, Inc., 1962. The title designates the number of frames or items in the program, 3200. This text was used during the Fall Semesters of 1965 and 1966 in the remedial English classes.

Correlation Coefficient

The correlation coefficient, symbolized by r, is an expression of the relationship between one variable (possibly a test score) and another (possibly a grade in a course).[1] In this report the terminology used to designate such relationship is that of Garrett:

r from .00 to +.20 denotes indifferent or negligible relationship.

r from +.20 to +.40 denotes low correlation.

r from +.40 to +.70 denotes substantial or marked relationship.

r from +.70 to +1.00 denotes high or very high relationship.[2]

English 12

The course title English 12 will hereafter be used to designate the English remedial offering at South Dakota State University. It is

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[1]Herbert Arkin and Raymond R. Colton, Statistical Methods (New York: Barnes and Noble, Inc., 1963), p. 80.

[2]Henry E. Garrett, Statistics in Psychology and Education (New York: Longmans, Green, 1960), p. 176.

a two-hour course with two hours of credit not applicable toward a degree. In 1965 English 12 was taken concurrently with English 113. In 1966 it was a prerequisite for English 113 for all students referred to this course.

English 113

English 113 is the course title which will hereafter be used to designate the first semester English course to which approximately forty-five per cent of the freshmen are assigned. Emphasis in the course is placed on the development of reading skills and upon proficiency in writing. A minimal grade of 75 per cent on a test in grammar, punctuation, and usage is a requirement for passing English 113.

English 123

English 123 is the course designation for the sequel to English 113. Reading and expression of ideas, most often those stimulated by the literature read, are emphasized. Formal instruction in grammar, punctuation, and usage constitutes a greater portion of the content of English 113 than English 123, but the latter stresses mechanically correct written expression. Included in English 123 is a research paper to provide experience in this area of written expression.

INSTRUMENTS USED

Diagnostic Test

The diagnostic test used in this study was an author-constructed test consisting of sixty items covering grammar, usage, punctuation, and capitalization. It was administered in the Fall Semester of 1966-67 at the beginning of the term and again at the end to the students in English 12.

Achievement Test

The achievement test used in 1966-67 was a seventy-five item test covering grammar and punctuation. It was an adaptation of a one-hundred item achievement test, Form D, developed by Dr. James M. Harrison and previously administered at South Dakota State University. The items in the test had been validated by Dr. James Harrison in 1949 and reported in James M. Harrison, "Comparative Predictor Study: The English Placement Test, A.C.E., and S.C.A.T." (Brookings: Language Skills Research Laboratory, 1949, No. 4) (mimeographed). The twenty-five items removed from the test duplicated the knowledge tested elsewhere in the questions.

The shortened version was administered to the students in English 12 toward the end of the 1966-67 Fall Semester and also to three hundred sixty-five students in English 113. The complete test was administered at the beginning of the Fall Semester of 1965-66 and again at the end.

The American College Test

The American College Test, hereafter referred to as ACT, is an achievement test developed at the State University of Iowa and required of all students entering South Dakota's colleges and universities. The main function of the ACT program is to provide information concerning a student's potentials, both academic and non-academic, to the student himself and to the college he wishes to attend.

The program includes four achievement tests of educational ability and background, a set of self-reported high school grades, and a student profile study based on subtest scores and high school grades.

The four-part test battery is made up of an eighty-item, fifty minute English usage test covering punctuation, capitalization, usage, phraseology, organization, and style. The forty-item, fifty-minute mathematics examination measures the student's mathematic reasoning ability. The fifty-two-item, forty-minute social studies reading examination tests reading comprehension in the social studies and includes some items to measure study skills. The fifty-two-item, forty-minute natural sciences reading examination measures skills needed in the natural sciences.

The information related to high school grades is obtained from the student himself who reports his last grade in English, mathematics,

social studies, and natural science prior to his senior year. These are used as an indication of high school academic achievement.[1]

Grade Point Average

Grade point average, hereafter referred to as GPA, is used by the ACT program as one means of estimating the academic promise of freshmen matriculating into college. The average is obtained through multiple-regression equations using the four ACT subtest scores and the four high school grades. The predictions for incoming students at a particular college are based on equations developed from the grades of the preceding year's incoming freshmen. The ACT program assumes that the results from one year can be used to predict, with a degree of accuracy, what the students of the next year can be expected to accomplish.[2]

ORGANIZATION OF SUCCEEDING CHAPTERS

Chapter II, "Programed Learning," will consider the nature of instruction and learning by the programed method, its psychological basis, and the more apparent weaknesses of the method.

Chapter III, "Related Research," will present relevant research in programed instruction. A brief survey of general research in this

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[1]American College Testing Program: Technical Report (Iowa City: Research and Development Division of the American College Testing Program, 1965), pp. 1-3.

[2]American College Testing Program, p. 18.

field and a discussion on research studies in programed learning dealing specifically with English and remedial English instruction are included.

Chapter IV, "Two Studies of Programed Instruction in Remedial English at South Dakota State University," will report two trials with programed instruction for remedial students at South Dakota State University. These studies cover 163 of the students who took the remedial course, English 12, during the Fall Semester of 1965-66, and 333 students enrolled in English 12 during the Fall Semester of 1966-67.

Chapter V, "Summary and Conclusions," will present a brief resume of the findings from the studies, the conclusions drawn on the basis of the findings, and the recommendations for future programed English courses in remedial English at South Dakota State University and for future research in this field.

CHAPTER II

PROGRAMED LEARNING

Background

Programed instruction, as a controlled approach to teaching, has recently gained support from psychologists, teachers, leaders in industry, military personnel, and others working in the fields of educational psychology and education. This growing interest may be explained in several ways. First, psychologists, researchers, and educators have investigated programed learning and in many cases and for many purposes have found it satisfactory, at times, even excellent. Second, research studies tend to support the hypothesis that in many situations programed teaching is practical in terms of course content, administration, finances, time, and results. Third, it tends to free the teacher from presenting much of the knowledge that is basic and relatively stable, therefore allowing him to devote more time and energy to complex creative activities and to individual problems. Fourth, in some fields, such as industry or the military, it can reduce the number of teachers needed for basic instruction. This it can also do, although to a lesser degree, in secondary and higher education. This latter explanation is becoming more and more relevant as the numbers of those desiring advanced training or education increase at an alarming rate in comparison to the numbers of those

qualified to take charge of this education.[1] As Professor B. F. Skinner states in his article "Teaching Machines," "There are more people in the world than ever before, and a far greater part of them want an education. The demand cannot be met simply by building more schools and training more teachers. Education must become more efficient."[2]

In attempting to make education more efficient, we must consider, in addition to the numbers of people wishing to acquire knowledge or training, the growing volume of knowledge, both technical and otherwise, that must be mastered by students today. Many researchers and educators feel that programing the more stable aspects of this knowledge would permit greater concentration on, and teacher involvement in, the new and ever-changing areas.

Although the creation of a particular program is a complex and difficult task in terms of human energy, time, and ability, the method of instruction itself is not difficult to describe. Programed learning is a system of teaching or learning based on the asking and answering of questions. The basic unit of instruction is a program used in conjunction with a teaching machine or incorporated into a special workbook. At the beginning of the instruction, the questions

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[1]Philip Lambert, "The Teacher and the Machine," Journal of Educational Research, LV, No. 9 (June-July, 1962), Foreword.

[2]B. F. Skinner, "Teaching Machines," Science, CXXVIII, No. 3330 (October 24, 1958), p. 969.

are quite simple and the answers highly cued. As the student advances, the questions become more demanding, and the answers are made less obvious. However, the degree of advancement in difficulty from one question to the next is so small that the student should have little trouble making the transition with no other help than the material itself.

For each question asked, a response is required. Traditionally this is an overt response, either the selection of the right answer from several possibilities or the devising of an answer to be written in a space provided. The correct response is easily accessible so that the student may almost immediately check his answer.

These questions and the answering of them may be handled in several ways. One of the more frequently used today is the programed textbook in which the material is set up in a straight linear manner or in a scrambled or branching order. In the straight linear arrangement, one may find the answer to the previous question on the next page in the same relative position. The questions run horizontally across both the left and right hand pages from the beginning of the book to the end or across the right hand pages first and then across the left hand pages. Another popular arrangement of material in a programed textbook has a frame starting at the top of each page with its answer in the next frame position below it, next to the succeeding question. In the vertical arrangement of material, the student uses a slider to cover up the answer as he makes his response and then moves it down to check his response. Another arrangement of a program

knowledge. It is a duty of the teacher to arrange it. Also in the statement appears the idea that a reward is necessary in order that a student's potential be realized. Both of these ideas are basic to the programed method.

The tutorial method of education which forms the backbone of education in many English universities and some American colleges also marks a step in the historical development of programed learning. The basis for this system is the philosophy that instruction should be individualized. Thus, it is possible to control the mastery of particular knowledge before the student advances. This idea seems parallel to the principle in programed learning that the student should not advance until he has mastered a particular step.[1]

Through the years many psychologists and educators have made statements that seem to endorse the principles of programed learning. For example, in 1912 Edward L. Thorndike in his book Education made the following statement, which in the light of recent progress in auto-instructional learning seems to be a clear endorsement of the method:

> A human being should not be wasted in doing what forty sheets of paper or two phonograph records can do...If, by a miracle of mechanical ingenuity, a book could be so arranged that only to him who had done what was directed on page one would page two become visible, and so on, much that now requires personal instruction could be managed by

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[1]Phillip Cozzie, "Programed Instruction: Problems and Practices" (Unpublished Master's thesis, Department of Science Education, University of Utah, 1965), p. 5.

> print....The improvement of the powers of the teachers themselves to diagnose the condition of pupils and to guide their activities by personal means....Just because personal teaching is precious and can do what books and apparatus cannot, it should be saved for its peculiar work. The best teacher uses books and appliances as well as his own insight, sympathy and magnetism.[1]

However, in spite of these earlier ideas that seem to foreshadow programed teaching and learning, it remained for Professor Sidney L. Pressey of Ohio State University to design the first recognized teaching machine. His first one, exhibited in 1926, presented in a window a question of a selective answer type; the student pushed a key corresponding to the answer he desired; a new question turned up; and the answer, if correct, was counted. Used in this manner the machine tested more than it taught, but a later refinement of the machine required the correct answer to be presented before the machine would advance. Pressey insisted that the end result of utilizing such a program would be to free the teacher from clerical and routine matters so that more time would be devoted to "inspiration and thought stimulating activities."[2] However, the machine as well as the theory was largely ignored or discounted, possibly in fear that teachers would be replaced by these machines.

