THE DEVELOPMENT AND EVALUATION OF PROGRAMED INSTRUCTIONAL COMPONENTS FOR SELECTED CONCEPTS IN A COLLEGE TEXTILES COURSE

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CHAPTER I

INTRODUCTION AND SIGNIFICANCE

A new movement in education which might be termed instructional technology has come to the fore during the past fifteen years. B. F. Skinner (1953) advanced the theory of operant conditioning in human learning. This theory, which grew out of Skinner's research in the animal laboratory, became the basis for the early research on learning via teaching machines or programed learning. With this start other psychologists developed their own theories, and a variety of programing techniques are now used to accomplish different kinds of learning tasks.

Faced with a society that is demanding increased quantity and quality in educational services, today's educators must seek new and more efficient methods of dealing with old problems. The demand for unprecedented many-sided solutions comes with the expansion of population, the burst of technology, the discovery of new forms of energy, the extension of knowledge, the rise of new nations, and the world-wide rivalry of ideologies.

Changes are especially urgent because schools must provide education for vastly increased numbers of persons for longer spans of productive life, at far higher levels of understanding, competence, and skill and always with the goal of strengthening our democratic way of life. This task calls for a realignment of educational priorities and re-examination of school functions and needs.

Improvements in American education have evolved from what society deemed best at a given moment. Each improvement has had its effect but all have been limited by the existing framework of the schools. Students need opportunities to develop individual responsibility and the skills of independent study. These two closely related qualities constitute reference points of quality education in individuals Trump (1963).

In addition to social and economic pressures encouraging students to seek a higher education, there are increased student loans, more scholarship assistance, and higher family incomes Parker (1966). The federal government has committed the United States to the concept of democratic educational opportunity. Higher education is becoming more available as institutions are moving to the students' locale in the form of extension centers, new community colleges, and new junior colleges. Colleges and universities are exploring ways of improving their instruction due to increasing enrollments, faculty shortages, expanding subject matter, and limited financial support.

Meeting the challenge of educating larger numbers of students with a limited faculty has encouraged the use of methods that depart

from the traditional face-to-face classroom method. According to Mayhew (1966) supplying enough qualified teachers may be the most important problem area created by large enrollments. This study deals with an instructional method which might permit the teacher to teach more students and might also give the teacher released time from the classroom for advising, counseling, individual instruction, keeping up with new developments in the teaching area, and in meeting other demands created by increased enrollment.

Research reports are indicative of the potential of programed instruction as an effective method of teaching that will be used more frequently in classrooms in the future. According to Gould (1968) an awareness of the philosophy underlying programed instruction and a recognition of the major types of programs should assist the home economics teacher in making effective use of programed instruction.

The writer's interest in developing a self-instruction program in textiles to replace the traditional lecture was motivated by the desire to make the textiles course more exciting, more relevant, and to realistically adapt the course to the individual needs of the student. A large number of students and some faculty members have considered textiles to be one of the least interesting areas in the home economics curriculum. The writer's experience and responsibility for teaching a course in textiles for three years prior to this study contributed infinitely to the underlying motives for the study. The technological revolution taking place in education was a persuasive element that

gave impetus to this study and further substantiated the notion that the need for an individualized self-paced program in the textiles area deserved priority.

Statement of the Problem

The problem in this study was to develop and to evaluate programed instructional components of selected concepts in textiles for use with undergraduate students in the first course in college textiles, with implications for more effective ways of teaching. The objectives of the study were:

1. To examine the literature, to review information gained from the writers' experience in teaching textile courses, and to identify some of the problem areas in textiles.

2. To study and become knowledgeable about theories behind programed instruction.

3. To develop skills and techniques required for effective programing, editing, testing and analysis.

4. To develop selected programed instructional components for use in the beginning college level textiles course.

5. To evaluate by pre test and post test, the effectiveness of the programed instructional materials.

6. To develop and administer a pre test and a post test for the programed instructional components.

7. To compare the students' test scores resulting from the traditional lecture method of teaching textiles with the students' test scores resulting from use of the developed programed instructional components.

8. To evaluate the students' opinion toward programed instruction.

Assumptions

The following assumptions were basic to the study:

1. Programed instruction is a valid teaching method.
2. The effectiveness of instruction can be determined by teacher-made tests.
3. The post test scores covering the programed components will be an indication of student achievement, and thus success of the program developed for the study.

Hypotheses

The null hypotheses to be tested were:

1. There will be no difference in pre-test and post-test scores of students using the developed programed materials.
2. There is no significant difference in achievement scores in subject-matter studied by students using programed instruction in textiles and in students being taught by the traditional lecture method of instruction.
3. There will be no differences in the expressed opinions of students favoring one method of teaching over the other.

Limitations of the Study

The study was limited to:

1. The development of programed instructional components of selected concepts in beginning textiles.
2. Validating the program during its development. (The program was not field tested)

3. The use of the 50 minute class period for the administration of the pre test, the program and the post test.

4. The small enrollment in the home economics department. It was necessary to use students from outside the department for testing the instrument.

5. Testing only upon completion of the program with no retention test.

6. Aspects of three selected concepts in textiles which were considered amenable to programing. They were: (1) textiles in the economy, (2) the nature of textiles and (3) textile use and care.

7. Identifying the students' attitude toward programed instruction at the time of completion of the program.

Procedure

This study was developmental in nature and the following procedure was used in order to accomplish the objectives described on page 4. A more detailed description of this procedure is found in Chapter III.

1. Related research was reviewed in order to determine the problem areas in textiles and to ascertain the extent to which these areas were being developed.

2. Several courses were completed by the researcher relating to programing theory and techniques, audio-visual aids and curriculum development.

3. A review of various curriculum guides and textbooks was completed to analyze the course content in terms of specific behavioral objectives. Many hours were spent in conference with faculty, teachers of textiles at Oklahoma

Colleges and Universities, and teachers of textiles in the Central Region of the United States.

4. Selected components of programed instruction in textiles were developed. The linear mode in the textbook format was used.

5. The selection of the groups for validating the program was made.

6. Pre-testing and post-testing was done for the purpose of validating the program.

7. The evaluation devices used were based on the specific objectives of the programed materials. A pre-test was developed to measure students' levels of skill and experience as they entered the program. Immediately upon completion of the pre-test and the program, a post-test was given to determine the gain scores of the students.

8. Students enrolled in a course in textiles during the Fall of 1970 in which the traditional lecture method was used, became the basis for the comparison of methods. Achievement test scores of students experiencing the developed program were compared with the test scores of students experiencing the traditional lecture method to determine if one group scored significantly different from the other group.

9. Questions were developed to ascertain the students opinions toward their experience with programed instruction.

Target Population of the Study

The major purpose of this study was to develop programed instructional components covering three broad concepts in textiles, for use with freshman and sophomore students at Langston University in Oklahoma. Langston University is a state-supported four year institution with a fluctuating enrollment of 1,300 students. A large number of the students come from urban and rural areas of the state, approximately one-fourth from out of state and a small percent of the students are from foreign countries. The institution offers the Arts and Sciences degree program, The Teacher Education degree program and the Associate degree in some areas.

The home economics department at Langston University offers the Vocational Home Economics degree and the Applied Science degree programs. The enrollment in the department varies from forty-five to sixty-five majors. The areas of emphases are clothing and textiles, child development and family relationships, foods and nutrition, home economics education, and housing and management. Presently, there is one male home economics major enrolled, and from six to eight males select electives in the department per semester. The selection of this population was made because the writer was on the faculty at Langston University. Two years of leave were granted to the writer for advanced study.

Definition of Terms

The terms used in this study were operationally defined as:

Concept - refers to an abstraction representing the world of objects and events and is a means of organizing them into categories (American Home Economics Association 1967).

Generalizations - express an underlying truth, have an element of universality and usually indicate relationships (American Home Economics Association 1967).

Programed Instruction - a "planned sequence of experiences leading to proficiency, in terms of stimulus-response relationships." It is based on the psychological approach to learning. It is a systematic way of approaching the problem of learning (Espich and Williams 1967).

Individualized Instruction - that instruction which allows each learner to progress at his own particular pace (Garner 1966).

Self-Pace - the rate of movement, the progress, or development set by an individual for himself (Markle 1964).

Feedback - knowledge of results as to whether the answer or choice is correct or incorrect (Markle 1964).

Cue - a stratagem used to focus the attention of the student and lead him to the required answers. Capitals, underlining, color and special grammatical constructions are all used to "cue" an answer (Garner 1966).

Frame - a unit of the program that requires a response from the student(Espich and Williams 1967).

Linear Program - a program devised to advance the student step-by-step to his learning goal and so organized that he will make minimal errors(Garner 1966).

Branching Program - a sequence of learning steps organized to provide logical progress and correction for incorrect answers; the frames are usually in the form of multiple-choice type questions. At the end of the program there is a short objective test, so the student can find whether he mastered the material in the program or not. If there is an error or uncertainty, the correct answer given on the next page also directs him to the page in the program where the point is discussed for any review or classification(Markel 1962).

Operant Conditioning - a psychological term used to indicate the conditioning which results when a subject is required to volunteer the correct response in order to gain reinforcement(Garner 1966).

Reinforcement - the process of confirming the progress of a student by making him aware of his correct behavior as he proceeds. It derives from the psychological view that rewarding an organism, makes repetition of the rewarded behavior more likely(Garner 1966).

Step-Size - the amount of information in a program frame. A very small advance on previous frames is called a small step-size(Garner 1966).

Stimulus - any information, request, question, order, which calls upon the student to make a response (Espich and Williams 1967).

Objective - an intent communicated by a statement describing a proposed behavior in a learner (Mager 1962).

Achievement - a measure of the students' mastery of the material of the course (Hoover 1966).

Concept Amenable to Programing - any concept which can be stated in measurable behavioral objectives (Hoover 1966).

Error Rate - the percentage of responses that are incorrect in a program (Espich and Williams 1967).

Gain Score - the difference between the pre-test and post-test scores (Espich and Williams 1967).

Criterion Instrument - measures the extent to which a desired kind of competence, proficiency or capability has been achieved (Espich and Williams 1967).

Unstandardized Interview - a group interview or conference method of obtaining within a brief time, the opinions of experts upon an important question (Brown 1941).

Testing Cycle - the three types of tests required to uncover some of the inadequacies of a program (Espich and Williams 1967). They are:

One-to-one testing - involves the programer and a representative of the group for which the program is intended. The programer develops test copies

of his program in a one-frame-per page format. The programer keeps copious notes at all times while conducting this type of test. This test merely ensures that a student can understand what he is reading and performs those tasks required of him as he goes through the program.

Small Group Testing - there is no personal contact between the programer and the students while the students are taking the program. Five to eight students should be selected as test subjects. A pre-test is administered to determine the extent of the students' knowledge in the area before he begins the program. The pre-test will be similar to, if not the same as, the test to be given at the end of the program. This is to ensure accurate gain results. If the results on the basis of the statistical analysis reach the standards set for the program, the programer will proceed to the next phase of testing.

Field Testing - the program is tested on the population and under the conditions for which it was designed. The programer will not administer this test. Students should be pre tested and post tested. The objective is, how well the program accomplishes its purpose. Field testing is to

> validate the program--to determine whether or not it can do the job. After the program has been successfully field tested and is considered valid, there is no further need to test it. If a major revision is necessary after the field test, the programer will repeat the testing cycle.

Organization of the Study

This study is organized into five chapters. Chapter I presented the introduction and significance, problem, objectives, assumptions, hypothesis, limitations, procedure, description of target population, definition of terms, and organization of the study. Chapter II is a review of literature related to the study. Chapter III presents the procedure used in developing the materials and conducting the study. Chapter IV presents the findings and analysis of data from the use of the program. Chapter V presents summary, conclusions and recommendations of the study.

CHAPTER II

REVIEW OF SELECTED LITERATURE

Introduction

A considerable amount of research on programed instruction has been conducted during the last five years. This research leaves little doubt that such programs do teach. A great deal of learning seems to take place, regardless of the kind of program or the kind of students. Frequently, programs can teach as well as a human teacher and sometimes better (Fry 1963). Programs have beenused successfully at all levels of the educational system. Programs have been tested on all levels of ability from slow learners to the very best students. They have been used to teach a great variety of academic subject-matter, verbal and manual skills (Hendershot 1967), (Center for Programed Instructional Materials 1962), (Spaulding 1967).

Programed materials require the student to answer questions and then provide him with immediate knowledge of results. This knowledge of results reinforces correct responses and the student travels through a series of sequential steps, always informed of his progress.

Although programed instruction is costly in both time required to develop a program and in the time needed to validate it, costs are lowered eventually in duplicating and presenting the material in an inexpensive textbook format. The printed programed material can be arranged in non-consumable form, and can be easily updated and revised. If students can learn selected areas of a course equally well or better through programed instruction, part of the teacher's time may be released for other duties required in meeting demands created by increased numbers of students. The possibility of released time is far from remote according to (Mayhew 1966):

> It may well be that the typical teacher of the future will spend only a small part of his time providing information. Such time as he does spend may be in a carefully rehearsed demonstration or lecture. The rest of his time may be occupied in conferences with individual students or with small groups of students.

Theoretical Background of Programed Instruction

Many institutions are finding, as they explore new instructional patterns, a critical need for independent learning. Independent learning situations can provide the capability for both formal and informal study utilizing a variety of instructional tools. Greater emphasis is being placed on independent study and many of the standard patterns are becoming obsolete. A highly flexible approach permits students to select their own hours for attendance and to take as long as they want to complete a unit.

Re-examination of school functions and purposes starts from the realization that vastly greater numbers of persons must learn far larger amounts of knowledge than ever before if the answer to world survival is to be found. Trump (1963) suggests that the problem includes better development of student talents and maximum use of professional skills, plus efficient use of school facilities, modern instructional aids and school funds. Instructional change may provide for more effective and efficient use of faculty and student time as well as for improvement in the learning that is accomplished. The curriculum must be evaluated and modified to meet the needs of today's student. The instructional program must take advantage of both human and material resources.

Techniques for the highest retention of course content have been the object of decades of research. The earliest attempt at automated instruction was recorded in 1809 when a patent was granted for a device designed to teach reading. A device to teach spelling was developed and patented in 1866. In 1914, Maria Montessori was granted a patent to train the sense of touch (Garner 1966).
Sidney L. Pressey (1926) of Ohio State University, is credited with devising the first recognized teaching machine. Pressey (1926) described the apparatus as a testing machine which presented questions to the student and immediately informed him of the correctness of his answers. Pressey (1932) evaluated his findings from eight years of work with automated teaching devices by describing advantages

of teaching machines and predicted widespread development of new apparatus and materials.