In 1954, B. F. Skinner and his associates revived interest in programing knowledge by presenting results of his studies with

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[1]Edward L. Thorndike, quoted in Fine, p. 37.

[2]S. L. Pressey, "A Simple Apparatus Which Gives Tests and Scores - and Teaches," School and Society, XXIII, (March 20, 1926), p. 376.

animals and birds.[1] Skinner advanced the concept that learning occurs most easily (a) when the material is broken up into small steps which are quite easily mastered by the subject and (b) when a type of reward is presented almost immediately for the right response. With Herbert S. Terrace of Harvard as the experimenter, Professor Skinner worked with and reported on the behavior of pigeons learning by the programed method. By breaking the complex problems to be taught into small steps, Terrace and Skinner were able to teach the birds to dance figure "8's", distinguish blue cards from white, play table tennis, distinguish subtle color discriminations, and perform other elaborate maneuvers. The conclusion drawn is that, "the way the pigeons were taught - in very small steps and with immediate rewards after each correct move - enabled them to learn while making few or no errors."[2] Subsequently Skinner and others have demonstrated many times that, although the mind of man is infinitely more complex than that of many animals, the ways in which men and animals learn are very similar. Thus, studies such as the above have application to the creation of learning theories and methods in the educational field.

Today educational, military, business, and industrial organizations have become actively concerned with the auto-instruction concept in learning. Many colleges and universities, as well as elementary

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[1]Irving Goldberg, "An Introduction to Programed Instruction," ed. Stuart Margulies and Lewis D. Eigen, Applied Programed Instruction (New York: John Wiley and Sons, Inc., 1962), p. 15.

[2]Fine, p. 47.

and high school systems, are engaged in developing programs in areas ranging from second grade spelling to advanced logic for use in their own systems and in others. Private organizations such as Bell Telephone, Teaching Machines, Inc., Doubleday and Company, and the Britannica Center For Studies in Learning and Motivation specialize in producing programs. The airforce, army and navy, as well as governmental departments have programs in the planning and experimental stages. Programed learning seems to have made an auspicious start in capturing a place for itself in the education field.

Psychological Basis for Programed Learning

The field of programed learning is predicated on several theories of learning psychology. The first of these is the theory that in order for learning to take place, the subject must be actively engaged in some manner in the learning process. It is felt that an active learning process in which the student must present some kind of response, either overt or covert, in order to progress will produce more motivation than a passive classroom or textbook situation. According to B. F. Skinner and his associates, the teacher must start the learning process "by doing something - anything - to evoke from the student some crude approximation of the desired terminal behavior."[1] For some, mental involvement is sufficient; for most, both physical

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[1]John F. Huntley, "Programmed Teaching Involves Patience and Love," The Journal on the Conference on College Composition and Communication, (December, 1962), p. 10.

and mental engagement is more effective. In programed learning, the student is usually instructed to present an overt response of some type before advancing in the course. The theory is that, by being physically and mentally involved in writing a response, to a great extent the student is forced or challenged to pay attention to the material being presented. He must attend to the question. Thus, either the idea that one must be actively engaged in the learning process if learning is to occur or that one must pay attention to the problem before learning will take place is made an integral part of the program.

Another theory utilized strongly in programed learning is the principle of reinforcement. This principle may be stated as follows: A subject, be he animal or human, learns most efficiently and performs best when he is reinforced or rewarded for correct behavior. This principle of reinforcement as applied to programed instruction has three facets. First, the confirmation of the right response is rewarding. Second, the "self-awareness of successfully responding is inherently rewarding," and third, the knowledge that one has the capacity to advance successfully is also rewarding.[1] One of the primary responsibilities of the programer is to arrange the material so that the right response is elicited. The effectiveness of the reinforcement of "right" has been demonstrated by Professor Thorndike

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[1]Donald Cook and Francis Mechnew, "Fundamentals of Programed Instruction," Applied Programmed Instruction, ed. Stuart Margulies and Lewis D. Eigen (New York: John Wiley and Sons, Inc. 1962), p. 4.

(1932). Using blindfolded people drawing lines, he demonstrated "that the consequences, or aftereffects, of an act are important determiners of the future course of that act." Almost any sort of information that leads the human learner to make what the experimenter or teacher defines as a correct response is a reinforcement.....[1] Therefore, although the reinforcement may be non-material, it is there and may operate quite strongly in those motivated to learn.

The time lapse between the giving of a response and the occurrence of reinforcement also plays a major role in the quality and quantity of learning that takes place. C. T. Perin (1943), F. A. Logan (1952), and J. P. Steward and R. J. Weldon (1953) all support experimentally the theory that delay of reinforcement affects both learning and performance.[2] And according to B. F. Skinner in his book Science and Human Behavior, "the consequences of behavior may 'feed back' into the organism. When they do, they may change the probability that the behavior which produced them will occur again."[3] This statement seems a clear endorsement of the idea that the right answer to a particular question should be supplied the subject as soon as possible so that the proper "feedback" may occur. In the almost immediate supplying

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[1]James Deese, The Psychology of Learning (New York: McGraw-Hill, 1958), p. 197.

[2]Deese, pp. 27-29.

[3]B. F. Skinner, Science and Human Behavior (New York: Macmillan, 1953), p. 59.

of the correct response, the programed method of instruction attempts to utilize this theory. In the usual lecture-discussion method of teaching and testing, the written responses of the individual student may not be checked and returned to him in less time than a day or a week or a month. It is not even unheard of that the student never again sees his work after handing it to the instructor. However, in programed learning the fact that the student is reinforced quite quickly, within a few seconds, when using either the programed textbook or the teaching machine, would suggest that learning should take place without too many errors being presented or reinforced.[1]

Repetition also plays an important part in programed instruction in that the same materials can be and are included in both the same and different forms as often as the programer desires or feels necessary. A glance at any programed textbook or program for a teaching machine will illustrate the frequency with which the principle of repetition is employed.

Another learning principle incorporated into programed learning is cueing. Key words or symbols and parallel grammatical structure in the unit of instruction and in the related questions offer obvious cues as to the right response. One of the more important characteristics of this approach to learning is that the correct response

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[1]Cook, in Margulies, p. 4.

should be the one elected all or most of the time. Cueing is one of the ways in which this end is attained, especially at the beginning of most courses or programs. In later areas, as the student becomes more knowledgeable and the material more complex, obvious cueing vanishes. However, because the student has had practice in handling cues, the chances are that he will have developed a high degree of motivation or "set" to learn and will be able to handle efficiently the ones that are present.[1, 2]

According to S. L. Pressey and other psychologists and educators, several other principles of learning also deserve mention. The principle of recency, for example, states that the last viewed item should be the one retained most easily. In programed instruction, the last response viewed is the correct one and, therefore, should be the one most easily retained.

The law of frequency which states that the more an item is viewed, the better it is remembered is also present in the programed method. Programs are so arranged that the right response is the one most usually given. One of the primary responsibilities of the programer is to arrange the material so that the right response occurs.[3]

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[1]Deese, Psychology of Learning, p. 93.

[2]Gabriel Della-Piana, "An Experimental Evaluation of Programmed Learning," Journal of Educational Research, LV, No. 10 (August, 1962), p. 493.

[3]Eric Bender, "The Other Kind of Teaching," Harper's Magazine, CCXXX, No. 1376 (January, 1965), p. 51.

The small steps make the right answer relatively obvious, and in some programs the student is held back until he gives it. Through repetition and review also, the same response on different questions is often called for.

Thorndike's law of effect is also in operation in the programed method in that receiving confirmation of a right response may be considered rewarding. Psychologists and educators who endorse the programed method of learning point out that, in the usual classroom question and answer session, only one student at a time can receive the recognized reward of the situation, the chance to give the right response to the class. The rest of the students who know the answer receive no recognition and, thus, no acceptable reward. In the programed situation, every student receives the reward of seeing his right answer supported in equal measure to the support given every other student's right answer, and, furthermore, he receives that support almost immediately, not a week or five weeks later on a test.

With less experimental support but with much observation of the learning scene, many educators and psychologists feel that the programed method should gain acceptance. Their reasons, in addition to the learning theories described above, are as follows. First of all, this method of presenting material offers a rather unique opportunity to individualize instruction. Many of the philosophies of education in the United States are predicated on the democratic intent to educate all who desire knowledge and, at the same time, to incorporate the idea of tutorial instruction into this education. Programed

learning seems to offer a way to provide individualized instruction in some areas for fast students, for slow students, and for those in the wide range of ability between fast and slow.

Second, the content of a program is selected usually by an expert or experts in the field and arranged in a predetermined sequence. The material and the steps in learning are then tried and tested before the program is released to the public. Because of this preparation, there is a better control over the material that is retained in a program. If during the trials given to one program many students miss a particular question, the program at this point is considered weak. The programer can in this manner identify problem areas and change the program to accomplish the end result - learning.[1] Because of the opportunities for testing and retesting, the material which finds its way into a finished program should be valuable material. The very form the method calls for forces the programer to be explicit. Purposes, intent, reasons for the inclusion of specific material must be clear.[2]

The programed method has also been found valuable where problems may occur. It seems to work quite well with adults who feel intimidated by other adults who threaten their self-esteem. Some

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[1]Dr. Robert M. Gagne in J. L. Hughes, Programed Learning: A Critical Evaluation (Chicago: Education Methods, Inc. 1963), . . 45.

[2]Deese, in Hughes, p. 130.

younger students also tend to reject the authority of a human teacher because defeat in the classroom has occurred too often for them or because past experience with adults has been upsetting. With those who have experienced much failure in the past, the programed method with its emphasis on right answers may help. The fear of failure may be lessened in that almost all programs are designed to elicit right responses.[1]

Generally it would seem that this method of presenting material offers a much more realistic view of the role of the learner as well as that of the teacher than other methods now in popular use. Now and in the past, we have made the amount of learning that takes place within a rigid framework of time the criterion for judging the individual student's abilities. We have equated knowledge or intelligence quite often with speed. Those who support the programed method point out that ideally the completion of a good program, without too much regard to the time factor, should give approximately the same competence to all who finish. In this case motivation and intelligence become the limiting factors to a student's accomplishments, not time.[2]

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[1]William J. Moore and Wendell D. Lineth, "Motivation in Automated Instruction," School Life, XL, No. 2 (November, 1963), p. 21.

[2]Philip Lambert, Donald M. Miller and David E. Wiley, "Experimental Folklore and Experimentation: The Study of Programmed Learning in the Wauwatosa Public Schools," Journal of Educational Research, LV, No. 9 (June-July, 1962), p. 490.