The first recorded research testing the effects of the "self-instructor and tester" was done by one of Pressey's students in the area of reading. The results of the experiment showed that the experimental group which utilized the teaching machine "gained from 2.4 to 3.0 times as much information" as did those who used the regular study method Peterson (1958). Another of Pressey's students (Little 1934) conducted an experiment in educational psychology which marked the first time that machines were used systematically as part of the university class routine. He concluded that drill devices had a practical use in the classroom and that they made possible certain instructional techniques which were not otherwise practical.

Pressey's pioneer work of the 1920's met with little public approval and he regretfully dropped further work on auto-instruction in 1932. Interest in mechanized instruction was revived again in the early 1940's. A few studies in the late 40's were based on Pressey's original work. Two investigators, Angell and Troyer (1948), reported two studies from Syracuse University in which significant learning was demonstrated by immediate knowledge of results through the punchboard-testing technique.

The punchboard was again utilized in 1949 by Jensen who used the technique with college psychology students in an independent study laboratory. He concluded that superior, highly motivated students

could handle college courses by guided independent study if they had sufficient materials.

Further work utilizing the punchboard was done by Pressey (1950). This study involved some 500 Ohio State University students in varying class situations in educational psychology. Eight groups, divided into four accelerated seminars, two examination-for-course-credit groups and two self-instructional laboratory groups, all used the punchboard as a learning device and made superior grades in comparison to the twenty-seven regular class sections in educational psychology.

Programed instruction was brought back from obscurity as a method of improving instruction in public schools by Skinner. Skinner (1959) explained his interpretation of reinforcement theory and its application both to classroom situations and teaching machines. Skinner described an "arithmetic-teaching machine" and its practical and theoretical classroom application in a paper presented at a psychological conference in 1954.

Skinner (1959) in a later paper on programing described a more elaborate teaching machine. This machine employed a disc on which the programed information was written. The student wrote his response to the given information then he checked his answer by uncovering a remaining portion of the frame. If his answer was correct, as interpreted by the student, he then moved a lever to the score position. This tallied his response and moved the machine to the next slot on the program. In this way the student worked through the disc twice; however, on the second

time around, only those questions that were incorrect on the first trial appeared in the window. Skinner maintained that the steps must be very small in putting ideas or recall information into a programed format.

In 1960 Skinner and Holland reported on the programing of verbal knowledge in a natural science course. Specific rules or guides for programing information were demonstrated. An experiment was described utilizing the teaching machine. The subjects were Harvard and Radcliffe students. The experiment was done mainly to check the attitude of the students toward programed instruction and to verify that this approach could be utilized effectively. The results of the study showed that a majority of the students were very favorably impressed with programed instruction and that, as had been shown in earlier studies, programing was an effective teaching device.

Glaser, Homme and Evans (1960) have been credited with applying programing techniques to textbooks. In several experiments using programed textbooks in the areas of statistics and music, the effectiveness of this technique was tested. Three significant results came out of these early studies: the groups utilizing smaller programed steps did significantly better on immediate test performance and the total number of errors was less; students making overt responses did not do significantly better than students who did not write their answers. In some instances, the students not making overt responses actually scored better than the overt responses group. Generally, the

programed textbook group achieved a higher score and showed less variability than did the group using the regular textbook. Results showed that in both areas the students using programed materials did better, though not significantly so, than did the group using the regular textbook. The programed textbook techniques were also being developed by Skinner and Holland at Harvard during this time.

Several military training devices constructed in the 1940's and 1950's were developed to teach skills by individualized self-instructional methods. Crowder (1958) developed a programed instruction approach somewhat similar to Pressey's in the 1950's when he was associated with the United States Air Force and was engaged in training trouble shooters to find malfunctions in electronic equipment. Crowder (1958) was developing a branching, also known as intrinsic, technique of material presentation. He based his approach on the idea that fast learners should not need to take all the small steps that Skinner proposed to achieve mastery of the material. Crowder's idea of "intrinsic programing" was to allow the individual's achievement to determine the sequence in which the programed material should be presented to the student, instead of relying on the linear fixed sequence that Skinner advocated.

Crowder's intrinsic or branching style of programing as represented in scrambled textbooks, consists of steps which contain a limited amount of information, usually less than a page, and a multiple-choice question presented at the same time. Crowder's

materials differ from Pressey's and Skinner's with respect to origin, (technical training programs in the armed services), mode of response, and versatility in their use. Using this type of program a frame may be a whole paragraph presented on a screen of a mechanical tutor, and following the paragraph, would be a question with several possible answers from which the student chooses one by pressing a particular button. If his choice is correct, the nest question in order is shown on the screen. But if his choice is wrong, he may be shown explanatory matter and given a subseries of questions designed to explain his error to him.

Crowder does not specify nor suggest any particular theory of learning as the basis of his intrinsic programing. However, the techniques of his method can be traced to the assumptions of cognitive theorists. Cognitive theorists are stimulus-centered rather than response- centered. Crowder (1958) described the system as adapting itself to the student's achievement and knowledge:

> If the student passes the test question, he is automatically given the next unit of information and the next question. If he fails the question, the preceding unit of information is reviewed, the nature of his error is explained to him and he is retested. The test questions are multiple-choice and there is a separate set of correctional materials for each wrong answer that is included in the multiple-choice alternatives.

Generally, the branching method permits the more capable student to by-pass material he would have covered in a linear program. Experimental evidence does not conclusively favor one

programing technique over the other; both are in use today, although the majority of programs are linear according to Silverman (1961).

Crowder's theory was experimentally tested by Coulson and Silverman (1961). Two major questions were under consideration in this study. One was the Crowder-Skinner controversy over linear versus branching programs. The other question was the method or type of subject presentation, multiple-choice versus constructed response modes. Constructed response originates within the subject, as opposed to that of choosing from alternative answers. Coulson and Silverman used material from Holland and Skinner's programed textbook for a natural science course and developed multiple-choice response items over the same material. This part of the experiment was designed to test whether or not Pressey's multiple-choice type of response was better than Skinner's constructed response proposal. In order to control the branching versus linear program variable, the teaching machines were manually operated by the experimenters instead of using fully automatic machines. The results of the experiment, though not significant, did show a difference in favor of Skinner's proposal, to use small rather than large steps. There was no evidence showing the superiority of either the multiple-choice format favored by Pressey or the constructed response format favored by Skinner. The branching technique took less time than did the linear program, but no significant difference was shown by either group on the criterion test.

Coulson and Silverman also used time as a variable and found that branching and multiple-choice formats took significantly less time than did linear, constructed response format. The other significant finding was that the small steps took significantly more time but produced significantly higher criterion scores than did the large step format.

Research that has been done on programed instruction shows that the majority of studies indicate no significant difference between the experimental and control groups relative to the dependent or criterion variable. However, a number of studies indicate strongly that the time required to achieve learning can be reduced through the application of programed instruction. Smith (1962) carried out an experiment in the United States Air Force Academy and concluded that neither the conventional classroom method of teaching nor programed instruction can produce better learning, but that programed instruction reduced time required for the training period.

Smith (1961) indicated that students using programed instruction in an elementary statistics study felt that they had more opportunity to receive individual assistance from the teacher than under more conventional methods. Hough (1962) found no differences in learning, but wrote that the programed instruction group saved 47 percent of the time required by the control group. Reed (1962) likewise found no differences in learning English, but reported that the high ability student performed better with programed materials, whereas the low ability student did better with conventional teaching.

Several other studies reported significant differences in favor of programed instruction compared with conventional teaching. Blyth (1962), Roe (1961) and Brown (1962) all reported that students using programed materials in any form did significantly better than those in conventional courses. Research studies comparing programed instruction with conventional methods of instruction have firmly established the fact that programed instruction is as effective as conventional methods. In these studies, instructional time typically was reduced with programed instruction groups.

Home Economics and Programed Instruction

Home economics teachers in the seventies are confronted with unprecedented challenges and opportunities in program planning and in teaching. This has come about because of increased knowledge and an understanding of the needs of individuals and families. In addition, there is increased knowledge and understanding of the processes by which mental, emotional, and motor-skill learnings are attained.

In the statement of the philosophy of home economics, it is evident that the profession must recognize and relate its research and its activities to change. Home economics can be effective as it alleviates the stresses and promotes the satisfactions that are brought about by new situations. With this challenge before the profession, as suggested in a publication by the American Home Economics Association (1959), Home Economics New Directions, it becomes essential

for home economists to anticipate and recognize change. Home economists need to assess the capacities of the individual to meet new demands and to establish professional programs which will be of benefit.

Of the various curricula, home economics is one that is concerned with the "problem of organizing and managing human material resources". These resources, coupled with modern technology, can aid home economists in dealing more effectively with change. According to a pamphlet published by the American Vocational Association (1968), Post Secondary Education in Home Economics, home economics educators must be among those initiating change in educational programs. In so doing, they will enable people to utilize constructively the knowledge and the techniques resulting from scientific, technological and societal developments.

McGrath (1968) challenged college and university home economists to examine their programs in order to determine whether or not they need redefinition or redirection. After such a study, home economists should be able to develop programs in relation to preparing students for useful and satisfying work in tomorrow's world. One type of program that is receiving particular emphasis is consumer education.

The decade of the sixties saw an old economic cause take on new significance. More or less dormant since the 1930's, the

resurgence of the consumer movement was stimulated by many of the same forces that were shaping the changing American environment during the past ten years. According to Shultz (1970), the population explosion, growing affluence, rising educational levels, economic expansion, technical and scientific advancement, mass marketing techniques, an increasingly complex marketplace, and changing social and personal values are some of the forces changing the environment.

These forces are still potent in the economy, and the decade of the seventies probably will see a growing concern for the consumer--her needs, desires and responsibilities. It will see an intensification of consumer-oriented activity on the part of government, industry and education. Shultz (1970) in a speech presented to the Annual Technical Conference of the Apparel Research Foundation declared that foremost among the institutions and individuals that are shaping the consumer movement is the government. The business community is addressing itself more and more to analyzing and helping to solve the problems of the consumer in our complex economy. The consumers are likewise involved in the marketplace. Consumers are not always articulate about their needs and desires; they have to be shown how to make their wishes known if they are to deal effectively in the marketplace. They must also be made aware that they not only have rights, but responsibilities and obligations. The consumer of textiles, for example, is confronted daily with such a bewildering

array of new fibers, fabrics, brands and trademarks that the old rules of choice can no longer be relied upon. Help is needed, the help of trained home economists.

From a planning conference on home economics curriculum in secondary schools which took place in Washington, D. C. in 1961, grew the beginning of a national project which undertook the identification of basic concepts and generalizations in five subject-matter areas of home economics (American Home Economics Association 1967). The subject-matter areas were: family relationships-home management-family economics; housing-interior design; furnishings-equipment; foods-nutrition; textiles-clothing; development of children-youth. A copy of the specific concepts and generalizations stated for textiles may be seen in Appendix B, page 94 . The Office of Education had considered a number of factors before deciding to undertake the project (Sitton 1967):

> The social, technological and economic changes that are taking place in our society with unprecedented speed are responsible for changes in home and family life, and in the role of women.
>
> Like some other disciplines, the field of home economics needs to be more precisely defined. The rapid accumulation of new knowledge and the need for students to acquire specialized skills as well as a grasp of the whole field make it increasingly difficult for the teacher to select the most significant learnings. Wise selection is essential if students are to probe deeply enough to gain an understanding of important concepts and if they are to acquire the ability to arrive at basic principles and generalizations and apply them in new situations. Communications between different educational levels and subject-matter areas need to be improved.

Professional home economists, especially those concerned with teaching and research in the area of textiles and clothing, are among the best equipped group in a market-oriented society to provide the important communications bridge between the consumer of textile products and the industry which produces them. If graduate research in textiles and clothing concerns itself with the properties of new fibers and fabrics, and with the performance of new products as related to consumer experience, then valuable first-hand information will be made available.

Conversely, the home economist can be of great assistance to consumers by seeing that they receive accurate information about the textiles, for example, on new fibers, fiber variants, and the differences between the various generic fiber families, especially related to end-use performance. In light of the rapid developments, one must find a basis for judgement of materials or be swayed by each new advertising campaign for fiber, fabric or finish. The consumer must be willing to try new things, she must possess a basis for comparison, and she must be able to give intelligent criticism for the continuing growth and improvement of a product. In fulfilling this role a first need is a workable vocabulary. Words in general usage have rather specialized meanings when applied to textiles. For example, "fine" means in colloquial speech something special, set apart; in textiles it mean fiber diameter. "Staple" for a textile indicates the length of fiber.

Another basic need in judging fabrics is the recognition of fibers involved. Kinds of fibers are increasing and in an effort to solve the problem the government has issued, from time to time, specific laws or Trade Practice Rulings enforced by the Federal Trade Commission. The consumer is presented by law with some information and protection. The law is in effect, the consumer needs to know and understand what the law is, what it means to her and what she can expect from it. The consumer movement offers the home economist perhaps her greatest challenge and opportunity as an educator according to Fortess (1970). He further states that the home economist can play a vital role as an objective communications link between the government, the industry and the consumer.

For many years home economists have been trying to take care of the individual differences of students; they have made an effort to individualize the courses of study for students. Programed instruction, if it lives up to its expectations, can do much to overcome the difficulties that accompany mass education. During 1960, Henrietta Fleck wrote about the need for programs to teach facutal material in home economics. She listed certain aspects of nutrition, housing, home furnishings, home care for the sick, clothing construction and selection, and food selection as possible areas of development of programs.

During 1963 several studies were conducted in the area of programed instruction in home economics. Sally E. Huffman in 1963 at the University of North Carolina reported her exploratory study

". . . to determine some of the problems which will be involved in preparing home economics teachers to use programed materials in their classrooms." A questionnaire was developed to determine teacher attitudes toward programed instruction, the teachers interests in programed instruction, and their willingness to use programed materials in their classes. A slight majority of the teachers in the sample indicated programed instruction could be more effective and efficient than the conventional methods of instruction in teaching factual information. The areas of clothing, housing and foods were most often recommended for future programs. It was agreed by 80 percent of the teachers that programed instruction should be used to supplement the basic course rather than become the basic course.

Reigel (1964) found no significant differences in a study between the conventional method of teaching nutrition for the ninth grade home economics classes and programed instructional method of teaching. It was found that students using programed materials completed the material to be learned in less time than students learning by the conventional method.

In 1963, the Journal of Home Economics reported on studies on the adaption of programed instruction to home economics. Nelson (1963) reported a study conducted at Cornell, Syracuse and the Universities of Buffalo and Rochester. New approaches to the development and evaluation of teacher preparation were investigated in the six year inter-institutional study. Nelson stated that "the possibilities of the

use of programed instruction in certain phases of professional home economics education are being explored with programs developed for this project". The programs developed for the Inter-University project were written by Lund (1963). From Lunds's research it was concluded ". . . that automated instruction is one method for effectively presenting some subject-matter to undergraduates in home economics education."

The Proceedings of the Nineteenth Conference of College Teachers of Textiles and Clothing (1963) contained reports by Hall (1963) and Celeste (1963) on research conducted in home economics using programs. Hall developed a program for use in flat-pattern construction and tested it in a course on Pattern Making and Clothing Construction. Hall reported favorable student reactions to the programed material on an unstructured evaluation device. Celeste (1963) at Michigan State University developed a program on the fundamentals of woven fabric structures. The sample was divided into four groups; three of which used the programed materials in various ways, the fourth group used the conventional method of learning. She found that students responded in a favorable manner to the programed materials. Eighty-seven percent of the total group of 102 agreed that programed material helped them to learn. Seventy-two percent indicated they would like more subject-matter in textiles by programed instruction.

Dommert (1966) developed and field-tested a program on zipper application for beginning clothing classes. According to her findings,

"The prevailing reaction of teachers and students was a favorable attitude toward the program. Both teachers and students indicated an interest in further development and use of this and other programs for home economics."

The E. I. Du Pont De Nemours Company (1963) has prepared a programed booklet on "Lycra". The booklet is a linear program presenting the facts on Lycra, a synthetic fiber developed by E. I. Du Pont Company that stretches and snaps back into place like rubber. At the end of the program, there is a quiz on the material presented.

Johnson, Shoffner and Clawson (1967) have developed a series of programs for use in junior high school clothing classes. Their programed material is organized into five paperbound books; Understanding and Using Patterns Part I and Part II, Construction Techniques Part I and Part II, and The Sewing Machine. The series is designed for students with little or no sewing experience. The frames are illustrated with easy to follow diagrams, and in some instances, there are cartoons in the diagrams.

Franzen (1966) developed a program on the structure of yarn. The field test had not been completed at the reporting of this study; however, the author spoke encouragingly of the programs. The Moore and Shoffner programs were revised by Murphy (1967) to initiate the by-pass system into the self-instructional clothing program. The by-pass technique allows students to skip a section of

instruction if he has mastered the information in that section of the program. A field test of students in junior high school using the by-pass system and those not using the by-pass system indicated that there was no significant difference between the two methods of using the programs.

Reich (1971) reported in the Journal of Home Economics on her research of a programed course in basic clothing for college students. The research involved development of a linear program for teaching basic principles of clothing construction to students with varying degrees of clothing construction experience. The program was intended to help students reach the concept level of learning while integrating manual skills with formal knowledge. Analysis of data generated from the program was encouraging, the students seem to like the individual approach to learning. The final revision of the program is complete and has been published by a commercial publisher.

Mahilum (1971) developed and evaluated programed instructional modules in child development for Filipino college students and concluded that the experimental group learned as well as the control group. She further concluded that the programed instruction modules were appropriate for the target population for whom the material was designed.

The low cost of the programed textbooks, when compared with the teaching machines, has encouraged outside interest to the point

that programed instruction materials have become big business according to Lysaught and Williams (1963). Educationally oriented companies and companies previously having little interest in educational publications are uniting forces to develop teaching machines and programs. Glaser (1960) reports that, "of the twenty-five members of Associated Merchandising Corporation stores, twenty-two are currently using one or more programs to train their employees. The other giants--Sears, Allied, Macy's, Gimbel's, Penney's--have developed and are using programed materials in some phase of their training."

The role of teachers and programed instruction seems to be a topic of much discussion. Silverman (1967) states that:

> The teacher's role is helping students to learn by providing effective materials and by encouraging, rewarding and guiding. Programed instruction does not change the role of the teacher in any appreciable way. For the most effective use of programed materials, it is necessary to have a strong collaboration between the teacher and the program. The teacher is still the controller of the learning situation, and she needs to make the experience interesting by acting as the source of motivation for the students. Programs may be used as a supplement for textbooks or as textbooks. The use of a program as a textbook does not exclude the use of textbooks themselves. Programs and textbooks can be used concurrently.

An important aspect of selecting curriculum materials in home economics has been based on the theory that the identification of basic concepts and generalizations provides valuable resource materials for curriculum building. According to Alexander (1966)

a curriculum that is structured on unifying concepts is flexible and can be chosen from among a wide range of possibilities. The identification of concepts and generalizations should facilitate the evaluation of the teacher-learning process.

Traditionally, the subject of textiles has been taught using the construction or "building block" concept. The generalization based upon this concept states that textiles are manufactured in steps and that each step contributes to the total performance of the final fabric.

The conceptual framework for teaching textiles has advantages. These advantages were cited by Galbraith (1966) as thus:

1. Its dividing of textile knowledge into organized sections which can be taught in a logical order.

2. The ability to vary the order in which these sections are taught in order to catch and hold the interest of a class.

3. The ability to teach at different levels using the same conceptual framework.

4. The ease with which new knowledge can be incorporated into the existing course outline.

The importance of the task of selecting concepts can be seen in Denemark's (1961) statement:

> Teachers of a given subject cannot teach all there is to know about it . . . Drastic choices must be made between what to include and what to leave out . . . The answer lies in carefully assessing all fields of study and selecting those elements of each which provide strategic keys to an understanding of other evens.

The selection and organization of the concepts and generalizations used in this study was made on the analysis of information derived

from a variety of sources. Decisions were made on the basis of the reviews from textile teachers of the Central Region, from textile teachers in the state of Oklahoma and from the writers' textile teaching experience. The concepts and generalizations collected from the above sources and used in this study are consistent with the results from the clothing and textiles section of the National Project for Curriculum Development in Home Economics. See Appendix B, page 94 .

Summary

The presentation of information to be learned in an orderly fashion, building step upon step, and providing for active student response is a concept that dates back 2, 000 years. The presentation of programed information in the form of teaching machines and programed textbooks is relatively new.

The field of home economics, like many other educational fields, is experiencing a vast expansion of knowledge. The number of teachers available and the classroom time available have not increased proportionately. Educators have been conducting research to develop newer and more efficient methods to aid pupil learning in order to prevent the elimination of valuable subject-matter from the curriculum. Programed instruction has been one of the focal points of this research. Research has been conducted to determine the effectiveness of programed instruction. Evidence from research

findings indicates that programed instruction is an effective teacher-learning method, that in some studies students learn faster and retention is greater than when the conventional method of instruction is used. Automated instruction seems to have much to offer in home economics as well as in other fields of education and continued experimentation with programed materials is needed at all levels of instruction and in all areas of home economics Nelson (1966).

The need for readily available and easily used individualized instruction materials in textiles has become increasingly apparent. Much of the information necessary for understanding in textile classes is factual and it seems programing would be an aid to both teachers and students. The teacher could spend less class time teaching basic facts and concentrate upon more advanced concepts of textiles. The students would have access to the basic information whenever they wanted or needed it to go over as often as they deemed necessary and could find out immediately whether they understood the information. This immediate knowledge of results allows the student to evaluate his comprehension of the subject before advancing to other areas of study. The writer felt that self-instructional programed units of factual information would guide students through a sequence of learning experiences which would lead to an understanding of the basic concepts in textiles.

CHAPTER III

METHOD AND PROCEDURE

Development and Evaluation of Program

Espich and Williams (1967), Markle (1964) and Horn (1964) emphasized that individuals who will formally test programed instruction materials should, as much as possible, represent the target population. The target population for the programed instruction components in textiles consisted of undergraduate freshmen students enrolled in Introductory Textiles at Langston University.

Introductory Textiles is a one semester freshman level course required of all home economics majors at Langston University. The class meets three times weekly with fifty minute periods, two for lecture and one for laboratory practice or individual study. There is no required textbook. An extensive reading list is provided. The course outline is designed to provide experiences for the students to develop understandings of textiles and the textile language. From this experience, it is hoped that students can better evaluate product performance, and recognize and exercise consumer responsibility. Students come to the textiles class with little or no previous knowledge of chemistry. They

seem to have no special interest in the course other than fulfilling degree requirements, one of the concerns that instigated this study.

The major purpose of this study was to develop programed instructional components of selected concepts in textiles, for use with undergraduate students. The time devoted to the development of the program was divided into preparation, construction techniques, editing and testing.

The decision to develop programed materials was based upon conferences with faculty in the textile area at Oklahoma State University and upon interviews with 5 selected college textile teachers. The 5 selected college textile teachers were teaching, or had recently taught, textile courses in institutions of higher education in Oklahoma. Of the 5 teachers interviewed, one was from Oklahoma State University and four were from smaller state colleges. The suggested concepts to be included in the programed components were: textile history, textile legislation, yarn structure, basic weaves, natural fibers and textile labeling.

According to Hillway (1956) a personal interview is one of the most common and most effective means of obtaining necessary data. Hillway lists the important steps in an effective interview as being: (1) to seek the confidence and cooperation of the respondent, (2) to prepare in advance a detailed outline or plan of the interview and (3) to record accurately, if possible, at the time of the response the answers given by the respondent. The above steps were used as a guideline in

planning and conducting the interviews used for this study. The interview schedule developed for this study may be seen in Appendix A, page 93 .

Summarized, results of the interviews with Oklahoma textile teachers were: Each of the five teachers had encountered problems in the teaching of textiles. The problems mentioned most often were the pre-determined adverse attitude of entering students, the student's feeling about the relevance of the content of the course, lack of current exhibit and demonstration material, and more effective ways of motivating students. When asked what they thought the reasons were for the problems identified, the teachers responded that the scientific nature of textiles, the need for emphasis on the consumer aspect of textiles at the beginning level, the attitude of some of the students upon finishing the textiles course, and the need for more innovative methods in teaching textiles. Some suggested methods and ideas mentioned by the interviewed teachers for helping to alleviate these problems were: developing individualized instruction over certain aspects such as taped lectures, slide presentations, simulation games for the consumer aspect, and programed booklets of factual information. Each respondent said they would use commercially available materials if they were applicable to their specific situation.

As a result of the interviews, review of literature, textile textbooks, curriculum guides, the national report on concepts and generalizations, and a backlog of the proceedings from regional and

national clothing and textiles meeting, tentative concepts were delineated and outlined. The tentative broad concepts delineated were: textiles in the economy, the nature of textiles, the acquisition and use of textiles, and responsibilities of consumers. A list of resources used for reference may be seen in Appendix B, page 102.

The proposed concepts and content outlines were reviewed and evaluated by a selected sample of college and university professors of textiles and clothing. During the 25th conference of the Central Region at Iowa State University in the fall of 1969, a sample of nine teachers were asked to review and evaluate the concepts. The nine volunteers were selected from a small discussion group session of which the writer was a member. The volunteers were asked to meet at a specified time and place to review the materials, only those who had time for the reviews were used. The teachers in the group were textile teachers from the University of Minnesota, Kansas State University, University of Oklahoma, Pennsylvania State University, Illinois State University, Purdue University and Indiana University. Individually and collectively, the results of the described activities were incorporated in the framework for the programed materials developed for this study.

The writer was enrolled in a programing techniques course at Oklahoma State University during the spring of 1969. Many hours were spent writing programs in varying programing modes. This practice was essential to developing more than one style of

programing. The broad concepts to be included in the program were broken down into manageable components. They were textile legislation, textile labeling and textile fibers.

Information vital to effective curriculum plans that are appropriately individualized, had been previously diagnosed by the writer during her experience in the classroom. The target populations' cultural backgrounds, motivational patterns, social learning, and the expectations they had of themselves and of others had been observed.

The basic ideas of several researchers in individually prescribed instruction were utilized in developing the programed materials to be used in this study. Don Allen's (1968) Ten Tested Tenets of Learner-Orientated Instruction, have been followed in many institutions of higher learning who recently committed themselves to independent study. These "tenets" were used as guidelines in the development of the program used in this study. Allen and others (1968) suggests that there should be "careful integration of all of the operating components of an independent study program into one carefully designed system." The components are:

> Small learning steps--each step covers a single item of instruction.
>
> Active participation--the learner makes a specific response or action for each step.
>
> Immediate confirmation--the learner is given the correct answer to each question immediately after his response.

> Self-paced study--learning activity, path and pace are all under the learner's control.
>
> Variety of method/media--a full range of learning methods and tools is utilized.
>
> Instructor-learner dialogues--there are frequent small-group sessions and a constant availability of tutoring.
>
> Programs tailored to individual learners--no two learners reach terminal objectives by the same path.
>
> Meaningful terminal objectives--program objectives are based on need-to-know or need-to-do criteria only.
>
> Compatible physical environment--the environment must produce "approach" behavior in the learner.
>
> Validation and evaluation--programs must be continually validated.

Equally important and fundamental to this study for the effective writing of the behavorial objectives were Moore's (1968) "essential steps in the development of individually prescribed instruction." They are:

> The objectives to be achieved must be spelled out in terms of desired pupil behaviors.
>
> To the extent possible instructional objectives should be ordered in a sequence which makes for effective pupil progression with a minimum number of gaps or difficult steps with little overlap or unnecessary repetition.
>
> If pupils are to work through a curriculum on an individual basis, it is essential that instructional materials be such that pupils can learn from them without constant help from a teacher and can make steady progress in the mastery of the defined objectives.

> In individualized instruction care must be taken to find out what skills and knowledge each pupil possesses and to see that each one starts in the learning sequence at the point which is more appropriate for him.
>
> For individualized instruction, conditions must be provided which permit each pupil's progress through a learning sequence at a pace determined by his own work habits and by his ability to master the designated instructional objectives.
>
> If instruction is to be effective, it must make provisions for having the student actually carry out and practice the behavior which he is to learn.
>
> Learning is enhanced if students receive rather immediate feedback concerning the corrections of their efforts in attempting to approximate a desired behavior.
>
> The final criterion for judging any instructional sequence must be its effectiveness in producing changes in pupils, and feedback concerning pupil performance should be used in the continuing modification and improvement of materials and procedures.

One of the fundamentals in the development of programed materials is to define the task. The task analysis involves the mental activity of breaking down the subject into units and sub-units so that the writer can consider what he teaches, how he teaches and the skills necessary to teach it. Further definition of the researcher's task involved was completed in response to the following questions that Mager (1962) recommend must be answered in order to instruct effectively:

1. What is it that we must teach?
2. How will we know when we have taught it?

3. What materials and procedures will work best to teach what we wish to teach?

Mager further suggested three criteria to consider in stating objectives. One, an objective must identify a terminal behavior by name; two, it should define the important conditions under which the behavior is expected to occur; and, three, it should specify the "criteria acceptability performance by describing how well the learner must perform to be considered acceptable." The concepts and generalizations and behavioral objectives may be seen in Appendix B, pages 94-101.