Weaknesses in the Programed Method

In spite of the many claims to excellence or competency made for the programed method as a means of transmitting knowledge, most authorities, teachers, and students agree that there are weaknesses and dangers inherent in this system of education just as there are in any educational system. For example, the very nature of the machine or textbook, which is the foundation of the system, is a weakness in that it is a mechanical means of imparting information. It cannot yet be by any stretch of the imagination as flexible as a good human teacher should be. Because machines and textbooks are things, they cannot initiate, transmit, or receive ideas in the same way a teacher can. They may mark as incorrect right ideas expressed in "wrong" words. They cannot spontaneously paraphrase or accept paraphrasing. Programs do not adjust to the individual student and may even give the impression of there being only one or two "right" answers to a particular question.[1, 2]

Another weakness in the programed method lies in the kind of knowledge that can be and most usually is programed. Objective knowledge - facts, details, rules - is most easily handled in this

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[1]Robert B. Nordberg in Joseph S. Roucek, Programmed Teaching: Symposium on Automation in Education (New York: Philosophical Library, 1965), p. 8.

[2]Marie C. Krumeich, An Historical Account of the Development of Programed Learning, (Unpublished Master's thesis, Department of Education, Danbury State College, 1965), p. 31.

system, and although claims are made and some programs are available that purport to say that creative thought can be encouraged through programing, objective knowledge makes up most of the programs of today. Therefore many programs foster rote learning which may or may not carry over into other areas of communication and knowledge.[1, 2]

In this system of presenting material, other weaknesses may develop if the programs are used to the exclusion of other methods. The first of these is the lack of motivation and the boredom which may set in on the part of the student. A basic attitude toward learning governs to a great extent the effectiveness of any method, but strong motivation is possibly more important to the programed method in that there may be little interaction with other people to counteract the mechanical nature of a program.[3] Constant page turning or button pressing and the basic format of question-answer used in programing can become wearisome when unrelieved by exchange of thoughts

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[1]Krumeich, p. 31.

[2]Daniel M. Smith, "New Instruction Media at Earlham College," a paper prepared for the Department of Audiovisual Instruction Convention, April 22, 1964, p. 4. (mimeographed).

[3]Moore, p. 22.

or ideas between people. For this reason studies report in some instances a lessening of interest in a program the longer and more exclusively a student works with it.[1, 2]

Another weakness centering around student reaction to programs is the adversion to the small step process of presenting information, a basic part of most programs, on the part of some students, usually bright ones. A student may lose interest if he is not challenged to "think" while working a program. Even more serious, he is occasionally stopped short if he comes to right conclusions without working through each step. In other words, in most programs "cognitive steps" are not provided for. Because the student is not reinforced for the more complex behavior, the chances of his later arriving at the same right conclusions are diminished. By programing below the student's ability, a programer may actually impede a student's progress or cause regression.[3]

However, probably the most serious objection to a wholehearted embracing of the concept of programing some areas of learning or all areas of learning is simply the fact that knowledge about this method is incomplete. Educational research has not as yet provided

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[1]Myles H. Goldberg, Robert I. Dawson, and Richard S. Barrett, "Comparison of Programmed and Conventional Instruction Methods," Journal of Applied Psychology, XL, No. 2 (April, 1964), p. 112.

[2]Jerry Reed and John L. Hayman, Jr., "An Experiment Involving Use of English 2600, an Automated Instruction Text," Journal of Education Research, LV, No. 9 (June-July, 1962), p. 478.

[3]Smith, p. 3.

enough information as to just how a student learns under this method or any method, why he learns, or where programing might be most appropriate. The possibilities for such answers are unlimited under the programed method which lends itself so readily to research. But if programed learning is to fulfill its seeming potential, these answers must be provided.

CHAPTER III

RESEARCH STUDIES IN PROGRAMED LEARNING

General Studies

There has been for some time a lag in the producing of empirical evidence to prove or disprove the worth of programed instruction as an educational method. Current interest in the method, however, has produced some informative studies.

For the most part, early studies have confined themselves to comparisons between live and automated teaching. Comparative studies of this nature are subject to so many variables such as teacher competence, student motivation, quality of the materials and means of evaluation that their results must be viewed with caution. However, these investigations are fairly consistent in concluding that live and programed teaching are equally effective. Most also state that the programed method produces considerable saving in instructional time.

For example, in an experimental study by John B. Hough, which compared teaching machine instruction with the conventional lecture-discussion method, both methods were reported as equally effective in terms of learning as measured by end-of-course tests. In reaching this conclusion, Hough used a control group receiving instruction by the lecture-discussion method and an experimental group using programed material. Forty-one junior and senior students from Temple

University enrolled in the course "The Contemporary Secondary School" made up the population for this study. The control group of twenty students received nine hours seven minutes of instruction during seven class meetings and could study lecture notes outside of class. The experimental group attended nine class sessions in which the students did all their studying.

The results of two quizzes and a post-test were used in reaching the conclusion that both methods were effective. The control group reported no studying of notes for the first quiz which was unannounced. On this test the experimental group using the programed approach did better than the control group. On the other tests, however, there was no significant difference in the levels of learning.

Hough reported a considerable savings of time with the experimental group. A total of nine hours sixty-three minutes of instructional time was spent by the control group including home study lecture notes. The experimental group spent only class time--five hours five minutes--on the material. This difference in time was four hours forty-three minutes in favor of programed instruction.[1]

Another study concerned with a comparison of live versus automated instruction was carried out by Lt. Colonel Norman H. Smith of the United States Air Force Academy at Colorado Springs, Colorado.

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[1]John B. Hough, "An Analysis of the Efficiency and Effectiveness of Selected Aspects of Machine Instruction," Journal of Educational Research, LV, No. 9 (June-July, 1962), pp. 467-76.

The subjects of this experiment were one hundred twenty-eight freshmen cadets taking a course in elementary statistics. The control group used the lecture-discussion method and a textbook. The eight instructors who taught the control groups were assigned at random for the first five meetings and then reassigned to other groups for the remainder of the course. The experimental group used a scrambled programed textbook adapted by the author from the textbook used with the control group. Both groups met five hours a week. The experimental group, however, received no formal instruction.

A final problem-solving test was administered to all groups at the end of the course. On the basis of these results, the author concluded that no superiority was shown by either method in producing learning. However, again it was found that the time required for learning was less under the programed method.[1]

As stated above, studies concerned with comparisons between live and automated or programed learning offer little more than the general conclusions that live teaching is no more or no less effective than programed instruction and that instructional time can be reduced through the presentation of material through the programed method.

Current research in programed learning seems to be more concerned with discovering the important characteristics of programed instruction and of the materials involved. At the present time,

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[1]Norman H. Smith, "The Teaching of Elementary Statistics by the Conventional Classroom Method Versus the Method of Programmed Instruction," Journal of Educational Research, LV, No. 9 (June-July, 1962), pp. 417-419.

these efforts seem to be of more value than comparative studies with live and automated instruction because the variables can be better controlled. The number of such studies is limited, but those available center around two problems. The first is the effectiveness of presenting programed material, with the different types of textbooks available and the different types of machines. The second area concerns variables inherent in the theories of programed learning itself. These include the ways of responding, the matter of pacing, and intelligence factors.

One study of the manner of presenting programed material was under the direction of Lewis D. Eigen. His study compared the learning which occurred as a result of using a vertical text, a horizontal text, and a teaching machine (see page 6 for a description of the vertical text and the horizontal text). He found that no statistically significant difference in learning resulted from use of the three methods.

In coming to this conclusion, Eigen divided seventy-eight eighth grade boys and girls into three groups, each studying the same material adapted from a modern mathematics textbook. One group used Rheem-Didak teaching machines, one a vertical text, and the other a horizontal text. Records were kept of student time spent on the material and student achievement on a post-test and a delayed post-test. The results indicate that no significant difference in

learning occurred which can be attributed to the format of the material or to the instruction although a savings in time did result from use of the textbook over the machine.

A study of a student reaction sheet administered toward the end of the course revealed that the fewest complaints were leveled against the vertical text. The most frequent charge against the horizontal text was that too much page turning was necessary in order to complete the course. The most frequent one against the machine was its mechanical malfunctions.[1]

A similar study was conducted by John Feldhusen using college students enrolled in a general psychology course. Two hundred seventy students were divided into nine groups. These groups were presented material on teaching machines and programed learning, areas relatively unfamiliar to the subjects according to a pretest.

The variations incorporated into the presentation of the material are as follows: Group One A used a standard linear program in a Min/Max machine manufactured by the Grolier Corporation or a teaching machine number 2002 manufactured by Foringer and Company. Group One B used a straight linear program in a manilla folder with an opening for exposure of a frame and another with a flap for the answer. The student wrote his answers on a separate paper and checked them by lifting the flap. Group Two was taught as a group

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[1]Lewis D. Eigen et al. "A Comparison of Three Methods of Presenting a Programed Instruction Sequence," Journal of Educational Research, LV, No. 9 (June, July, 1962), pp. 453-60.

rather than individually. The students in the group were pretested and post-tested and used the same material described above with the manilla folder. Group Three Y used the folder material but was given no opportunity to check answers. Group Three Z used the folder material with no answers provided but was allowed to check answers after the program was completed. Group Four used the same material but with the answers where blanks usually occur. Group Five was presented the same material but in a textbook format. The students were told merely to read at individual rates. Group Six D was treated exactly as Five, but the material was arranged in narrative form. Group Eight used the same material and procedures as Group Two but was paced as a group. Group Seven took a pre-test at the beginning of the class period each day and a post-test at the end of the period. Other instruction, not on programed learning, was offered during the period. Group Nine was taught using the same method and material as Group Two but was not given the pre-test.

The results of this study support the results of the one by Eigen. There were no sufficient differences in learning among the nine experimental groups using nine variations of programed material.[1]

Some studies analyzing the important characteristics of the programed method itself include the mode of answering the questions which make up the material. One of the basic tenets of the method is

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[1]John F. Feldhusen and Andrew Birt, "A Study of Nine Methods of Presentation of Programmed Learning Material," Journal of Educational Research, LV, No. 9 (June-July, 1962), pp. 461-466.

that the giving of answers should actively involve the student in the learning. Skinnerarian psychology states that the best learning results when this engagement is overt or physical. Some recent studies, however, present results which seem contradictory to this philosophy.

L. M. Stolurou and C. C. Walker reported on a "Comparison of Overt and Covert Response in Programed Learning." Twenty-three students in this study worked through a programed text, responding overtly (writing). Another group of twenty-three covered the same material, responding covertly ("thinking"). Three tests were given to measure learning - a pretest, a post-test and a delayed post-test. Time spent on the programs was also recorded.

The results of the study state that no reliable differences in learning or retention were found. However, the average time used to complete the program was significantly different. The covert response required less time than the overt response.[1] Phillip Cozzie, reporting in an unpublished Master's thesis on the problems and practices in programed instruction, supported this conclusion.[2] James Deese, Professor of Psychology at Johns Hopkins University, also suggested that overt responses may possibly be more important in long-term retention than in immediate recall.[3]

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[1]L. M. Stolurou and C. C. Walker, "A Comparison of Overt and Covert Response in Programed Learning," Journal of Educational Research, LV, No. 9 (June-July, 1962), pp. 421-29.

[2]Cozzie, p. 60.

[3]Deese, in Hughes, p. 193.

Another basic tenet of programed instruction is that the rate of progress should be determined by individual ability and motivation rather than by the conventional group pacing found in the lecture-discussion method. However, studies have appeared that seem to challenge the necessity for individual pacing. Feldhusen included in his study of nine variables, a comparison of students allowed to progress at their individual rates and those held to teacher-paced instruction.[1] He reported that group pacing did not seem to affect learning. David Sohn asserted that, while group pacing is satisfactory when keeping the class together is desirable, the individualized rate factor can be allowed to operate on assignments.[2]

Such studies and statements probe both the value of programed instruction in the transmission of knowledge and the value of independent variables inherent in the method. In both areas, there are many problems in producing sound research because of the difficulty of controlling the environments and the populations involved. However, programed learning seems to have a place in the educational system. Determining just how effective a role it can play and just how widely it can be utilized should be a prime responsibility of educational research.[3]

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[1]Feldhusen, p. 466.

[2]David Sohn, "P. I. - Out of the Clouds and Into the Classroom," Scholastic Teacher, LXXXIV, (March 13, 1964), p. 12T.

[3]Lawrence M. Stolurou, "Implications of Current Research and Future Trends," Journal of Educational Research, LV, No. 9 (June-July, 1962), p. 526.

> We who are responsible for the education of American youth must explore every possibility to improve the educational process to the end that a course of action is forthcoming which will lead to greatness for the American education system in the last half of this twentieth century. To do so is to survive. To do otherwise is to perish.[1]

Studies with Remedial English Students

One of the more ambitious studies of programed learning with remedial English students is reported by C. Dwight Dorough and Martin M. Shapiro in "Automated Instruction of Remedial English," Title VII, Project Number 551 of the National Defense Education Act of 1958. This study, which began in 1960, utilized an original program by the authors designed to correct deficiencies of English grammar. Five separate revisions of the program were made. In the Fall of 1960, the first draft was tried on twenty students, then revised and tried on twenty more. In the spring of 1961, ninety-nine students finished the program, which in the summer of 1961 was revised for 35 mm. filming. One hundred forty-four students took the course in the fall of 1961. In the spring of 1962, eighty-one students worked through the program using 35 mm. film strips and the DuKane Redi-Tutor. During this semester class themes, which were compared with themes written by a control group, were also written. One was written during the first meeting of the class.

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[1]Kenneth Anderson and Allen Edwards, "The Educational Process and Programed Instruction," Journal of Educational Research, LV, No. 10 (August, 1962), p. 542.

On the basis of this writing, the best writers were placed in a credit course. Later another theme was written, with illustrative themes reproduced by Thermofax and discussed. Two weeks before the end of the course, a final theme was written. These themes were evaluated by a panel of critics. In the summer twelve participated in the program, which had been revised and refilmed. These also wrote class themes as did the seventy-nine students who finished the course in the fall of 1962. The program was handled by the DuKane Redi-Tutor.

Students were placed in the remedial program on the basis of scores obtained on the College Entrance Examination Board's A - Z Test. In all sections both traditional and programed, remedial students who took part in this controlled study had equivalent scores. Class work was in grammar, and theme writing constituted homework. All classes covered the same material. At the end of the course, all students retook the entrance examination and/or an original test constructed by the authors. A review test was also given, but because the performance on this test correlated significantly ($r=0.9098$) with final test performance, inclusion was no longer deemed necessary.

Both methods, programed and traditional, yielded the same mean proficiency as determined by the scores on the final test. The final given during the Fall Semester of 1962 - 63 was a test constructed by the authors of the study. Students using the programed materials achieved a mean score of 133.676 with a variance of 344.741. The students taught by the lecture method had a mean score of 134.148 with a variance of 531.386 (See table 1).

TABLE 1

RESULTS OF FINAL TEST GIVEN IN FALL OF 1962 - 1963

	Number	Mean Score	Variance
Program	71	133.676	344.741
Lecture	149	134.148	531.386

The conclusion reached by the authors largely on the basis of the results of this final test is that the teaching method did not affect performance significantly but did affect the distribution of performance scores significantly. Also the programed method produced fewer drop-outs and absolute failures but more students percentage-wise who reached minimum standards. In addition, the financial cost per student was more efficient under the programed method because one professor or "master Teacher" serviced more students than is ordinarily possible under the lecture-discussion method.

In addition to the problem of the numbers of these students who must be handled, another problem at the University of Houston as elsewhere has been finding a way of interesting students in improvement while attacking their weaknesses. According to the authors, the attitude of these students toward English and toward their own deficiencies is, on the whole, indifferent. These students likewise have little understanding or sympathy with cultural values commonly

linked with higher education. According to Dorough, programed learning seems to offer a way of meeting and alleviating both the problem of numbers and the problem of motivation.

The main disadvantage of the program used in this study, according to Martin Shapiro, co-author of the study, was that the traditional grammar used has basic inconsistencies which cause confusion. For example, the names for parts of speech and parts of a sentence are difficult concepts to differentiate. But traditional grammar was used because it is perhaps the most acceptable basis for "subject matter experts" and "teachers."

One additional advantage of using the programed method according to Dorough was that in handling grammar by programing more time was available for experience in writing themes than was true for the traditional method. He concluded, therefore, that because of the financial advantage, the Hawthorne or novelty effect, the time advantage for the more able student, and the salvaging of more students for higher education, the programed method could be judged superior for the handling of remedial English.[1]

A study under the direction of Jerry Reed, a supervising teacher of English, and John Hayman, a research supervisor from Stanford University, attempted to measure the effectiveness of the textbook English 2600 by Joseph Blumenthal and of automated learning in

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[1]C. Dwight Dorough and Martin M. Shapiro, "Automated Instruction of Remedial English," Title VII, Project Number 551 of the National Defense Education Act of 1958, University of Houston, 1961?

general. The study, utilizing the facilities and personnel of the Denver Public School system, was centered around several questions. Two are: (1) Will English 2600 work with students of low academic achievement? and (2) Is the learning that results substantial?

The design of the experiment included approximately two hundred fifty students from five high schools in the Denver system. The program covered a three month period from October 31, 1960, to January 27, 1961. During this period the students were grouped in twenty classes. Ten of the classes followed the programed textbook; ten were teacher directed. Among the twenty, eight were considered classes of average ability, eight of low ability, and four of high ability. In placing students and in determining the effectiveness of the courses, two pretest and two post-tests were used. One was the language section of the California Battery (Form W was used as the pretest; Form Y, as the post-test). The other was one accompanying the textbook, English 2600.

According to the directors of the study, the experiment revealed that the students with high ability who used the programed text had a greater rate of learning gain than the groups taught by the lecture-discussion method. The low groups using the programed material did not do as well as those taught by the lecture-discussion method. There was no substantial difference in learning with the groups classified as average. However, for all groups, those who used the programed text and those who were teacher directed, learning as measured by the post-tests was substantial.

The conclusions advanced by the authors of the study are that the advantages of using programed material lie in the immediate reinforcement of right answers that the method provides, the meeting of individual needs that is accomplished by this method, and the progress at individual speeds which is possible. There is also a novelty value attached to this method, at least, during the beginning weeks of the course. In addition, the teacher is free in the programed learning situation to give individual help as needed. Some of the disadvantages reported by Reed and Hayman are that cheating is possible, boredom occasionally results especially among the accelerated groups, and motivation to make full use of the material available is often lacking.[1]

Those in charge of the study at Denver or working with it felt some of the results to be rather surprising. Ideally everyone working through a program will learn most of what it presents, but the statistics from this one experiment do not bear this idea out. On the California test the means, adjusted by covariance, for the three groups, accelerated, regular, and slow, were seventy-five, seventy, and sixty-four respectively. These figures indicate that equal competence with the subject matter was not achieved equally by all groups. The average progression rate for frames also differed. The accelerated groups

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[1]Jerry Reed and John L. Layman, Jr., "An Experiment Involving Use of English 2600, An Automated Instruction Text," Journal of Educational Research, LV No. 9 , (June-July, 1962), pp. 477-484.

averaged two hundred seventy-three frames per hour; the regular groups averaged two hundred thirty-three; and the slower groups averaged one hundred eighty-five frames. The error rate for the slower classes was six and one-half percent as compared to two percent for the accelerated students.

As a result of general teacher dissatisfaction for the above mentioned reasons and in recognition of the rather rapid changes that are taking place in the field of linguistics, the programed instruction in the area of English was abandoned by the Denver schools.[1]

A series of research studies under the direction of C. R. Carpenter and L. P. Greenhill at Pennsylvania State University purported "(1) to investigate the possibilities of programing entire courses in mathematics and English grammar, and (2) to compare different methods and media...for presenting programed learning materials."

In the English grammar section of the study, a course consisting of fourteen units was prepared. In addition, unit tests, mid-way tests and final tests were prepared and validated through actual trial with students at the university. Two studies were conducted in what the authors term "Experiment V." The first, which has most applicability to the teaching of English to remedial students involved a comparison between a self-pacing teaching machine presentation and an externally-paced closed-circuit television presentation. The second comparison

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[1]Wilbur Schramm, "Programed Instruction in Denver," Four Case Studies of Programed Instruction (New York: Fund for the Advancement of Education, 1964), p. 33-34.

was between programed instruction over a closed-circuit television and instruction by an "experienced" instructor using the lecture-discussion method.

The programed course which developed from this study was intended as a type of remedial program. Students scoring below forty-five on the English Placement Test at Pennsylvania State University were required to take a supplementary non-credit course in English grammar. This supplementary course met for two seventy-five minute classes a week. Under the programed method, the student was expected to complete a grammar unit and a unit test during one class period.