Bloom's (1965) Taxonomy of Educational Objectives: Cognitive Domain was used as a reference in constructing outlines of educational objectives for the proposed concepts. The educational objectives and course outline used for this study may be seen in Appendix B, page 94-101.

After drafting the outline, the sequence and behavioral objectives, the criterion instrument to be discussed later in this chapter, was developed. The programing strategy was selected. The linear mode was chosen for each of the components. The writer deemed the linear mode appropriate to the population and to the subject-matter to be programed. The basic consideration in deciding the instructional mode was the nature of the information to be presented. Factual information, which requires recall, is better suited to the linear type mode according to Hofer (1967). It appeared that the basic concepts selected for the components were factual.

To produce a linear program, the programer followed a step-by-step process of his own to increase the probability of an effective end product. He defined the target population--what learners the program will be prepared for; specific pre-requisites--level of achievement, and how these learners typically learn best. The programer then specified the behavioral objectives and prepared the criterion examination.

The linear model required each student to proceed in the same order. This model was modified slightly by including review frames to direct the student back to material he had not learned. The program was largely of the constructed response type, requiring students to write out answers to each frame. Only a few frames in each program utilized multiple-choice type responses.

Designed in a vertical format, simulating that of a programed textbook, the programs were reproduced by ditto duplicator process on $8\frac{1}{2}$ by 11 inch paper and stapled into booklets. The original proposal of one large book had to be revised into two smaller units to utilize the fifty minute class periods of students available for the test. Examples from the program can be found in Appendix C, page 103. Answers were located below the six asterisks under each frame, requiring the student to cover all of the frames below the frame presently being studied. This technique was intended: (1) to eliminate the student glancing ahead for information to use in answering the frame upon which he was working, and (2) to permit

better utilization of the "conventional chaining" technique. The conversational chaining technique connects each frame by using the response in one frame as the introductory part of the following frame (Lysaught 1963).

Some conventions followed in constructing the program included presenting material in relatively small steps, providing a logical sequence of content, and structuring the frames so that the required responses were relevant. A variety of techniques was utilized in writing frames. One technique utilized in the program was "cueing"--giving clues in the context of the frame in order to ensure the correct response. In introductory frames, the "fading" technique--the gradual withdrawal of cues, was used. The following frames are examples of the two techniques "cueing" and "fading":

> 21. Constant research and experiment has refined rayon and today the high modulus rayon is as different from first generation rayon as today's teens are from their parents. High Modulus Rayon has been engineered to maintain its strenght and to give a soft, silky hand. The modern rayon called H _ _ _ M _ _ _ _ _ _ R _ _ _ _ is an improvement in the first generation transitional rayon that makes it stronger when wet and soft and silky to feel.
>
> * * * * * * *
>
> High Modulus Rayon
>
> 22. Acetate, a man-mad transitional fiber is like a gardenia flower, beautiful but fragile, it drapes well, is heat sensitive and is not very durable. A fragile man-made transitional fiber is _____.
>
> * * * * * * *

acetate

A technique used extensively was that of parallel grammatical construction to aid students in understanding new concepts:

41. When the hang tag or label states that a fabric is made of 100% wool fiber, that means that the fabric is pure wool fiber. When fabric contains only one fiber, it is said to be a _____fabric.

* * * * * * *

pure

42. To make fabrics more suitable to the needs of the consumer as well as to the manufacturer, the textile industry often blends or mixes certain fibers. When two or more different fibers are woven together for a fabric the fabric is called a _____.

* * * * * * *

blend

43. In your own words, why are fibers blended?

_____

_____

* * * * * * *

To better satisfy and meet the needs of the consumer and manufacturer (OR EQUIVALENT ANSWER).

Repetition was utilized occasionally to ensure learning of important content:

30. Textile labeling is the information attached to the product to indicate the fiber content

and fiber classification. The information relating to the fibers used in making the textile product is found on the _____.

* * * * * * *

label

31. The information on the label informs the consumer about the product, its fiber content, its intended end-use, its care instructions. The _____ tells the customer or consumer what he can expect of the product he is buying.

* * * * * * *

label

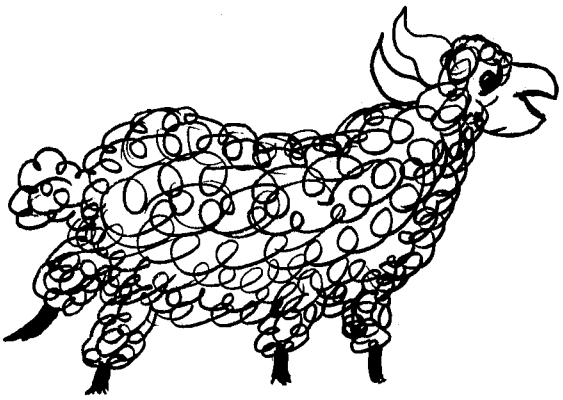
32. The _____provides all the information needed for understanding the use and care of a textile fabric. READ THE LABEL.

* * * * * * *

label

A line drawing of cartoons symbolizing topical fibers was used to help increase the responsiveness to the program and to utilize another form of communication other than conventional prose. Examples:

9. What are the characteristics of wool fibers?
Wool - - - -



- sheds wrinkles
- absorbs much moisture before it feels wet
- fibers are covered with scales
- if rubbed or soaked too long in hot water during laundering, the fibers swell and scales lock. This causes permanent shrinking or felting.
- is of animal origin, it comes from the sheep

Wool is a natural fiber that is curly and warm. Wool is resilient, it will bounce back when pressed.

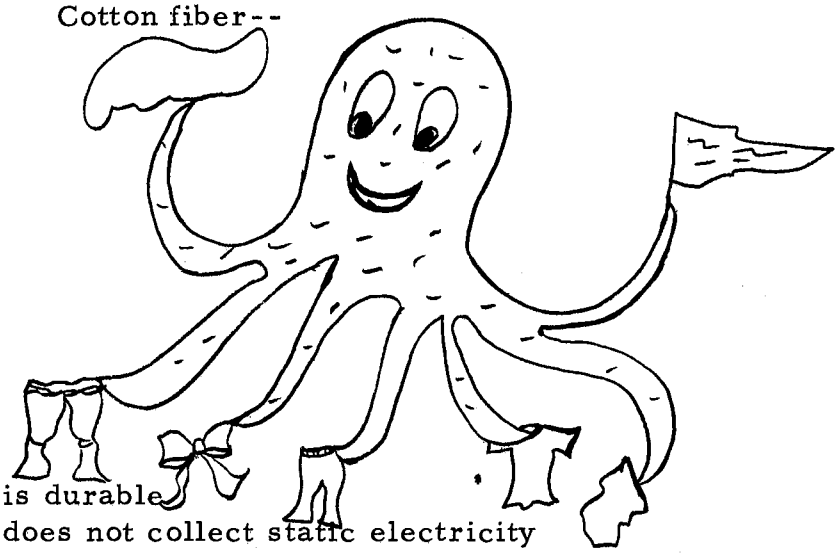
Wool is the softest, warmest and most resilient of all the fibers in the _____category.

* * * * * * *

natural

10. What are the characteristics of the cotton fiber?

Cotton fiber--



- is durable
- does not collect static electricity
- can be safely washed and dried at high temperatures
- is comfortable to wear
- is obtained from natural sources, a plant

Cotton is the most versatile of the natural fibers. The fiber of many uses, or most versatile is _____. It is the natural fiber that is used in a wide variety of items.

* * * * * * *

cotton

All of the responses required in doing the program were to be written. There were some muliple-choice items used in a discrimination situation. The student was asked to select the true statement, based upon what he just read. In making the selection, he should understand and apply the concept that was presented to him.

For the purposes of this study, two types of testing the program were done. The first phase, one-to-one testing and the second phase called the small group testing. Each phase was designed for a separate and distinct purpose. Nine students were used in the one-to-one test. Three separate groups were used in the small group testing cycle. Both types of test were required to uncover most of the inadequacies of the program.

The summary description of the nine students selected for the one-to-one test included students from a wide range of majors. They were all freshmen students, 2 home economics, 1 chemistry, 1 business education, 2 physical education, 1 sociology, 1 elementary education major and 1 high school senior. There were 4 males and 5 females in the sample. Special effort was made to select samples from the population with varied interest backgrounds. The expectation of greater magnitude within responses prompted this decision. It was further assumed (Espich and Williams 1967) that these students would probably stumble more often due to the newness of the material.

One-to-one testing involved the researcher and a representative of the population. With the help of students on one-at-the time

schedule, an attempt was made to uncover as many inadequacies relating to clarity in wording as possible and to eliminate them from the program.

One student from the population considered by the researcher to be a little slower than the average was selected. This student would probably stumble more often than most students while doing the program. Espich and Williams (1967) support the choice of a student of this description for testing new educational methods and materials. Prior to the actual test the researcher explained to the student that he was going to help re-write the program; it was emphasized that he must learn from the program for it to be considered successful. He was urged to indicate immediately any areas that were confusing, areas in which he was not sure of his response, areas where a particular statement was not consistent with a concept he had gained from an earlier part of the program. Stress was placed on the fact that the student and the researcher, together, were going to smooth out the program, remove any inadequacies and make the program work--not necessarily the first time through.

The writer developed test copies of the program in a one-frame-per-page format, with the answers at the top of the following page. The student was seated facing the writer and given the first frame and asked to read it and announce out loud what should go in the blank or how he would answer the question. After he gave his answer, the writer confirmed it for him and gave him the next frame to read.

While he read the second frame, the writer recorded his previous answer. If the student could not answer or gave the wrong answer, the writer discussed the frame with him and at that time tried to find out what it was that had led him astray. The students' answers were recorded in writing; after questioning the student, the researcher made notes of the events or concepts that led to the wrong answer. Students do not always think as the programer imagines they will. One purpose of one-to-one testing was to see how close the writer came to anticipating and preparing for the students' mental activities. During this testing, the researcher had opportunity to evaluate the validity of the adjustive devices used. It was evidenced if the devices had the capability of sensing students' inadequacies and to make adjustment for these shortcomings. Copious notes were kept at all times while conducting this test.

As the student progressed through the program frame by frame, the writer found frames to which the student simply could not respond. These frames required a great deal of explanation to put the student back on the track.

The one-to-one test was given to ensure that the student could understand what he was reading and could perform those tasks required of him as he went through the program. At this point, the programer did not know whether the program would work. The data gathered from this phase of testing had importance only for the programer and was essential to the revision of the program.

After the program was tested with nine separate students on the one-to-one basis, revisions were made to eliminate problem areas pointed out by students. According to Skinner (1960), the programs are tested and modified until the desired behavior is achieved on the part of the student.

Immediately following the one-to-one testing, the program was submitted for review to a volunteer group of teachers in attendance at the 26th Conference of College and University Professors of Textiles and Clothing of the Central Region, being held in Chicago, Illinois, October, 1970. The group who volunteered were textile teachers from Tennessee State University, Kansas State Teachers College, Lincoln University, Grambling College and Iowa State University. Included in the group selected were schools that had students with like characteristics of the target population as well as schools with characteristics that might be assumed to be quite different.

The five volunteers were asked to take a copy of the program to read. They were asked to respond, in writing, to any phase about which they had question.

The researcher then asked the group to meet at a specific time and place for at least a twenty-minute discussion of the program. Time was extremely valuable and was a factor in the depth of the discussion of the reviews. The specific areas outlined for which the teachers were to pay special attention during reviews were:

1. To note the wording used in the frames; was it clear?

2. What do you think about the sequence of the information in the program?

3. What is your opinion of the content of the program?

4. Do you think students--your students would respond favorably to a program of this type?

5. What method are you now using to teach these concepts?

6. Would you use a refined copy of this program in your classes?

When the reviews were completed the writer conducted an unstandardized interview with the group; this method offered an economical method of obtaining, within a brief time, the opinions of experts upon the important questions. The remarks from the reviews centered around minor difficulties encountered in whether students would understand some of the wording, clarity of some statements and a difference of opinion on the sequence of steps in the program. All of the volunteers agreed that they would use the material if it were available. They also thought their students would like the method of learning certain aspects better than the one they were now using. The important remarks brought forth in the discussion were organized, interpreted and used for refining the program.

Next, the program was submitted for the first small group test during the second half of the first semester 1970. Twelve students comparable to the group used in one-to-one test were selected for

the first small group test (hereafter referred to as Group I). The sample group consisted of four males, eight females; five were freshmen, three were sophomores and four were juniors. Espich and Williams (1967) suggest that group size be small for this cycle of testing, from five to eight. The writer advertised for volunteers who had one hour of free time to participate. Twelve students accepted and were used.

The procedure for the small group test was different from that used for one-to-one test. The students were informed that they were taking a draft of a program that was still in the developmental stage. It was emphasized that it was the program that was being tested, not the students. The students understood that they acted merely as advisors telling the programer what was wrong with the program and to supply a measure as to how well the program performed.

After explaining the program and the procedure of the examination, the programer administered a pre test to determine the extent of the students' knowledge in the area as he entered the program. In order to determine the gain that the student made in the program, it was necessary to know his starting point. The pre test was the same as the test to be given at the end of the program.

The students were encouraged to guess at the answers on the pre test, since many times a guess will turn out to be a correct answer--an answer that they knew all the time, but of which they were uncertain.

The students who scored almost nothing on the pre-test offered the greatest challenge to the program, for they had the most to gain.

After the pre-test, the students were instructed in the mechanics of taking the program. None of the group had ever used programed instruction before. They were asked to mark the difficult areas or frames with three large X's in the left margin as they worked their way through; these areas were later discussed with the individuals. The students were then given the programed booklet and asked to go through the material. The programer recorded the starting time, since it was important to know how long it took students to finish the program. Once the students started the program, the investigator did not give any help or clarification of the material.

After all the students finished the pre-test, the program and the post-test, the test was graded and the programer sat down with each student and discussed the program. The items that the student had been asked to mark with X's were isolated and each area was discussed to try to determine what program inadequacy caused the student to have trouble. The experience of this small group test did yield some startling information. One major problem discovered was the amount of time required for students to complete the mechanics of the whole experiment. The program as written, proved to be too long for the fifty minute class period and when the period ended the students had not finished, became confused and were inattentive to the program. Due to this confusion and inability of

students to complete the program, the decision was made not to use any test data from this group. The marking of the frames was used for revision. The time problem led the researcher to divide the program. The program as well as the pre-and post-test forms were revised and divided so that one part could be completed in one class period and a second part could be scheduled for a different class period.