The objectives of the first major experiment utilizing the programed material presented by television, by teaching machines and by a teacher included an attempt to utilize the effectiveness of the presentation by measuring the amount of learning that resulted. This evaluation was based on end-of-course tests. An attempt was made also to assess student attitude toward the different methods.

One general conclusion reached through the study was that variations in pacing do not seem to affect achievement. This conclusion was supported by other research studies such as Hughes[1] and Feldhusen.[2] Another conclusion was that the method of presenting the material made little difference; the researchers felt that closed-circuit television with supplementary materials was effective in presenting programed materials. Because students seem to learn as well in large

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[1]Hughes, p. 171.

[2]Feldhusen, p. 466.

groups with programed methods that are group paced as they do in small groups or with individualized instruction, they feel that using programed materials with large numbers of students in externally paced situations is justified.[1]

Brigham Young University Laboratory School at Provo, Utah, has been experimenting with programed instruction at all levels, kindergarten through twelfth grade. In addition, some of the facilities and materials are being utilized by college students at Brigham Young University. The Laboratory School maintains a Continuous Progress Plan which stresses individual progress, self responsibility, and knowledge of basic study skills. Under this system, the student may progress at his own rate, completing areas of study or even courses as quickly or as slowly as he is motivated to do or capable of doing.

In 1964 twenty commercially prepared programs including the programed textbooks English 2600 and English 3200 by Joseph Blumenthal were in use as were an undetermined number of locally prepared units. Plans at that time were to increase by as many as possible the number of programs available to facilitate even further the individualization of instruction.

The class work is done in an "L" shaped room, the size of three classrooms, containing more than one hundred carrels for individual study. On the secondary level, classes meet for one hour during which

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[1]C. R. Carpenter and L. P. Greenhill, Comparative Research on Methods and Media for Presenting Programed Courses in Mathematics and English (University Park, Pennsylvania: Pennsylvania State University, 1963), pp. 57-63.

the student works in his individual carrel on the material which he rents and brings with him. Supplementing the programed material is small group discussion lead by an instructor on problem areas that are discovered by the student himself. A testing program which also points out problem areas is also maintained utilizing clerical help.

No problems had occurred prior to the time this report was written except a slight one in over-enthusiasm on the part of the students. Both the students and the teachers were enthusiastic over results with programed materials. The conclusion can be drawn from their reports of their experiences that programed learning is highly effective and satisfying for above average students and for below average students, and equally as effective as other methods with average students.

The results obtained in a remedial mathematics course which utilized the facilities at the laboratory school have also been encouraging. The students enrolled in the programed mathematics course, half of the total remedial mathematics enrollment, did much better on the final test given to all sections than the traditionally taught sections. In fact, of the three-fourths of the students who had finished the programed course at the time of this writing, none had failed the examination. The results were so encouraging that plans were made at that time to use programed materials exclusively the following year for remedial instruction in mathematics.

According to Dr. Read, the director of the Laboratory School, programed materials offer a way of taking the burden of supplying

information out of the hands of teachers and placing it more directly into the hands of the students. According to him, textbooks as they are ordinarily written are directed toward the teacher providing a source from which to obtain assignments. The programed textbook provides a method whereby the student can teach himself immediately and effectively if he so desires. For the purposes of the Continuous Progress Plan employed at this school, programed material is absolutely essential in providing a way of offering individual instruction.[1]

At Delta College, University Center, Michigan, a most successful attempt, as judged by the Coordinator of the Program, Dr. Carl H. Hendershot, has been underway since 1962 to provide an avenue for persons academically unprepared for college to work on their areas of weakness. A system of programed courses was at that time made available in various areas including English. Some of these courses, particularly English and mathematics, are required for those whose scores on entrance tests and whose academic background show deficiencies.

According to Dr. Hendershot, the programed method of attacking individual problems is most effective and efficient for several reasons. First, the programs enable the student to work exclusively on his individual weakness. He may at the same time progress as rapidly as he is motivated to do because of the individualized nature of the instruction. Second, the instructor is freed from group instruction and,

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[1]Jack V. Edling, "Programed Instruction in a 'Continuous Progress' School," in Four Case Studies of Programed Instruction, (New York: Fund for the Advancement of Education, 1964), pp. 66-94.

therefore, can give tutorial assistance more liberally. Third, because classes can be much larger, more students are enrolled and served than would be possible under the lecture-discussion method. According to Dr. Hendershot, master teachers have no more problems in handling these large classes partly because papers and tests are graded by student assistants.

The programed course in English grammar at Delta is combined with theme writing. Programs are also available in other areas such as vocabulary and spelling. This combination of approaches seems to be quite successful in preparing the students for mastering the material in the regular freshman English courses.

The table reproduced here points up the fact that, as Dr. Hendershot stresses, many of these so-called weak students can and do succeed later in college English. These figures become even more pointed if one keeps in mind that they represent achievements of students placed in a remedial course or remedial courses for proven academic inadequacies. Of the two hundred nine students who completed the program during the three semesters covered in Dr. Hendershot's report, nineteen received "B" in the freshman level English courses; one hundred five received "C"; and fifty-two received "D". Thirteen received "E" (compulsory withdrawal from college), and twenty voluntarily withdrew (see Table 2).[1]

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[1]Carl H. Hendershot, "PI Opens College Doors to Ineligibles," N.S.P.I. Journal, III No. 8 (October, 1964), pp. 10, 11.

TABLE 2

PERCENTAGE OF STUDENTS WHO HAVE COMPLETED IMPROVEMENT COURSES RECEIVING D-AND-ABOVE, AND C-AND-ABOVE GRADES IN FRESHMAN-LEVEL COURSES

Subject	Winter 1962		Fall 1962		Winter 1963		Fall 1964		Winter 1964	
	D-A	C-A	D-A	C-A	D-A	C-A	D-A	C-A	D-A	C-A
English 111, 121	88	56	80	55	89	59	76	62	92	83
Mathematics 119, 110 105	69	55	90	82	100	93	100	90	100	100
Chemistry	50	50	100	100	100	100	86	86	100	86
Physics III			83	67	100	100	100	50		

At the present time semi-programed textbooks are being used in the remedial course as well as overhead projection films and some television instruction to assist from seventy-eight to eighty per cent of those whose past achievements indicate serious deficiencies. According to Dr. Hendershot, the achievement figures for these students and others since the program was inaugurated in 1962 have not changed significantly even though the teaching personnel and the materials have changed over the years.[1]

[1]Letter from Dr. Carl H. Hendershot, Coordinator of Improvement, Delta College, University Center, Michigan, Nov. 17, 1966.

Dr. Hendershot concludes that providing programed material for those who wish to correct deficiencies performs an invaluable service in allowing people to help themselves whether they are in college or not. Through the facilities of the Division of Continuing Education at Delta College, a library of five hundred programs, both machine and textbook, is made available to the general public as well as to students. He reports that programs from the center in English, chemistry, foreign languages, electricity, mathematics, general science, and areas of vocation interest are widely used. Plans were at the time of this report to expand both this community service and the remedial programed service at Delta College in order that even more of those who wish to learn might have opportunities to do so no matter what their educational backgrounds might be.

In summing up the attitude toward programed instruction at Delta College, Dr. Hendershot stated that "For those who possess both the ability and the will to learn, well written programs offer a challenging opportunity for academic achievement."[1]

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[1]Hendershot, pp. 11.

CHAPTER IV

TWO STUDIES CONCERNING THE USE OF PROGRAMED INSTRUCTION WITH REMEDIAL STUDENTS

Description of 1965-1966 Study

During the Fall Semester of 1965, the English Department at South Dakota State University initiated the use of programed material and the programed method of instruction in the teaching of remedial English. One hundred eighty-two freshmen considered deficient in the fundamentals of English grammar were enrolled in the remedial course English 12. Student placement in this course was made on the basis of a ranking obtained from the predicted GPA of each incoming freshman, a prediction based on ACT scores and high school grades. Those who placed below the fifteenth percentile on the GPA ranking scale were placed in English 12.

Nineteen of the original one hundred eighty-two students enrolled in this course were not included in this study. Three of the nineteen were foreign students and, therefore, not typical; four were special students; and twelve withdrew from the course before the end of the semester. Thus, this investigation considered one hundred sixty-three students.

Directing the class activities and responsible for the keeping of records and correction of tests was one teaching assistant (the author of this study), who had the assistance of two other part-time employees. One was an adult with some high school teaching experience; the other was a junior English major enrolled as a full-time student in the University.

The instructional material utilized in the course originated in the programmed grammar textbook English 3200 by Joseph Blumenthal (Harcourt, Brace and World, 1962).

Originally instruction was to be information presented through a programmed textbook with the instructor available for assistance only during the class periods. After six class meetings this arrangement was modified to permit individual counselling and assistance on an appointment basis. The class periods, however, followed the plan of individual pacing and auto-instruction. Students worked independently in their textbooks or on tests; no forms of group instruction seemed inappropriate in that, with individual pacing, students worked on particular units or in particular areas at different times.

Tests were administered at the end of each unit of study. Accompanying the textbook were eleven unit tests, a midterm test, and a final test, making a total of thirteen testing devices. Also included was a set of alternate forms. Those students who did not achieve seventy percent correctness on the first form retook the test using the alternate form. This procedure of taking the alternate test set a clearly defined standard for the student to meet and encouraged maximum learning. Individual pacing permitted some to complete the course work before others. Those who did consistently acceptable work as measured by these tests did finish before the end of the semester.

In addition to the tests discussed above, an achievement test, Form "D" of Dr. Harrison's placement test, was given at the beginning

of the course and repeated at the end of the semester. The test-retest procedure was included to determine if learning had occurred.

The unit tests were administered twice a week in an auditorium designed to seat approximately two hundred twenty students. Those prepared to take a unit test reported to the section of the auditorium set aside for the taking of a particular test. For administration reasons, only one test was allowed in one class period. After finishing the test, the student remained in the section and resumed his textbook study.

It had been hoped that the tests could be corrected as soon as the students finished in order to provide quick reinforcement of right answers. However, lack of staff prevented such rapid correction. Approximately half of the students who took tests on a particular day were forced to wait until the posting of scores the next day to discover how well or how poorly they had done. This inability to process the papers more quickly weakened the plan of the course; the quick reinforcement of the programed method was not provided, and problem areas often went undiscovered.

Those not prepared to take a test worked in another part of the same building. There, they were expected to advance in the programed textbook. One of the three supervisors--the experienced adult--provided individual assistance if needed.

With the exception of four, students enrolled in English 12 were also enrolled in English 113, a three-credit freshman course. Of the four not enrolled in both, two were preparing to take the proficiency

test required by the University before graduation for all who receive "D" in either or both semesters of freshman English. The other two students were interested in self-improvement.

Of the one hundred sixty-three students who completed the semester, seventy-seven passed both English 12 and English 113. Forty-eight failed both. Thirty-three failed English 12 but passed English 113 in the Fall Semester of 1965 or in the Spring Semester of 1966. Five passed English 12 but failed English 113 (see Table 3).

TABLE 3

ACHIEVEMENT OF ENGLISH 12 STUDENTS IN ENGLISH 12 AND ENGLISH 113

Level of Achievement	Frequency
Passed both English 12 and English 113	77
Passed English 12 but failed English 113	5
Passed English 113 but failed English 12[a]	33[a]
Failed both English 12 and English 113	48

[a]Included in this number are those who took English 113 for the second time in the spring of 1966 and passed.

Of those passing English 113 as well as English 12, six received a grade of "B" in English 113; sixty-four received a "C"; and forty received "D" (see Table 4).

TABLE 4

PASSING GRADES RECEIVED BY REMEDIAL STUDENTS IN ENGLISH 113[a]

Grade	Frequency
A	0
B	6
C	64
D	40

[a]Included are students who passed English 113 in the Spring Semester

Of the 60 who had passed both English 12 and English 113 in the Fall Semester of 1965-66 and who registered in English 123, seven received a grade of "B"; thirty-three, "C"; sixteen, "D"; and four, "F". (see Table 5). Seventeen of the seventy-seven who were eligible for English 123 either withdrew from college or did not enroll in the course. However, sixty students of the one hundred sixty three who started English 12 completed the freshman English requirement in the normal time period of two semesters. Fifty others reenrolled in English 113 during the Spring Semester of 1966, making a total of one

hundred ten students still registered in the university during the spring semester. Sixty-five of the original one hundred sixty-three included in this study returned to the campus for the Fall Semester of 1966. This number represents approximately forty percent of the original group.

TABLE 5

GRADES RECEIVED BY REMEDIAL STUDENTS TAKING ENGLISH 123 DURING THE SPRING SEMESTER OF 1966
N = 60

Grade	Frequency
A	0
B	7
C	33
D	16
F	4

Because of the many uncontrolled or uncontrollable variables present in a study that involves learning and people rather than objects and materials, many of the results herein presented should be viewed with reservations. However, as far as possible, all facts and relevant conditions of the experiment are presented.

The first investigation analyzed the results of a test-retest to see if the English 12 enrollees did learn grammar presented through a programed text. A comparison of the scores obtained from the test-retest study of Form "D" of Dr. Harrison's grammar test yielded a twenty-nine point average gain on the one hundred fifty-two sets of tests included. One hundred seventeen of the students taking the test twice obtained a twenty point or more increase in their scores; thirty-two increased their scores by forty points or more. Only four of the comparisons yielded a negative result.

This apparent increase in the students' scores on a grammar test must be discounted to some extent for several reasons, all centering around environmental and emotional conditions in operation when the test was given at the beginning of the course. First of all, the room in which this test was administered was extremely warm that day. It was also rather crowded, and the seating was uncomfortable. In the auditorium used for testing, the seats, arranged in tiers, were relatively small, quite closely arranged, and fixed. Second, motivation for doing well on the test was lacking; no recognized reward was offered to the student for doing well. Third, feelings against taking English 12 and English 113 concurrently were strong.

Conditions under which the retaking of the test occurred were much more conducive to the students' doing well. The temperature in the room was more comfortable although the room itself was almost as crowded and the seats as uncomfortable as they had been for the first presentation of the test. More important, however, student attitude

toward the course and toward the testing in general seemed much improved. Many of the students had done quite well with the material; some even expressed the desire to "prove" by doing well on this test that they had mastered the material. The students had also been informed that the scores on this test would be used in determining "pass-fail" grades in the course. As a result of these factors as well as a probable actual increase in knowledge of English grammar, the scores obtained in the retake were consistently higher than on the original administration of the test.

In further investigation of the characteristics of the performance of the remedial students of the 1965-66 Fall Semester, a study of their ACT standard scores was undertaken. The means on the subtest are English, 13.965; mathematics, 17.122; social science, 14.604; and natural science, 17.820 (see Table 6).

It should be noted that although all of the mean scores are extremely low, the English subtest score is the lowest by over a full point from the next lowest in social science. It is over three points lower than the mathematics score. These differences may reflect a higher interest as well as higher achievement in science and a corresponding lower interest and lower achievement in the humanities. They may also reflect the lack of motivation toward reading and English often found in remedial students.

TABLE 6

A COMPARISON OF MEAN SCORES OF ENGLISH 12 AND ENGLISH 113 STUDENTS ON ACT SUBTESTS

	English	Mathematics	Social Science	Natural Science
English 12 1965 Mean	13.985	17.122	14.604	17.820
English 12 1966 Mean	16.294	19.450	17.750	19.909
English 113 1966 Mean	20.453	22.591	22.784	23.653
Difference between English 12 Mean of 1965 and English 12 Mean of 1966	2.309	2.328	3.146	2.089

In the 1966-67 study, the means found for the remedial students were as follows: English, 16.294; mathematics, 19.450; social science, 17.750; and natural science, 19.909. For comparison, they are included here as are the means earned by the English 113 students included in the study of 1966-1967. They are English, 20.453; mathematics, 22.591; social science, 22.784; and natural science, 23.653 (see Table 6). From these comparisons, it appears that the scores on ACT subtests reflect serious scholastic deficiencies for the students in English 12 in all areas studied and that the possibility of successful completion of the course is slight.

In the 1965-66 study, linear correlations were run to assess the relationship between subtest scores of the ACT and grades or scores earned in English 12 and in English 113.

In English 12 the scores obtained on the achievement test given at the end of the semester were used in place of the English 12 grade, because the final grade "pass" or "fail" was considered too vague to be of any real value in the study. The scores of one hundred thirty-nine students were used.

In the comparison of the English 12 final test score with the ACT subtests the correlation coefficients were English, .1991; mathematics, .2233; social science, .2425; natural science, .2051. Using the terminology of Garrett, presented earlier in this thesis, the relationship between the ACT subtests in English and the English 12 grade is negligible, that between English 12 grades and the other subtests is slight. Between the final grades in English 113 earned by the same students and the ACT subtests, the correlation coefficients were English, .000; mathematics, .1571; social science, .1806 and natural science, .3243. The relationship existing between the English 113 grades of the sample studied and the ACT subtests were also negligible except in the case of natural science in which a relationship was present but slight.(see Table 7).

TABLE 7

RELATIONSHIP BETWEEN ACT SCORES AND GRADES IN ENGLISH 12 AND ENGLISH 113
N = 139

	English	Mathematics	Social Science	Natural Science
English 12 final test score	.1991	.2233	.2425	.2081
English 113 final grade	.000	.1571	.1806	.3243

An evaluation of the almost complete lack of relationship that existed between the ACT subtest scores and the scores obtained by a limited sample of remedial students at the end of a remedial or of a freshman English course suggests two possible interpretations. The first is that for the limited population studied, the ACT subtest scores had little value in predicting achievement for students at the extreme lower level in scores or in ranking on the GPA scale, at least for the freshman year and especially in English. From the prediction for success of this limited group of the freshman population, one would expect limited achievement. However, on the basis of the negligible relationship shown by this study of a limited population, one might suggest that some of these students may be capable of satisfactory achievement despite past achievements or poor backgrounds in English.

The second possible interpretation of this lack of relationship implies a criticism of the instruments, the procedures, or the materials used in the study. The reliability of the tests, both local and commercial, the validity of using these tests either as placement devices or as a means of measuring student learning, the reliability of the data fed the computer, and the validity of the procedures are some factors affecting the results of this study. It is possible that the ACT subtests discriminate disproportionately against the poor student. It may be true that students who are verbally proficient do disproportionately better on these tests than equally intelligent, but non-verbal students. It lies beyond the scope of this paper to investigate the errors in make-up or prediction that may exist in the ACT program, but not beyond that scope to suggest that such error may exist. It also may be and probably is true that grades given in the freshman English courses are not always valid measures of real achievement. For example, the variables that may be present in one classroom under one teacher are almost too numerous to mention. The environmental conditions may be favorable or unfavorable; the teacher may be expert, adequate or inept; aims or motivations of individual students may affect the emotional climate of the whole group; the instructional materials will have strengths or weaknesses. It is possible that the presence of any or all of these conditions during this experiment might be enough to invalidate any or all conclusions.

In the opinion of the author, the conclusion that some of these students who were placed in English 12 were capable of benefiting from instruction under the programed method seems to be valid. Sixty percent of the students accepted by the university as conditional students in 1965 completed the freshman English program within two semesters. Forty percent of these students enrolled the following year in the same university. (In the 1964-65 freshman class as a whole -- the last year for which figures are available -- the attrition rate was 20.4; therefore, approximately eighty percent enrolled the next year.) Forty percent of the remedial students, some of whom by university standards could have been refused admission in the first place, felt themselves capable of continuing their college educations. It is too soon to know how many will receive their degrees. It may well be impossible to measure the benefits to the individual and society from this opportunity for higher education, but at least the students were given the opportunity to attend college and to remedy their deficiencies. Further investigations of the achievement of English 12 enrollees is suggested using a larger number of students for which similar data have been collected and using the same, as well as other, methods of evaluating the data.

Description of 1966-1967 Study

During the Fall Semester of 1966-67, remedial English was taught for the second time by the programed method. Setting the upper level of the predicted achievement ranking at the twenty-second percentile increased the number of students placed in English 12. Three hundred sixty-one students who had ranked on or below the twenty-second percentile on the predicted GPA scale furnished by the ACT program were assigned to the remedial course. Of this number, seventeen withdrew from the course; for this reason, they were not included in this investigation.

As in the 1965 study, the textbook used in presenting the instructional material in grammar was Joseph Blumenthal's English 3200. However, it was supplemented in 1966 by a programed textbook on composition, Marily Bender Ferster's Programmed College Composition (Appleton-Century-Crofts, 1965). The second text provided opportunity for experience in college composition which is emphasized in English 113 and English 123.

The procedure used in directing the course during the 1966-67 study follows.

The students were divided into four groups which ranged from seventy-nine to ninety-six students each. Each group met for two fifty-minute sessions each week in an auditorium designed to seat approximately two hundred students. During the first ten to fifteen

minutes of each class period, the students took a ten-item, multiple-choice quiz covering the material assigned in the textbook English 3200. The student spent the remainder of the period in individual study in the textbook Programmed College Composition.