After the interviews with students were completed, revisions were made in the program and the criterion instrument. The interviews and other data delineated from the group was utilized in the revision and refining of the program.

The researcher analyzed the program frame by frame and noted the X's placed there by the student. A check was marked that represented a miss of that frame by a particular student. This was done for each students' program booklet. The data from each students' program was extracted and recorded on a chart developed by the researcher. Definite patterns of misses were seen on the chart. The clusters of misses indicated a problem area within the program. An example of the chart used for the frame analysis may be seen in Appendix D, page 107.

The information delineated from the personal interviews conducted with each student that participated in the test was likewise vital in revising the program. During the personal interview, the students that participated in Group I were asked the following questions:

1. What was not clear to you about the frames you marked with X? (Each frame was taken separately).

2. Did you find it difficult to read?

3. Was it difficult to understand?

4. Did you know what the programer wanted you to do?

The replies indicated a need for the revision in the directions to the program, smaller steps in some instances and more cues.

In summary, the experience of presenting the program to a group, none of which had used programed instruction before, was enlightening. The directions were inadequate, too much time was spent explaining and assisting the students after they had started the program.

After the program was completed by Group I and revisions were made, the researcher proceeded to test the revised two-part program on another small group. The sample group selected was enrolled in a Social Institutions course at Langston University during the Spring Semester '71. The total class of twenty students were present for Part I of the program. At the second meeting and administering of Part II of the program, only sixteen were present. Due to the difficulty of scheduling, the materials for the four students absent for Part II were deleted from the study.

The summary description of the sixteen students selected for the second small group test, (Group II) included 8 males and 8 females with no declared major. The Social Institutions class

provided a structured situation for the administration of the programed materials.

The purpose for testing Group II was to see how well the program accomplished its objectives. The objective of this phase of testing was to validate the program--to determine whether or not the program could do the job. During the testing of Group II, the researcher expected to find few areas in need of revision since most of the revision work had been done in the previous tests.

The programed material was presented to the students with only necessary explanation. After introductory remarks, the pre test was given and collected. The program was passed out and the starting time recorded. These students were not asked to mark difficult frames. When the student finished responding to the frames in the program, he completed the post test and his finish time was recorded. The student then responded to an opinnionaire.

There were many types of data that could be gathered concerning the program. Part of the data was obtained directly from the post test results, some was obtained from the students' completed copies of the program itself and opinions delineated from the opinnionaire.

Data collected from the Group II testing was essential in determining whether the program met the standards set for it. The ninety-ninety standard, the most stringent of the standards used to measure program performance, was the goal for this study. Although authorities are in agreement that the ninety-ninety standard

is very difficult to reach, the writer assumed it to be a goal worth aiming for. Chapter IV presents the analysis of Group II in relation to the standards.

Espich and Williams (1967) interpret the ninety-ninety standard as:

> The first 90 represents the class mean, considering all the students. The post tests are graded, the raw scores are given percentage values, and the class mean is computed. The class mean must be 90 percent or better.
>
> The second 90 represents the qualification that 90 percent of the students will achieve each objective of the program. When certain that on a given population, the class mean will be 90 percent and that no more than 10 percent of the students will miss any particular item, one can consider the program complete and ready to use.

Espich and Williams (1967) further states:

> Ninety percent is probably as good a representation of "most of the time" as any. We do not believe, however, that a program in which any student makes correct responses 85 percent of the time is necessarily a bad program if it enables him to do all of those things it set out to teach him. The ninety-ninety standard is a difficult one to meet, but is worth shooting for.

Program evaluation is an extremely complex problem. Program evaluation includes the building of valid and reliable criterion tests as part of the program development. In evaluating programed instructional material Lumsdaine (1965) advanced two sources of information. These are the "internal" and the "external" characteristics of a program. He describes each as follows:

> . . . 'internal' characteristics refer to the features which can be revealed through inspection of the program material, including both its 'content' and such pedagogical features of constructions as length of frames, use of branching, techniques of promptings, patterns of repetition and review, kinds of responses called for and the like.
>
> . . . 'external' information about a program refers to features which cannot be observed merely by inspecting the program itself . . . Other kinds of external information could include such information as the qualifications of the author, achievement produced by a program.

In order to determine whether the criterion test met the standard, the second 90 in 90/90 standard, the researcher ran a test item analysis. The second 90 in the 90/90 standard represent the qualification that 90 percent of the students will achieve each objective of the program or no more than 10 percent of the students incorrectly performed on a particular item. The primary objective of breaking each of the test items into the smallest possible part was to enable the researcher to identify more precisely the inadequate portions of the program--to focus attention on as small an area as possible for revision purposes. In considering the test items individually, the item number missed was recorded along with the number of students who missed the item. The percentages correct were figured. The results of the test item analysis may be seen in Appendix E, page 110 . When results from the test item analysis revealed that more than 10 percent did perform incorrectly on some of the test items, that area of the program was revised before the program was administered to Group III. See Appendix J, page 126.

The article "Criteria for Assessing Programed Instruction" reported by the Joint Committee on Programed Instruction and Teaching Machines DeCecco (1964) recommended that:

> Aside from the data obtained in testing a program's use under laboratory or field conditions, inspection of the program itself as a basis for appraisal can be supplemented if the author has spelled out the program's purpose by describing and exhibiting in full the achievement test items which purport to exemplify what the program is intended to teach.

Critical reviews of programs may furnish additional basis for evaluation. Evaluation should include data on achievement attained by using the program as well as the reviewer's opinion about the program and content and style. There should be continuity of thought, appropriate examples, appropriate frame size and appropriate illustrations.

The items of information about which the researcher was interested from the Group II, small group test were: pre test, post test mean, range, total time required to complete program, frame rate per minute, error rate on frames, error rate on criterion test, item analysis on frames and mean gain scores for the individual and group.

The object of the frame item analysis is the breaking of each test item into the smallest possible part, to enable the researcher to identify more precisely the inadequate portions of the program. The frame error rate will show the percentage of frames to which a student made an incorrect response. The average frame error rate will tell how hard the program was for the students, but does not indicate its

effectiveness. The average frame error rate for the program was the average of the individual students' frame error rate. An acceptable frame error rate should be between 5 and 10 percent. According to Espich and Williams (1967) a program with a high average frame error rate probably would not be successful. Students would become frustrated while working on the program--it may be difficult. A program with a 0 or 1 percent frame error rate would probably not be very challenging to students. The range of errors on frames for Group II was between 6.56 percent and 14.12 percent. Table I shows

TABLE I

SUMMARY OF ERROR RATES ON FRAME RESPONSES

GROUP II

	Total Errors		Error Rate%	
	Part I	Part II	Part I	Part II
Sum of errors	105	129	164	236
Mean error rate	6.56	8.06	10.25	14.12

N = 16

the total errors committed by Group II on frames (in Part I and Part II). Complete data on errors are found in Appendix E, page 108.

The total errors on the criterion test and the corresponding error rate per student are found in Appendix E, page 108. Table II shows

that there were a total of 100 errors made on the criterion test by 16 students. The mean was 6.25. For Part II the total errors were 129 with a mean error rate of 8.06.

TABLE II

SUMMARY OF ERROR RATE ON CRITERION TEST

GROUP II

	Total Errors		Error Rate%	
	Part I	Part II	Part I	Part II
Sum of errors	100	129	382	424
Mean error rate	6.25	8.06	23.93	26.50

Compared to the variation in time, it took the students longer to read Part I; they read Part II in less time but made more errors on the criterion test. This could have been caused by a number of factors, the technique used might be one. Part II had some pictorial diagrams that might have caused the reader to speed up.

In light of the data obtained from the results of administration of the program to Group II, several revisions were made. Directions were reworded and several frames were restructured based upon the error rate.

The last testing group (Group III) used in this study was selected from the target population--home economics. The sample was selected from students who had not had the textiles course before so that information would be new to them. The post scores from Group III were compared with achievement test scores from a group of students taught by the traditional lecture method. Statistical analysis was used to compare the two methods of teaching.

Traditional Lecture

Achievement test scores from the traditional lecture method were taken from the researchers class records. Scores taken from the records were those tabulated from the same concepts as those contained in the programed components. The course outline and sequence for the lecture were the same as for the programed components. There was some modification in the criterion instrument due to time lapse and revisions. The time required to teach and test the same concepts included in the programed unit were computed for the traditional lecture method of teaching. These data may be seen in Appendix F, page 112. The test was administered to a class of nine students regularly enrolled in the introductory textiles course who were being taught by the lecture method. The traditional lecture class had access to recorded tapes of the lectures in the Langston University Learning Resources Center facilities. The recorded lectures were on file in the center and students were free to use them at their discretion. The Mann-

Whitney U Test, a non-parametric statistical procedure was used to analyze the data collected from the two methods of teaching. These data were utilized in an effort to answer the null hypothesis that there will be no significant difference in the achievement scores of subject-matter studied by students using programed instruction in textiles and in students being taught by the lecture method.

Development of Criterion Instrument

The criterion test was devised to measure the effectiveness of the programed components as a teaching tool. The purpose of the criterion instrument was to determine whether or not the program as developed by the writer was an effective way to teach textile concepts to undergraduate students.

One criterion test, with pre-test and post-test forms, was developed to measure achievement of students. It was decided that the pre-test and post-test would be the same since the program teaches the criterion test. The pre-test was needed to evaluate pupil growth on the programed topics. Criterion measures, generated by the behavioral objectives, were developed for assessing the learning which resulted from the components simultaneous to the development of the objectives. The first step in constructing a criterion test was developing a table of specifications (Ahmann and Glock 1961). The table of specifications is a device that can be used to facilitate planning a paper-and-pencil achievement test. The table of specifications

is one means of checking content validity of the test. See Appendix G, page 113. By examining the distribution of the subject-matter content and the behavioral changes, in the table of specifications, one is able to determine if the test actually measures the necessary content and behavioral changes that it intends to measure. The use of tables of specifications in paper-and-pencil achievement test construction serves as a kind of guarantee that the subject-matter under consideration will be properly sampled and that all of the pertinent behavioral changes will be involved in the test items to the degree of their relative importance(Ahmann and Glock 1961). Cureton (1951) further defends curricular validity:

> It (curricular validity) is a special case of logical relevance . . . An ordinary subject-matter test has usually been considered to possess curricular relevance to the extent that it tests the students' knowledge and effective grasp of those facts, principles, relations, patterns and generalizations which are the de facto immediate objectives of instruction. The usual evidence of curricular relevance is a tabulation showing that the test content actually parallels and covers the course content, that the test operations are those specified in the course objectives, and that the test situation is not such as to bias the responses . . . it is perfectly reasonable for the test user to propose to use a test to measure what it actually does measure.

The writer constructed a two-way table of specifications of the selected components to be programed, see Appendix G, page 114. Prior to the development of the table, a breakdown of behavioral changes and subject-matter topics was completed so that the relative im-

portance of each could be determined. These judgements have been represented as percents and can be seen in Appendix G, page 115. The relative weights attached to each cell in the table were used as a guide to building the test with representative items. As the test items were written they were identified with one or more of the cells. This procedure minimized the tendency to over-represent or to under-represent any cell or group of cells. Appendix G, page 114. summarizes the distribution of test item type and weights assigned.

Student achievement of the objectives was measured by 3 types of test items; true-false, multiple-choice and matching items. The true-false questions were developed to measure student knowledge of facts and principles. The largest portion of the criterion test consisted of true-false type questions. This type question allowed the test to sample widely a large amount of subject-matter without needing a great amount of testing time. It was assumed that most students could respond quickly to well-constructed items of this type. The objective type test items were chosen in order to eliminate judgement in evaluation of the response on the part of the scorer. It was important that the test contained a representative group of test items. The test contained true-false, multiple-choice and matching items which allowed the student to choose the correct response from the information provided in the item.

Multiple-choice questions were constructed to measure student knowledge and ability to interpret labeling information and signs.

The first constructed criterion instrument was designed in the one test format that consisted of fifty-six items. After the first small group testing was completed, as with the programed unit, the criterion test had to be revised and divided into two separate parts to facilitate the fifty minute class periods of the sample. The revisions were made and the test divided according to concepts contained in the matched division of the program. This was necessary so that the pre-test and post-test could be completed on the same day as the program due to limitations of the study. After this revision there were two parts to the criterion test instrument, part one contained twenty-six items and part two contained thirty items. A complete copy of the pre-and post-test for Part I and II can be seen in Appendix H, pages 116-120.

Opinionnaire

In an effort to access the opinions of the students toward programed teaching, an opinionnaire was developed. According to Kerlinger (1966) an attitude is a predisposition to think, feel, perceive and behave toward a cognitive object. Two methods for evaluating attitudes of the individual are (1) direct observation and (2) attitude scales. Attitude scales are designed to measure the extent to which an individual has favorable or unfavorable feelings toward an object or an idea.

Thurstone (1959) defines an opinion as a verbal expression of an attitude. Since an opinion symbolizes an attitude, we may use statements of opinion as a means of measuring attitude. The opinnio-naire consisted of nine statements about the program, its use and its possibilities. The students were asked to check one of the three statements that described their feeling about the program. The statements represented three degrees of feelings. The last question was an open-ended type; the student was asked to make a selection or to write-in his own selection. A copy of the opinionnaire and results appear in Appendix I, page 123.

Summary

The major purpose of this study was to develop programed instructional components over selected concepts in textiles. The selected concepts were: textile legislation, textile labeling and textile fiber families. The program was designed for use with undergraduate students in home economics at Langston University. The program was divided in two parts, referred to as Part I and Part II, the pre-test and post-test were divided to match the respective parts. The linear mode was used in the program. Part I of the program contained 68 frames, Part II contained 55 frames, there were 26 criterion test items for Part I and 30 criterion test items for Part II. All of the frames required overt response.

The procedural sequence for developing the program and the criterion instruments was: (1) Selected content; (2) Wrote behavioral objectives; (3) Determined component content; (4) Developed table of specifications for criterion instrument; (5) Developed criterion instrument; (6) Determined programing mode; (7) Programed, edited and tested; (8) Developed opinionnaire; (9) Evaluated.

The testing phase of the program's development was one of the most rewarding and eye-opening. At all times during the testing of the program the investigator kept in mind that the purpose of the testing was to test the program, not the students. There was great temptation after an unsuccessful test to feel that a group of poor students had been selected. No amount of preparation can condition a programer for the reactions experienced during the first test of a program.

The findings and analysis from this effort are discussed in Chapter IV.