The study of grammar in the textbook English 3200 was arranged into units of instruction corresponding to the class schedule. Each student received a list of the assignments at the beginning of the course and, for testing purposes, was expected to follow that list. Group pacing was implemented during this semester as being more practical and more efficient than individual pacing for the presentation of grammar in this course. The system of keeping records utilizing a computer, the larger number of students enrolled in the class, and the smaller staff (two part-time employees instead of the three available in 1965) necessitated this shift from individual pacing. The decision to use group pacing rather than individual pacing - recommended by Blumenthal and some authorities on programed learning - was justified partly through research by Feldhusen (page 37), Carpenter (page 48), and Hughes (page 37) which concluded that group pacing for administrative purposes did not significantly affect learning rate or quality. The individual pacing feature of programed instruction still figured in the time spent on assignments and, in the course English 12, on the work done on composition.

Tests used during the semester included a pre-test, twenty-six quizzes, a midterm test, a post-test, and an achievement test. The same test, a sixty-item instrument covering grammar, usage, and

punctuation was administered both as a pretest and as a post-test. All tests, with the exception of the achievement test, were adapted from tests designed to accompany English 3200 but in a format not suited to machine correction using Mark-Sense cards. The adaptation consisted of dividing the units of material to fit the class schedule and of reworking certain items to fit a multiple-response format. As mentioned earlier, specific assignments were made in the grammar portion of the study; therefore, the units set up by the author of the textbook had to be adjusted to make the amount of material covered reasonable for a specific assignment. The multiple-response format was essential for the marking of a choice on a Mark-Sense card.

The last instrument, the achievement test, was a seventy-five item adaptation of a test formerly used at South Dakota State University as a placement test (see page 9).

During the 1966-67 presentation of remedial English, an IBM 1620 computer was used for grading tests and computing averages. In taking a test, the student selected one of several answers and indicated his choice by marking it on a Mark-Sense card with an IBM pencil. He then returned the card to the teaching assistant for processing. The increase in the number of students with a decrease in staff necessitated this change from the hand-correcting and averaging done in 1965. Machine grading and averaging freed the teaching assistant to concentrate on problem areas in grammar and on composition and enabled her to return the results of the test more speedily than if hand scoring had been used.

The scores for each quiz were posted the day after the test was taken, along with a record of the questions most frequently missed. These questions were reviewed by the teaching assistant during the next class period immediately following the quiz. If a student wished to pursue these problem areas further or receive assistance in either grammar or composition, the teaching assistant and a student helper were present for consultation during the class period. Conferences outside the classroom were discouraged because of the number of students. However, make-up tests were given for excused absences.

Students worked on composition for approximately thirty minutes of class time and were encouraged to work outside of class also. Eleven themes were assigned; a minimum of seven were required. The number turned in by the students ranged from zero to fifteen. In assigning a grade for the work done in this area, the teaching assistant read an average of four themes from each student in addition to two test themes written without advance preparation during two class periods, one at the beginning of the course and the other near the end. A composition letter grade was given to each student based on the number of themes presented and the quality of the themes read.

The final grade in the course was determined from the theme grade, assigned a weight of one-third, and the grammar average, assigned a weight of two-thirds. The grammar average included the scores on the twenty-six daily quizzes, the midterm test score, which was weighted six times, and the final test score, also weighted six

times. The scores on the quizzes and the tests were expressed in percentages of right answers. Letter grades for the grammar were assigned as follows: 65 - 74, "D"; 76 - 84, "C"; 85 - 94, "B"; and 94 - 100, "A". The achievement test score was not included in the grammar average but was used rather as check on the final grade and as an instrument of comparison between this group and the control group of English 113 students.

Of the three hundred forty-four students who received final grades in English 12, two hundred eighty-five or eighty-three percent passed the course. Four students received a grade of "A", 34 received "B", one hundred fifty-three received "C", ninety-four received "D", and fifty-nine students received "F" (see Table 8).

TABLE 8

FINAL GRADES IN ENGLISH 12
No. 344

Grades	Frequency
A	4
B	34
C	153
D	94
F	59

The distribution of scores indicates that more students received relatively low grades than high ones; thirty-eight individuals attained more than a "C", one hundred fifty-three less than a "C". Because the students did have serious deficiencies in English as well as other areas and because grades were not determined according to a curve but on percentages of right answers, such relatively low grades were to be expected.

In further investigation of the characteristics of the performance of the remedial students of the 1966-67 Fall Semester, the ACT subtest scores were reviewed. The means obtained on the subtests were English, 16.294; mathematics, 19.450; social science, 17.750; natural science, 19.909. The composite mean was 18.450 (see Table 9). It should be noted that the mean scores were higher in mathematics and natural science and lower in social science and lowest of all in English. These differences may reflect a greater interest in science than in the humanities and a lesser motivation to do well in English, a subject not considered practical by many students; poor backgrounds and inefficient reading habits may compound the problem. It should be noted that these means are higher than those of the 1965-66 group.

For use in comparison, the scores of English 113 students were also investigated. In English, their mean score was 20.452; in mathematics, 22.591; in social science, 22.784; in natural science,

TABLE 9

MEANS OF ACT SCORES - ENGLISH 12 AND ENGLISH 113

	English	Mathematics	Social Science	Natural Science	Composite
English 12	16.294	19.450	17.750	19.909	18.450
English 113	20.452	22.591	22.784	23.653	22.520
Difference	4.158	3.141	5.034	3.744	4.070

23.653. Their composite mean was 22.520. (Table 9). A comparison of each mean score of this group with the mean scores of the remedial group reveals a point difference of three to five in each area. The largest difference occurred between the social science scores of each group; the smallest difference occurred between the mathematics scores. Considering that the English 113 group represents the "average" college freshman, one could conclude that the three to five point advantage that they achieved represents a real difference in ability or achievement from the remedial students' scores. These differences also suggest that the English 12 enrollees have serious academic inadequacies which may preclude successful academic achievement.

With the English 113 group, the mean English score was the lowest of the means and the means and the natural science the highest. Thus, the "average" students could also be characterized as having higher interests in science than in the humanities and a lesser

motivation to do well in English. However, the social science score was higher than the mathematics mean, possibly indicating that the reading habits of the English 113 group were more effective than those of the remedial group. In addition, their deficiencies as indicated by their higher ACT means seem not as serious as those of the remedial students and, therefore, may not hamper them as much in pursuing a college career.

A study of the scores on a test given at the beginning of the Fall Semester of 1966-67 to the English 12 students and again at the end of the semester, suggests that the students did improve in their ability to handle test problems in English grammar. The instrument used was a sixty item objective text on grammar and punctuation (see page 9). The test-retest comparison showed an average gain of thirteen percentage points on the 320 sets of tests included. On the pretest, the mean was 51.420; on the retest, the mean was 63.996. In so far as conditions for testing seemed to be satisfactory for the test and the retest, these scores seemed to be valid reflections of student achievement.

First, physical conditions under which both tests were given seemed to be acceptable. The room used during this semester was more than adequate in size. At no time were more than ninety-six students seated in a classroom designed to hold two hundred. In addition, the seats were well-spaced and moveable, the room well-lighted and airy. There was ample space for those in charge to move freely among the students as they worked.

In addition to the physical conditions, external motivation for doing well on both tests seemingly was present. The students were aware that high scores on the pretest would lead to a reconsideration of their placement in the course. On the basis of a seventy per cent or higher score on the test and a twenty-second percentile ranking on the predicted GPA, twenty-six students were excused from English 12. (These twenty-six individuals are not included in this report.) On the retest, the students knew that their scores would be used in determining final grades for the course. Therefore, there appeared to be sufficient external motivation for high scores in both testing situations, and the assumption that some learning did take place is probably valid. However, that this learning was incomplete is also a fact that must be considered.

For the purposes of comparison this same test was administered for the same group of English 113 students mentioned above. These students scored a mean of 78.900.

The test for the English 113 group was administered in two sections of television instruction during the last meeting before Thanksgiving vacation. As no tape was scheduled for showing and because the students had completed their work in grammar, this class period seemed an appropriate time for the testing. However, the students were aware that not all sections of English 113 would take the test and also that the scores would not be used in determining grades. Therefore, although many did do well on the test--twenty-

eight missed five or fewer items, one hundred eleven missed ten or fewer items--the class as a whole did not achieve as expected, possibly because of the absence of external motivation.

The fact remains, however, that the English 113 students did do measureably better on the achievement test than did the English 12 students as evidenced by the mean of the English 113 students, 78.900, as compared to the mean of the English 12 students, 63.966, a difference of fifteen points. This disparity highlights the fact that at the end of the remedial course the students who began with serious deficiencies in English mechanics still had problems. Only further research can determine whether these problems will prevent these students from performing satisfactorily in freshman English courses or in other areas. (See pages 57-58 for a discussion of the achievements of the 1965-66 remedial group in the English 113 and English 123 courses.)

On the other hand, the students in remedial English did seem to achieve a limited success in the English 12 course work. The standard for passing the grammar material was a sixty-five percent average of the scores from the testing instruments (the twenty-six quizzes, the midterm test and the final test) plus nine acceptable themes. Of the three hundred forty-four individuals who were still enrolled at the end of the Fall Semester, two hundred eighty-five or eighty-three percent passed the course. Fifty-six percent or one hundred ninety-one students received a grade of "C" or better, demonstrating a seventy-five percent achievement or better. These results seem most encouraging in view of the fact that these figures represent the

achievements of students placed in a remedial course for obvious academic weakness. Again, however, whether these students can achieve success in a freshman English course or in any other college course is a matter for future study.

During the 1966-67 study in a further attempt to investigate all available information that might lead to a better understanding of the remedial student and the achievement one might expect from him, the relationship or lack of relationship between certain sub-scores of the ACT program and grades or scores earned in English 12 was examined. It was theorized that if the student achieved in the course with any degree of success, correlation would be low because the students under study placed at the bottom of the scale in the GPA rankings with subscores on the ACT below average. The resulting correlations were so low in most instances that little significance can be attached to them, but for the purpose of reporting the results of the effort, they are included in this paper.

The first study compared ACT subtest scores in English, mathematics, social science, and natural science as well as the ACT composite score with grades earned in English 12 by 333 students. The correlation coefficient between the English 12 final grade and ACT English score was .1257; ACT mathematics, .0544; ACT social science, -.1104; ACT natural science, -.0768; ACT composite score, -.0197 (see Table 10).