CHAPTER IV

FINDINGS AND ANALYSIS

This chapter is concerned with the analysis of the findings on the programed instructional materials. The validation of the program included collecting data on completion time, frame error rate, error rate on the criterion test, the mean scores, range and gain scores from pre-test and post-test. Percentage scores and the Mann-Whitney U Test were utilized to test the hypotheses.

After the program was administered to Group I format revisions were made. The program was then administered to Group II with the pre-test and post-test. After further revisions the program was then administered to a third group, Group III. A pre-test and post-test design was used for the study to determine the effectiveness of the program in teaching the selected concepts in textiles. The pre-test was administered to determine the students' knowledge of textiles before he entered the program. The post-test was administered to determine the amount of gain the students made after they had completed the program. Gain scores were obtained for both Group II and for Group III. All of the students' performance was important

and each indicated some measure of the programs' proficiency. Table III gives the data relating to the pre-test and post-test for Group II.

TABLE III

SUMMARY OF PRE-TEST AND POST-TEST DATA

GROUP II

	Pre-Test Score	Post-Test Score	Mean Gain Score
Means	65.50	80.80	15.25

N = 16

One of the items calculated was the mean score for the post-test. The 90/90 standard for the mean score was the objective of this study. The Group II mean on the pre-test was 65.50 and the mean for the post-test was 80.80. After the mean scores were figured, the mean gain score was figured. The mean gain score gives the number of points difference or the points gained from the pre-test to the post-test. This is figured by subtracting the pre-test score from the post-test score. The desired mean gain score for the 90/90 standard is 10. For Group II the mean gain score was 15.25 which is 5.25 higher than the standard of 10. This higher mean gain score may indicate that for this particular group, learning did take place during the administration of the program. See Appendix L, page 128.

The investigator believes that timing is important in determining the effectiveness of programed instruction. The students in Group II used a mean time of 81.55 minutes to complete the program and the test. The time range for Group II was from 60-113 minutes. The number of frames read per second was also accessed. Group II read the 68 frames in Part I at a mean time rate of 45.55 seconds per frame. Results indicate that when the students reached Part II of the program on the second day they were reading faster. The mean frame rate per second on Part II of the program was 32.66. These data may be seen in Appendices K and L, pages 127-128.

Group III consisted of a sample from the population of all home economics majors who had not had the textiles course. Group III achieved better scores than did Group II. Group III obtained a mean score of 89.15 which was less than 1.0 away from the 90/90 standard set for the program. Table IV below shows a summary of these data. Group III had a mean gain of 32.23 percent. Raw data from Group III may be seen in Appendix L, page 128.

TABLE IV

SUMMARY OF PRE TEST AND POST TEST DATA

GROUP III

	Pre Test Score	Post Test Score	Mean Gain Score
Means	56.92	89.15	32.23

N = 13

Testing Effectiveness of the Program

A null hypothesis underlying the study was that there would be no significant difference between the achievement scores in subject-matter studied by students in home economics class (Group III), using programed instruction than in the home economics students using the traditional lecture method of instruction. The developed program was tested with samples from the target population and the data recorded.

Post test scores were used for the achievement scores for Group III. The achievement scores from a similar test administered when the study of the selected concepts was completed, in the traditional lecture method group, were also tabulated. See Appendix M, page 129.

The Mann-Whitney U Test, a non-parametric statistical procedure which may be used with ordinal data, was used to analyze the data collected from the student achievement tests. The U test is based on the notion that, if scores of two similar groups are ranked together, there will be a considerable intermingling of the two groups ranking.

If one group significantly exceeds the other, then most of the superior groups' rankings will be higher than those of the inferior group. After the combined ranking of the two groups, the value of U is computed by concentrating on the lower grouped rank. According to Siegel:

> The Mann-Whitney U Test assumes that the scores represent a distribution which has an underlying continuity. With a very precise measurement of a variable which has underlying continuity, the probability of a tie is zero. However, with the relatively crude measures which we typically employ in behavioral scientific research, ties may well occur. When tied scores occur, we give each of the tied observations the average ranks they would have had if no ties had occured.

Siegel further recommended that one should correct ties only if the population of ties is quite large, if some of the t's are large, or if the P which is obtained without the correction is very close to the one's previously set value of Alpha.

The Mann-Whitney U Test is one of the most powerful non-parametric statistical tests, it utilizes most of the quantitative information that is inherent in the data. It is most commonly employed as an alternative to the student-ratio when the measurements fail to achieve interval scaling or when the researcher wishes to avoid the assumptions of the parametric counterpart (Runyon and Haber 1968).

The following formula was used in this study:

$$U = n_1 n_2 + \frac{n_1(n + 1)}{2} - R$$

where
n_1 = the number of cases in the smaller of two groups
n_2 = the number of cases in the larger of two groups
R_1 = sum of the ranks assigned to group whose sample size is n_1 - less than 20

TABLE V

MANN-WHITNEY U ANALYSIS OF ACHIEVEMENT SCORES OF TWO METHODS OF TEACHING

Traditional Lecture		Programed Instruction Group III	
Achievement Test Score	Rank	Post Test Score	Rank
90	6.5	98	1
87	10.5	97	2
79	16	96	3
63	17	94	4
60	18	90	6.5
59	19.5	90	6.5
59	19.5	90	6.5
45	21	89	9
17	22	87	10.5
		85	12
		82	13
		81	14
		80	15
R_1 =	150.0	R_2 =	103.0
n_1 =	9	n_2 =	13
U =	12	$U \leq 20$	$12 < 20$

The results of the rankings are shown in Table V, where $n_1 = 9$ and $n_2 = 13$ in the two-tailed null hypothesis test. The rejection level had been pre-set at 0.01 Siegel (1956). The value of U was computed and found that U = 12 which was less than 20, thus it is significant above the 0.01 level of confidence This tells the investigator that the group using the programed unit did score significantly higher

than the group using the traditional lecture method of learning. The null hypothesis was rejected in favor of the programed method.

Student Opinions of Programed Instruction

Upon completion of the program, students were asked to respond to an opinionnaire. A summary of student responses to the questions on the opinionnaire appears in Appendix I, page 123. Answers checked by the students represented three degrees of feeling; (a) liked a lot; (b) liked some; and (c) disliked. Tallies were made for each category and for each question asked. The last question was open-ended. The open-ended question gave students the opportunity to write in their favorite teaching method. A copy of the opinionnaire may be found in Appendix I, page 123.

Each of the sixteen students in Groups II and III responded to every question on the opinionnaire. Data obtained from the opinionnaire was concerned with how the student liked or disliked the program. Seventy percent of the students liked the program a lot and 27 percent liked it some. Three percent of the students indicated a total dislike for the program method of learning. The opinionnaire summary data for Groups II and III are presented in Appendix I, page 123. Only 14 percent of the students wanted an entire course programed, compared with 86 percent that wanted teacher lecture sometimes. Forty-one percent of the students expressed the desire to use the programed method again sometime and 59 percent would

like to use it often. Thirty-one percent of the 29 students had never used programed instruction before. When given the opportunity to identify their favorite teaching method, 45 percent listed programed instruction, 14 percent listed lecture, 10 percent listed demonstration, 14 percent discussion, 10 percent panel discussion. Two students listed outside reports as a favorite method of learning.

With reference to appropriateness of the program for the sample's background, data indicated that it was very appropriate. The pace of the program was considered very good and the step-size seemed appropriate for the sample. Seventy-three percent of the students indicated that they would recommend the program to other students, 24 percent would recommend it sometime and 3 percent would not recommend it at all.

The favorable opinion toward programed instruction may be explained in part by the fact that programed instruction was a new experience for the majority of the participants in the study. The novelty of participating in research appealed to some, particularly to the home economics majors in Group III.

Summary

This chapter has presented the findings of the present investigation resulting from the development of programed components in textiles as interpreted according to the (a) post-test gain, (b) frame rates per minute, (c) proportions of responses expressed as

percentages and (d) Mann-Whitney U Test. The statistical analysis of the study involving achievement in textiles disclosed that the group using programed instruction scored significantly higher than the group using the traditional lecture method of teaching; it further revealed a trend favoring programed instruction as a method of learning. The writer rejected the hypothesis that was formulated.

Chapter V will present the summary, conclusions and recommendations of the study based on these findings.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The major purpose of this study was to develop programed instructional components in textiles for use with undergraduate students. The objectives of the study were: (1) to examine and review information gained from the writer's teaching experience in textiles, and to identify some of the problem areas; (2) to study and become knowledgeable of the theories behind programed instruction; (3) to develop formal skills and techniques required for effective programing and analysis; (4) to develop programed instructional components over selected concepts in textiles; (5) to determine the effectiveness of the developed programed instructional materials; (6) to develop and administer a pre-test and a post-test for the programed instructional components; (7) to compare the students' test scores resulting from the traditional lecture method of teaching textiles with the students' test scores resulting from the use of the developed programed instructional components; and (8) to ascertain the students' opinions toward programed instruction as a means of learning.

The concepts delineated for programing were textile legislation, textile labeling, and textile fiber families. The linear mode was the programing technique utilized. The program was designed for freshman or sophomore level undergraduate students with little or no background in textiles.

The developmental process involved the selection of concepts, the formulation of behavioral objectives, writing the criterion test items and writing the program. The program was tested in segments during development. The testing cycle included one-to-one testing, utilizing nine students from the population, the small group test was repeated three times using a total of forty-one subjects. On the basis of the program, response errors, post test errors and individual reactions of students, revisions were made and the program re-tested. This process was repeated until the group mean reached 89.15, a point at which the researcher deemed was close enough to the pre-set 90/90 standard. The program had satisfactorily met one of the standards and the data gave some indication of the programs' proficiency.

A list of questions submitted to the students indicated that the sample had favorable opinions about the method. Some of the group were experiencing programed instruction for the first time.

The Mann-Whitney U analysis was employed to test the null hypothesis that there would be no significant difference in achievement scores of students taught by the traditional lecture method and

in achievement scores of students using the programed method. The difference was found to be significant above the 0.01 level of confidence, the null hypothesis was rejected in favor of the programed method.

Conclusions

On the basis of this developmental study, the following conclusions were drawn:

1. Programed instruction seemed to be an effective method for teaching textiles.

2. Effective learning resulted from utilizing programed materials in textiles; programed materials could probably be put to effective use in other areas of textiles.

3. Instructors should explore the possibility of developing programs in their own subject-matter area.

4. More research is needed to determine the extent to which learning is retained.

5. More research is needed on the extensive use of programed instruction in a structured classroom situation to determine how it would affect the outcomes.

6. Programed instruction, after development, does save time for both the teacher and the student.

7. Since motivation seems to be of importance in the learning situation, the teacher's role seems to be emphasized rather than minimized when using programed instruction.

8. Students in the sample had a favorable opinion toward the programed method of learning.

Recommendations

On the basis of the findings in this study, the writer makes the following recommendations:

1. Further investigation needs to be done; the value of using programed materials in textiles versus the adopted textbook.

2. An example of an actual program should be included in the directions to the students.

3. A seperate answer book for student responses should be developed, so that the program can be re-used.

4. The home economics teacher needs to be trained in the development of programed materials, and given released time to develop programs.

5. Feasibility studies are needed to determine the effectiveness of the use of programed materials in conjunction with other teaching aids for use in textile laboratory situations.

6. It is recommended that this study be expanded to include one semester of course content that might be used in a learning resource center, tutorial laboratory or a consumer information package.

7. Final recommendation is that the program developed for this study undergo further revisions, since all segments of it did not meet the set standard, and then be submitted to field testing.

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APPENDIX A

INTERVIEW SCHEDULE FOR DETERMINING PROBLEMS AND ATTITUDES ABOUT TEXTILE COURSES*

1. Have you encountered any major problems in your textile teaching experience?

2. If so, what were these problems?

3. How would you describe your students attitude about textiles when they entered the course?

4. Have you formulated any specific reasons for their attitude?

5. Did their attitude, in your opinion, change by the end of the course?

6. Do you feel the need for change in activities and/or methods in teaching textiles?

7. What method of teaching would you suggest?

8. Which concepts would you prefer to present by your suggested method?

9. Do you know where you can find these materials available?

10. Would you use prepared materials in your classes?

*Used with five Oklahoma textiles teachers

APPENDIX B

CONCEPTS AND GENERALIZATIONS FOR TEXTILES*

I. Significance of textiles to the individual in society.

:: Textiles in the economy

1. Production and distribution of textiles influence consumption patterns of individuals and families.

2. Methods and risk involved in the production and distribution of textiles influence the quality, cost and availability to the consumer.

3. The textile industry is affected by the consumption patterns of individuals and families.

   a. Producers and distributors adjust the quality of textile merchandise to the amount of money consumers will spend.

   b. Political, social, psychological, and geographic factors influence what is produced in the textile industry.

4. The welfare of society may be affected by economic decisions of the textile industry, governments, and consumers.

5. The comfort of textile products is influenced by fabric, finish, construction, and style, and the subility of these for various activities.

6. The physical condition of the human body influences the type of clothing and textiles selected.

II. Nature of textiles

1. Textiles are products of fiber and/or yarn, fabric construction, and finish.

2. Each fiber has physical and chemical properties which affect its performance in a fabric.

    a. Fibers vary in such properties as length, luster, resiliency, strength, and crimp, and also in their reaction to such conditions as light, moisture, temperature, and stress.

    b. Some characteristics of fibers may not be retained in the finished fabric if blended or combined with other fibers or modified during some stage in the manufacturing process.

    c. Fibers may be modified both chemically and physically to produce desirable characteristics for specific end uses.

3. Differences in yarns result from variations in ply, twist, count, weight, crimp, texturizing processes, and other design variations.

4. The characteristics of yarns produce variation in fabrics with respect to texture, design, function, and end use of the fabric.

5. Fibers and/or yarns may be converted into cloth by various methods such as weaving, knitting, knotting, interlacing, bonding, felting, extruding.

6. Fabric construction is a determinat of the properties of the end product; fabrics produced by different methods have definable characteristics.

7. Finishes may be applied to fabrics to produce and control desired qualities.

8. Factors influencing the choice of finish for a fabric are: the type of fiber and its arrangement in yarn and fabric, the receptivity of the fabric to various finishing preparations, the extent to which the fabric can be chemically modified, and the use for which the fabric is intended.

9. The finished textile will give more satisfactory service when the characteristics of the fabric are compatible with intended end use.

10. Knowledge of the physical and chemical characteristics of textiles and clothing helps individuals and families predict their performance and gain increased satisfaction from selection, use, and care.

III. Acquisition and use of textiles

:: Selection

1. The resources available for meeting textile needs include available goods and services, purchasing power, personal information, ability, time, and energy.

2. The availability and use of resources for achieving textiles are related to the allocation of resources to other individual and family goals.