TABLE 10

RELATIONSHIPS BETWEEN ACT SCORES AND SCORES IN ENGLISH 12 AND ENGLISH 113

	English	Mathematics	Social Science	Natural Science	Composite
English 12 final grade	.1297	.0544	-.1104	-.0768	-.0197
English 12 grammar average	.2484	.2115	-.0304	-.0112	.4309
English 12 achievement test	.4614	.1104	.0846	.1131	.2510
English 113 achievement score	.4172	.1628	.1962	.1917	.3249

The resulting correlation coefficients in a study of the relationship between the English 12 grammar average (average of 26 quizzes, midterm and final scores) and ACT subtest scores are as follows: English, .2428; mathematics, .2115; social science, -.0304; natural science, -.0112; composite .4309. Slight correlation is present between the ACT English score and the English 12 grammar average and between the ACT mathematics score and the English 12 average. A correlation of .4309 existed between the grammar average and the composite score. In the terminology of Garrett, this figure, although

at the lower end of the designation, would denote substantial or marked relationship and might suggest the advisability of further investigation of the composite score as a predictor of achievement for remedial students.

The correlation coefficients indicating the relationships between the English 12 achievement test and the ACT subscores are as follows: English, .4614; mathematics, .1104; social science, .0846; natural science, .1131; composite, .2510. It might be well to note that the correlation coefficient expressing the relationship between the achievement test and the English subscore .4614 would denote substantial or marked relationship although again at the lower end of the designation, that between the achievement test and the ACT composite slight, and all others negligible.

For comparison purposes, correlation studies were also run for the English 113 group used in the 1966-67 study. Studies were undertaken comparing their ACT subtest scores to their scores on the achievement test. It was felt that these correlations might be higher as these students represent the more "average" group of college freshman; however, the results did not support this belief: English .4172, mathematics .1628, social science .1962, natural science .1970 and the composite .3249 (see Table 10). As with the English 12 group, the relationship with the achievement test was negligible for mathematics, social science, and natural science subtest; slight for the composite,

substantial with the English subscore. The results suggest that the achievement test and the ACT battery evaluate different aspects of student accomplishment.

CHAPTER V

GENERAL SUMMARY

The purpose of this study was primarily to investigate the effectiveness of the remedial course English 12 which utilized the programed method of instruction during the Fall Semester of 1965 and 1966. During the first presentation, one hundred sixty-three students used the programed textbook English 3200 by Joseph Blumenthal (Harcourt, Brace and World, Inc., 1962). The individual pacing principle of the programed method was followed; the students worked at their own rates, taking unit tests when they felt prepared to do so. In 1966, the textbook English 3200 was supplemented by the textbook Programmed College Composition by Marilyn Bender Forster (Appleton-Century-Crofts, 1965). The individual pacing principle was followed with the work in composition, but the grammar material was group paced. The change in procedure with the grammar was necessitated by the larger number of students in the course, three hundred sixty-one; the smaller staff, two part-time employees instead of the three available in 1965; and the use of an IBM 1620 computer for grading tests and keeping records.

Included in this report is a discussion of programed instruction, its history and its psychological justification. According to the majority of authors included in the discussion on programed learning, the programed method of transmitting knowledge is psychologically and educationally sound. In supporting this method, the authorities reviewed stressed the individualized nature of student

participation. The student can progress at his own rate, learning as quickly or as slowly as his ability and motivation impel him. Because of this emphasis on positive individual growth rather than the often negative relative growth, the method can take away much of the fear of failure that affects the performance of certain students particularly those often found in remedial groups who have so often experienced the negative effects of academic weakness.

Proponents of the method also point out that programs are usually tested and retested experimentally to find approaches that work. Hence, this experimental process, more easily and accurately carried out with programed texts than with more traditional textbooks, provides a reliable finished product -- a "teacher" who does a good job of teaching, anywhere, anytime, in almost any situation.

Proponents suggest another benefit of utilizing the programed method as an aid to learning - the freedom afforded to the teacher to work in more thought-provoking and stimulating areas. A major criticism of education in general has been that teachers must spend too much time on rote learning and routine matters. If a relatively stable body of essential facts can be taught as effectively by using a "workbook", the teacher can then focus attention on the more creative areas of knowledge and on even more individualized attention to problems.

Weaknesses are, of course, inherent in this method of education as in all educational methods. Programed learning implies solitary learning. There is little opportunity for interplay between

personalities or practice in oral communication. Therefore, the method and the materials may become boring especially for the young or immature. In addition the programs, themselves, may be weak. They may be and often are prepared as commercial enterprises rather than educational ones. Therefore, care must be practiced in selecting them -- as much care as should be exercised in adopting textbooks.

The main danger in programed instruction, however, lies not in the material nor the method but in their acceptance as a substitute for all other methods. Programed learning materials should be, in most instances, aids to instruction, not substitutes for it. A good teacher and a variety of approaches still work best in education.

Research studies in the area of programed learning have not been produced in the numbers necessary for educators to judge positively the merits and weaknesses of the method. However, the ones that compare the lecture-discussion method to the programed method seem to agree that both produce learning; statistically neither seems to outrank the other in effectiveness. The programed method, however, does produce a considerable savings in learning time.

In studies concerning the characteristics of programed instruction, several results seem to be quite consistent. First, no statistically significant differences in learning results from the different variations used in presenting materials. All produce learning. Second, no statistically significant differences in learning result from variations in the manner of responding to questions. Neither overt nor covert response is more effective. However,

there is a saving in time utilizing covert means of answering questions. Third, no loss of effectiveness seems to result when classes are group-paced rather than student-paced. The individual rate factor still operates on assignments.

Studies concerning the use of programed instruction with remedial English students produced several conclusions. First remedial students seem to learn as well or better under this approach. Second, motivation seems to be as high if not higher with students using programed material possibly because of the emphasis on "right" answers, the quick reinforcement of "right" answers, the "Hawthorne" or novelty effect of a new approach, and the emphasis placed on the individual rather than the group. Third, the teacher, freed from rote learning situations, is able to give more attention to individual problems and to other areas of study. Fourth, the savings in time that usually results in using programed instruction can be utilized in other areas, particularly composition. Fifth, much of the responsibility for learning shifts from the teacher to the student.

Some of the weaknesses brought out in the studies concerning remedial students are that "cheating" is possible in this method, boredom sometimes results, and motivation among poor students is often lacking. One study reported that, for the reasons named, remedial students did not do as well as accelerated students. Other investigators concluded that the strengths of the method outweighed the weaknesses.

SUMMARY OF STUDIES AT SOUTH DAKOTA STATE UNIVERSITY

The two studies conducted at South Dakota State University concluded that remedial students did learn under the programed method. In 1965-66 an average gain of twenty-nine points was achieved in a test-retest program. Sixty of the one hundred sixty-three remedial students completed the freshman English requirement in the normal time of two semesters. One hundred ten completed one year of college, some retaking English 113 during the spring semester. Sixty-five or approximately forty percent re-enrolled for the Fall Semester of 1966.

In 1966-67, the remedial group averaged a thirteen point gain in a test-retest program. Of the three hundred sixty-one students who enrolled in the fall, three hundred forty-four finished the course. Eighty-three percent passed at the "D" level or above; fifty-six percent passed at the "C" level or above.

The studies investigating the relationship between the American College Test in English, mathematics, social science, and natural science and grades or scores earned in the remedial course and in English 113 produced no reliable evidence on which assertions could be made. The only tentative conclusion that may be offered is that these remedial students did achieve in seeming contradiction to their poor performances on the ACT subtests.

RECOMMENDATIONS FOR FUTURE PRESENTATION OF REMEDIAL ENGLISH BY THE PROGRAMED METHOD

1. If required, English 12 or remedial English should be a prerequisite for freshman English, it should not be taken concurrently with any other English course. In 1965, remedial students were required to take English 12 and English 113 at the same time. Many of the problems which developed during the semester could be traced to this requirement which placed an almost overwhelming amount of work in English on students who had many problems to contend with not only in English but in other areas as well.

2. Much effort should be directed toward motivating the student to do well in English. Motivation is probably the most difficult area to work in, but with remedial students, many of whom have no clear-cut goals or real desire for education, it is most important.

3. Physical accomodations should be as conducive to studying and learning as possible. Intense concentration for a period of time is necessary for learning to take place. This concentration is almost impossible if the room is too crowded, too noisy, too warm, or the seats uncomfortable. Having it possible for the instructor to move freely between the seats is also important if individual help is to be given.

4. An adequate staff is also essential for a workable and effective program. No less than three competent persons should be available to give assistance to a group of fifty to one hundred students. Even more

are necessary if composition is stressed. As mentioned in the report, the program method is an aid to learning and instruction; it should seldom be a replacement for other methods or for competent instructors.

5. If at all possible, all instruction should be individual paced, not group paced. Concentration should be placed on each student's particular problems; the individualized nature of the course is one of its strongest psychological supports. In 1966 group pacing was used, but much of the challenge to learn well and quickly was lost. As mentioned above, motivating remedial students is often difficult. One approach that seemed to appeal to the student in the 1965 study was that the course was designed to help him as an individual. If he could master the material and seemingly overcome his weaknesses, he would be finished with the remedial work and free to concentrate on other problems. Many accepted the challenge. In 1966 the group approach was used for administrative reasons and seemingly worked also in terms of learning, but much of the excitement was gone.

6. In the remedial course, provisions should be made for work on composition. In 1966 this was done with some improvement in student writing. The choice of textbook, however, was unfortunate in that it was too advanced for the group. The terminology was often unfamiliar to the students and the approach to writing, although sound, was rather complicated. A textbook concentrating on the steps necessary in

preparing material for a composition might be more appropriate for a remedial course. For example, there are programed composition textbooks that attempt to teach the organization of an effective theme.

RECOMMENDATIONS FOR FURTHER STUDY

1. Further investigation of the presentation of remedial English instruction on the college level by the programed method is extremely important if its use is continued. The studies herein presented were limited in numbers and scope and offer only a small start in what should be a thorough study of what this method can and cannot do for remedial English instruction and remedial students.

2. Follow-ups on students who have taken remedial English would be valuable to those attempting to evaluate the worth of programed English on the college level. In particular, it would be of value to know how many of these students receive degrees.

3. Studies of remedial English utilizing control groups taught by the lecture-discussion method and experimental groups taught by programed instruction might be valuable in assessing the comparative worth of each method.

4. A more thorough study of the validity of predicting the performance of stratified sections of college populations from ACT material would aid in counselling these students and in making decisions involving course offerings.

5. Experiments utilizing programed instruction in spelling, grammar, usage, and punctuation in connection with English 113 might be valuable for those attempting to present the mechanics of English efficiently and effectively.

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