3. The information provided by agencies and industry through such means as labels and advertising is one resource which may assist the consumer in predicting the performance of textiles.

:: Use and care

1. The suitability of a textile product for its intended use is dependent upon the nature of the textile, its design, and its construction.

2. The utilization of a textile product is related to the care needed and the facilities available for providing that care.

3. The type of care needed by the product will be determined by the nature of the textile, construction, and ornamentation.

:: Responsibilities of consumers

1. The consumer can improve production and distribution of textiles and clothing by communicating needs, wants, satisfactions, or dissatisfactions to the retailer and the manufacturer.

2. The consumer's purchase of any item of clothing denotes to the retailer or manufacturer approval of the item.

3. The return of items that are unsatisfactory to the consumer is one way of communicating with retailers and manufacturers.

4. The concerted effort of consumers can bring about improved standards of clothing products and increased consumer information.

5. Full utilization of resources and fulfillment of social responsibility require knowledge of, and adjustment to, social and technological change.

* Selected concepts from American Home Economics Association Report (1967).

COURSE OUTLINE

INTRODUCTORY TEXTILES

The Introductory Textiles Course - Home Economics 1113

Introduction

- The History of Textiles
- An Overview of the Industry
- How Textiles Relates to World Economy
- Textile Legislation
- Textile Labeling

Textile Fibers

- Fiber Theory
- Fiber Classification and Identification
- Natural Cellulosic Fibers
- Man-Made Cellulosic Fibers
- Natural Protein Fibers
- Man-Made Protein Fibers

Yarn Structure

- Yarn Construction
- Complex Yarns
- Textured Yarns

Fabric Construction

- Felt and Nonwoven Fabrics
- Knitted Fabrics
- Woven Fabrics
- Engineered Yarns and Fabrics

Fabric Finishes

- General
- Special

- Dyestuffs
- Design
- Color

Fabric End-Use

- Fiber, Yarn, and Fabric Geometry
- Factors in Selection, Use and Care
- Fabric Performance
- The Consumer Responsibility

EDUCATIONAL OBJECTIVES FOR INTRODUCTORY TEXTILES

Generalization:

The better the understanding that students have of textiles and its language, the easier it will be for them to evaluate product performance, to complain when the product does not measure-up and to recognize and exercise their responsibility for the use and care of items purchased.

The researcher's objectives of the course were:

I. To give an overview of the textile industry so that consumers will understand production as well as consumer problems and will have a greater appreciation for past developments as well as a broad concept of future possibilities in the field.

II. To develop a realization of the importance of textiles in everyday living.

III. To develop an appreciation of the rapid growth and importance of the textile industry today.

IV. To teach basic facts that can be applied to textile fibers, fabrics and end-use performance in order that new textile products can be purchased and used more intelligently and with greater satisfaction.

V. To provide information leading to the best use of textile products by the consumer in terms of his own particular pattern needs.

VI. To develop a workable vocabulary of the field.

VII. To evaluate the students performance according to the objectives.

BEHAVIORAL OBJECTIVES FOR LECTURE AND PROGRAMED COMPONENTS

Upon finishing the programed unit in textiles, the student should without assistance, be able to:

Define in writing the common textile terms found in the program.

Discuss in writing the meaning of the textile laws associated with textile fibers and fur.

Identify in writing the various types of legal protection in the area of labeling.

Interpret the information found on hang tags, bolt ends and labels.

Recognize by sight six synthetic families of fibers.

Recognize by sight the generic or last name of these six synthetic families of fibers.

Identify by picking out on labels the tradename of fibers indicated on a hang tag.

Differentiate the performance characteristics common to natural fibers.

Name and describe the four major natural fibers.

Distinguish between the two outstanding characteristics of natural fibers.

Identify in writing two out of four of the transitional fibers.

Identify in writing four out of six of the synthetic fibers.

LIST OF RESOURCES USED IN THE DEVELOPMENT OF THE PROGRAMED UNIT IN TEXTILES

American Home Economics Association. Concepts and Generalizations: Their Place in High School Home Economics Curriclum Development, Report of a National Project, 1967,

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APPENDIX C

SAMPLE OF PROGRAMED COMPONENTS

PART I

When the word textile is used with the term fiber it refers to any product capable of being made into fabric. Any product capable of being made into fabric is called a _ _ _ _ _ _ _.

******

Textile

Products capable of being woven or otherwise made into fabrics are called textile fibers. When fibers can be woven into fabrics they are called _____ _____. (two words)

******

Textile Fibers

Textile fibers are any product that is capable of being made into fabric. Textile fibers are products that can be made into _ _ _ _ _ _.

******

Fabric

Just to see how you are remembering, answer this question in your own words:

What is a textile? _____

_____

******

A textile refers to any product that can be woven or otherwise made into fabric. (OR EQUIVALENT ANSWER)

SAMPLE OF PROGRAMED COMPONETS

PART II

Textile performance is influenced by the general characteristics of fiber families and the unique personalities of individual fibers. Consumers need to understand these properities so they can make choices on the basis of what they expect from the fabric or garment.

All textile fibers fall into one of three categories: The catagories are:

Natural
Transitional
Synthetic

The three categories of textile fibers are:

a. _____
b. _____
c. _____

******

Natural - Transitional - Synthetic

One of the categories into which textile fibers may fall are natural. We will study this one first. A natural fiber is one of natural origin (obtained from nature). The major natural fibers are: Cotton - Linen- Wool - and Silk. These four fibers are of _ _ _ _ _ _ _ origin.

******

Natural

Cotton-- is obtained from the boll of the cotton plant.
Wool-- is obtained from the hair of the sheep or lamb.
Linen-- is obtained from the stem of the flax plant.
Silk-- is obtained from cocoons that are spun by silk worms.

All of these textile fibers are of natural origin. They all occur in _____ sources.

******

Natural

The natural fibers absorb moisture and withstand high temperatures. These are their two outstanding characteristics. Another way to say it is, natural fibers are hydrophillic - which means they love water, and thus are absorbent, Natural fibers can be ironed at high heat setting on the iron. Two major characteristics of natural fibers are; they are hydrophillic and they can withstand _____ _____.

******

high temperatures

The love of water means hydrophillic. Hydro- means water, Phillic- means love. Natural fibers love water, they can be said to be Hydro_ _ _ _ _ _ c, which means love of water.

******

Phillic

Natural fibers do absorb water, they also can withstand high _____.

******

temperatures

The natural fibers occur in natural sources. The name of the natural fibers are _____, _____, _____, and _____. They absorb moisture and withstand high temperatures.

******

Cotton, Wool, Silk, Linen

In summary, natural fibers are:

1. comfortable in warm weather
2. may shrink or stretch during laundering
3. slow to dry
4. easily wrinkled but can be pressed out with a hot iron.

These are the characteristics that natural fibers have in common (or alike). List the four common characteristics of natural fibers.

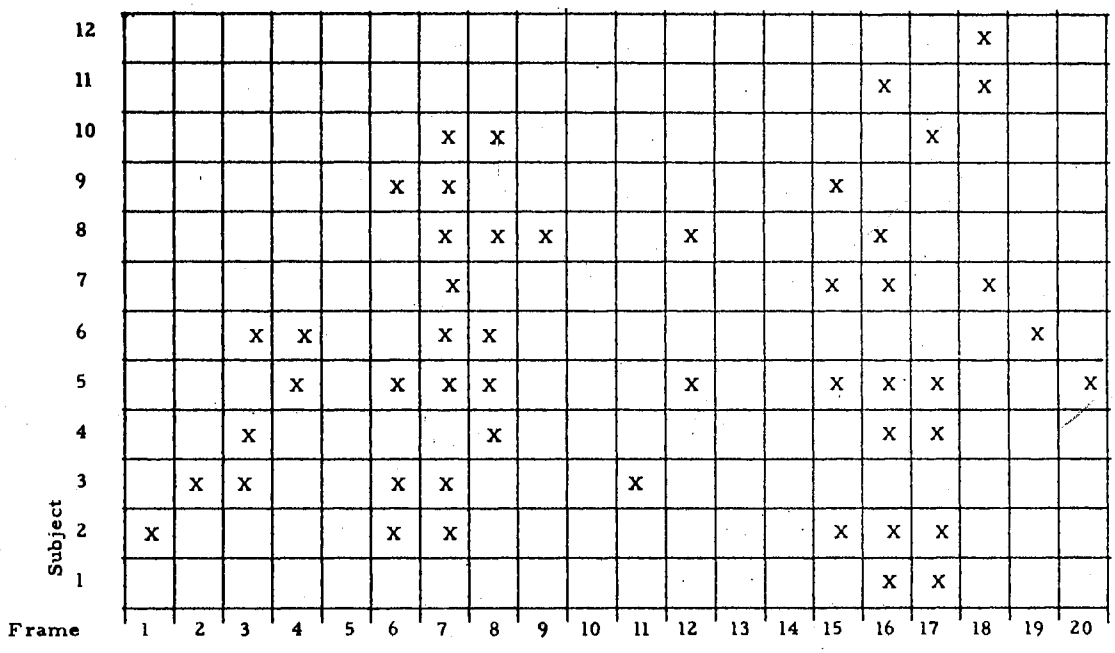
1.
2.
3.
4.

******

1. comfortable in warm weather
2. may shrink or stretch during laundering
3. dry slowly
4. may wrinkle but can be pressed with a hot iron (OR EQUIVELANT ANSWER)

APPENDIX D

SAMPLE OF FRAME ANALYSIS SHOWING CLUSTERS OF MISSES OF STUDENTS USING PROGRAMED COMPONENTS IN TEXTILES



APPENDIX E

ERROR RATES ON FRAME RESPONSES

GROUP II

Subject	Errors on frame responses: Total error		Error rate %*	
	Part I	Part II	Part I	Part II
1	2	7	3	13
2	14	12	20	22
3	7	6	10	11
4	1	6	1	11
5	5	8	7	15
6	6	10	9	18
7	2	2	7	4
8	8	6	12	11
9	5	5	8	9
10	13	15	19	27
11	6	11	10	20
12	2	5	7	9
13	13	11	19	20
14	3	5	4	9
15	12	8	18	15
16	6	12	10	22
Sum	105	129	164	236
Mean	6.56	8.06	10.25	14.12

* formulae-Mahilum (1971)

$$R = \frac{E}{A} \times 100$$

where: R = the individual error rate
E = the total error on responses
A = total correct possible responses

ERROR RATES ON CRITERION TEST

GROUP II

Subject	Errors on criterion test: Total error		Error rate %	
	Part I	Part II	Part I	Part II
1	2	7	8	23
2	14	12	53	40
3	7	6	27	20
4	1	6	3	20
5	5	8	19	23
6	6	10	23	33
7	2	2	8	7
8	3	6	11	20
9	5	5	19	17
10	13	15	50	50
11	6	11	23	37
12	2	5	8	17
13	13	11	50	37
14	3	5	11	17
15	12	8	46	23
16	6	12	23	40
Sum	100	129	382	424
Mean	6.25	8.06	23.93	26.50

TEST ITEM ANALYSIS FOR PROGRAMED COMPONENTS
IN TEXTILES FOR GROUP II

PART I

Item Number	Number Missed	% Correct
1	3	81
2	4	75
3	0	100
4	9	44
5	2	88
6	8	50
7	4	75
8	0	100
9	0	100
10	0	100
11	0	100
12	3	81
13	1	94
14	0	100
15	0	100
16	1	94
17	4	75
18	2	88
19	2	88
20	0	100
21	9	44
22	3	81
23	4	75
24	0	100
25	3	81
26	2	88

TEST ITEM ANALYSIS FOR PROGRAMED COMPONENTS
IN TEXTILES FOR GROUP II

PART II

Item Number	Number Missed	% Correct
1	2	88
2	11	31
3	3	81
4	2	88
5	1	94
6	1	94
7	1	94
8	7	56
9	1	94
10	1	94
11	4	75
12	9	44
13	5	69
14	7	56
15	2	88
16	1	94
17	7	56
18	1	94
19	1	94
20	1	94
21	3	81
22	0	100
23	0	100
24	4	75
25	2	88
26	4	75
27	8	50
28	6	63
29	6	63
30	6	63

APPENDIX F

RAW SCORES AND TIME, STUDENTS TAUGHT BY TRADITIONAL LECTURE METHOD

Subject	Test Score	Time/Hours
1	87	7
2	60	7
3	63	7
4	90	7
5	79	7
6	59	7
7	59	7
8	17	7
9	45	7
Sum N = 9	559 $\bar{M}$ = 62.11	63

APPENDIX G

TABLE OF SPECIFICATIONS FOR PROGRAMED COMPONENTS IN TEXTILES

Subject-matter topic	Behavioral Changes			
	Recall of information %	Understanding of concepts %	Application in new situations %	Total %
Definition of terms	15	13	2	30
Textile legislation	10	10	0	20
Textile labeling	5	5	0	10
Fiber families	3	4	13	20
Unique personalities of fibers	2	3	15	20
Total	35	35	30	100

DISTRIBUTION OF TEST ITEM TYPE AND WEIGHTS

Type of Test Item	Part I	Part II	Combined total	%	Item Number Part I	Item Number Part II
True-False	15	20	35	70	1-15	1-20
Multiple-Choice	10	10	20	20	16-25	21-30
Matching	1	0	1	10	16	0
Totals	26	30	56	100	26	30

BREAKDOWNS IN PERCENTAGES OF BEHAVIORAL CHANGES AND SUBJECT-MATTER TOPICS

Breakdown	%
I. Behavioral changes	
1. Ability to recall information	35
2. Understanding of basic concepts and principles	35
3. Ability to apply the information, concepts and principles in new situations	30
Total	100
II. Subject-matter topics	
1. Definition of common textile terms	30
2. Specific textile legislation	20
3. Labeling in textile products	10
4. Characteristics of fiber families	20
5. Unique personalities of individual fibers	20
Total	100

APPENDIX H

PRE AND POST-TEST

PART I

Directions: Read the statement carefully. Decide whether or not the statement is "true" or "false". Write T in the blank if it is true and F if it is false. (T and F)

_____ 1. Any product capable of being woven into fabric is a textile.

_____ 2. Textile fibers become fabric after they are woven.

_____ 3. A standard is the goal or measure of the adequacy of a product.

_____ 4. Textile products are standards.

_____ 5. When textile standards are enacted by the United States Congress they become law.

_____ 6. The American Standards Association sets voluntary standards.

_____ 7. The American Standards Association is the agency that enforces the consumer legislation enacted by Congress.

_____ 8. Labeling provides that mandatory or forced, fiber content by percentages be stated on the label.

_____ 9. A fabric composed of one single fabric is a blend.

_____10. The generic name is the last name of a fiber family.

_____11. The register mark follows the first or trade name of fibers.

_____12. Flammable fabrics are those that will not burn.

_____13. If a label states that a fabric is pure or 100%, that means it is a blend.

_____14. Synthetic fibers are man-made manufactured fibers.

_____15. Fabric bolt ends, labels and hang tags all carry basically the same kind of information.

Directions: Read the statement carefully and then circle the letter in front of the best answer.

16. The laws that require textile products to be identified as to fiber content, size, use and care are called:

    a. Regulations
    b. Procedures
    c. Standards
    d. Classifications

17. When groups in the textile industry establish standards on their own for their own use, they are _____ standards.

    a. Mandatory
    b. Approved
    c. Adopted
    d. Voluntary

18. The organization that provides the framework for approving standards is known as:

    a. American Standard
    b. Federal Trade Commission
    c. American Standards Association
    d. Consumer Protection

19. Textile standards have to be enacted by Congress to become

    a. Fibers
    b. Law
    c. Regulations
    d. Marketable

20. If you had a major complaint of some textile product, to get legal help would you

    a. Get rid of the product
    b. Tell your neighbor
    c. Tell the American Standards Association
    d. Tell the Federal Trade Commission

21. The labeling act that constitutes "truth-in-fabrics" and "truth-in-furs" is the labeling act called:

    a. Textile Fiber Identification of 1960
    b. Fur Products Labeling Act of 1951
    c. Wool Products Labeling Act of 1939
    d. Flammable Fabrics Act of 1953

22. Which of the illustrations below shows the correct arrangement for fiber identification and register mark on labels?

    a. 65% Polynosic (R) Rayon
    b. Combed (R) Cotton
    c. Cotton Poplin (R)
    d. (R) DuPont Trademark

23. Which illustration correctly identifies a register mark?

    a. 65%
    b. 35% Rayon Acetate
    c. 30% Dacron (R) Polyester
    d. 100% Wool (R)

24. If a label reads 58% cotton, 40% rayon, what should the percentages of the other fiber be?

    a. 2%
    b. 10%
    c. 5%
    d. 20%

25. Which one in the list is <u>not</u> a piece of textile legislation that has been enacted by Congress to protect the manufacturer as well as the consumer?

    a. Fur Products Labeling Act
    b. Flammable Fabrics Act
    c. Hatch Act
    d. Textile Fiber Identification Act

26. The six major generic families of synthetic fibers include which <u>THREE</u> of the following?

    a. acrylic
    b. glass
    c. spandex
    d. linen

27. Fibers in the acrylic generic family are fur-like and are used in imitation fur, which characteristic below is NOT true of acrylics?

    a. are light weight
    b. feel like wool
    c. rubbing causes little balls or pills
    d. are very absorbent

28. Which unique characteristic is NOT true of glass fibers?

    a. not affected by sunlight
    b. are not brittle
    c. needs careful washing
    d. will not burn

29. Which of the following statements DO NOT describe the nylon fiber?

    a. absorbs water easily
    b. needs to be rinsed thoroughly to prevent greying
    c. absorbs colors of other fibers
    d. very strong fiber

30. Spandex is a synthetic generic fiber family that DOES NOT have ONE of the qualities below, which one is not a spandex quality?

    a. returns to shape quickly after stretching
    b. is not weakened by perspiration
    c. is always used with other fibers
    d. does not have continuous bounce.

PRE AND POST-TEST

PART II

Directions: Read the statement carefully. Decide whether or not the statement is "true" or "false". Write T in the blank if it is true and F if it is false. (T and F)

_____ 1. The three categories into which natural fibers fall are natural, transitional, and synthetic.

_____ 2. Natural fibers do not absorb moisture.

_____ 3. Hydrophillic means water absorbent.

_____ 4. The natural fibers are wool, cotton, silk and polyester.

_____ 5. Common characteristics of fibers, means like characteristics of fibers.

_____ 6. The natural fibers occur in natural sources.

_____ 7. Wool fibers are curly and warm.

_____ 8. Cotton is a warm fiber.

_____ 9. Silk is the natural fiber of regal elegance.

_____10. Transitional fibers are those fibers that are man-made from cellulose and engineered to performance desired.

_____11. Transitional fibers are part natural and part man-made.

_____12. Rayon is a weak fiber.

_____13. High modulus rayon is a first generation rayon.

_____14. Acetate is a very coarse fiber.

_____15. Modacrylic fibers soften at low temperatures.

_____16. The man-made transitional fiber that can be softened by heat is triacetate.

_____17. Unique characteristics of fibers are those that are alike.

_____18. Acrylic fibers are kitten soft.

_____19. Trade names of fibers are first names.

_____20. A generic name of a fiber is the first name.

Directions: Read the statement carefully and then circle the letter in front of the best answer.

21. One of the categories into which all textile fibers fall are

    a. fiber
    b. natural
    c. polyester
    d. original

22. Which of the following is a transitional man-made fiber?

    a. cotton
    b. wool
    c. acetate
    d. linen

23. Which of the following is a natural fiber of natural origin?

    a. cotton
    b. acetate
    c. triacetate
    d. rayon

24. If fibers are said to be hydrophobic they

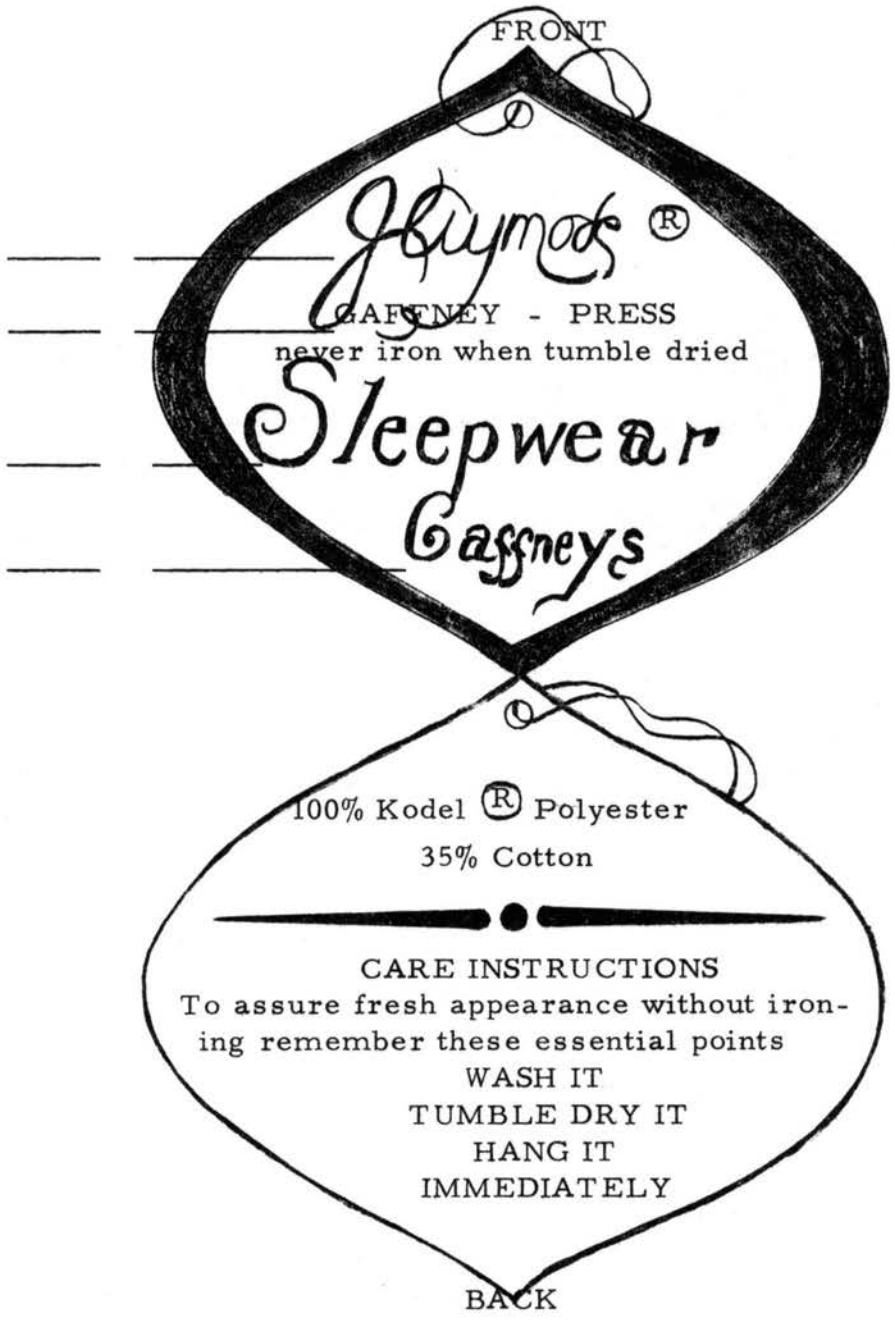
    a. love water
    b. fear water
    c. will burn
    d. will not burn

25. If fibers are thermoplastic they

    a. fear water
    b. are very absorbent
    c. are not affected by heat
    d. soften at high temperature

26. Study the label below. From the list given, choose the word or phrase that best identifies the information on the label and write the letter to the left of the word in the proper blank on the label. All letters should be used only once.

_____a.	Brand Name	_____e.	Fiber Trade Name
_____b.	Care Instructions	_____f.	Finish
_____c.	Generic Fiber Family	_____g.	Retailer or Manufacturer
_____d.	Fiber content	_____h.	Register Mark



_____ _____

_____ _____

_____ _____

_____ _____

APPENDIX I

OPINIONNAIRE AND RESULTS

GROUP II AND GROUP III

DO NOT SIGN YOUR NAME

To aid in determining your attitude toward this method of learning, PLEASE place a check in the blank to the left of the statement that best describes your real feeling about this program.

N=29	N	%
1. Which of the following best describes your like for this method of learning?		
_____(A) Like a lots	20	70
_____(B) Liked some	8	27
_____(C) Disliked	1	3
2. Which of the following best describes your feelings?		
_____(A) Would rather have all of the course by this method	4	14
_____(B) Would rather have the teacher lecture	0	0
_____(C) Would rather have the teacher lecture sometimes	25	86
3. Have you ever used programed instruction before?		
_____(A) Often	1	3
_____(B) Sometime	19	66
_____(C) Never	9	31
4. Would you like to have the opportunity to learn more information by this method?		

N=29	N	%
_____(A) Often	17	59
_____(B) Sometime	12	41
_____(C) Never	0	0

5. Do you feel that the program was appropriate to your educational background?

_____(A) Very appropriate	21	73
_____(B) Somewhat appropriate	7	24
_____(C) Not at all appropriate	1	3

6. Do you feel that the program moved at the proper speed or pace for you?

_____(A) Very much	21	73
_____(B) Sometime	8	27
_____(C) Not at all	0	0

7. Were the steps of information the right size for you?

_____(A) Very much	22	76
_____(B) Some	7	24
_____(C) Not at all	0	0

8. Would you recommend this program to other students?

_____(A) Would recommend very much	21	73
_____(B) Would recommend some	7	24
_____(C) Would not recommend at all	1	3

9. Circle the teaching method or methods you would prefer to be used in your classes most of the time. If your favorite method is not listed, write it in the space provided.

_____(A) Lecture	4	14
_____(B) Discussion	4	14
_____(C) Programed lessons	13	45
_____(D) Demonstration	3	10
_____(E) Panel discussions	3	10
_____(F) Case studies	0	0
_____(G) Reports	2	7
_____(H) Outside reading	0	0

N=29	N	%
_____(I) Outside speakers	0	0
_____(J) _____	0	0
_____(K) _____	0	0
_____(L) _____	0	0

APPENDIX J

RAW SCORES FROM PROGRAMED TEXTILE COMPONENTS PARTS I AND II

GROUP II

Subject	Pre Test Score	Post Test Score	Gain	% Gain	Time Minutes to Complete
1	63	86	23	.62	76
2	61	69	8	.21	83
3	71	85	14	.48	76
4	62	88	26	.68	60
5	75	82	7	.28	84
6	64	75	11	.31	91
7	77	94	17	.74	85
8	70	85	15	.50	78
9	68	85	17	.53	80
10	62	68	6	.16	113
11	65	75	10	.29	73
12	75	90	15	.60	66
13	61	69	8	.21	99
14	61	87	26	.67	98
15	51	83	32	.65	68
16	63	72	9	.24	75
Means	65.50	80.80	15.25	44.81	81.55

Range of Post Test Scores 68-94

Range of time required to complete 60-113

N = 16

APPENDIX K

COMPLETION TIME REQUIRED (MINUTES) FOR FRAMES RATE/SECONDS MADE BY STUDENTS USING PROGRAMED COMPONENTS

GROUP II

Subject	Total Time Used Part I	Frame Rate/Seconds Part I	Total Time Used Part II	Frame Rate/Seconds Part II
1	46	40.60	30	32.72
2	54	47.64	29	31.64
3	49	43.23	27	29.45
4	40	35.29	20	21.81
5	44	38.82	40	43.63
6	56	49.41	35	38.18
7	57	50.29	28	30.55
8	50	44.11	28	30.55
9	50	44.11	30	32.72
10	72	63.52	41	44.73
11	45	39.70	28	30.55
12	39	34.41	27	29.45
13	70	61.76	29	31.64
14	54	47.64	44	48.00
15	50	44.11	18	19.63
16	50	44.11	25	27.27
Sum	776	728.75	749	522.52
Mean	48.50	45.55	29.90	32.66

N = 16

APPENDIX L

RAW SCORES FROM PROGRAMED TEXTILE COMPONENTS PARTS I AND II

GROUP III

Subject	Pre Test Score	Post Test Score	Gain	% Gain	Time Minutes to Complete
1	64	94	30	.83	65
2	61	90	29	.74	72
3	47	96	49	.92	70
4	49	90	41	.80	61
5	51	89	38	.78	69
6	55	80	25	.56	78
7	63	90	27	.73	77
8	70	98	28	.93	65
9	61	81	20	.51	60
10	67	97	30	.91	61
11	51	87	36	.73	80
12	50	82	32	.64	61
13	51	85	34	.69	79
Means	56.92	89.15	32.23	75.07	69.70

Range of post test scores 80-98

Range of time required to complete 60-80 minutes

N = 13

APPENDIX M

ACHIEVEMENT TEST FOR TRADITIONAL LECTURE METHOD

Directions: Read the statement, decide whether or not the statement is "true" or "false". Write T in the blank if it is true and F if it is false.

_____ 1. Any product capable of being woven into fabric is a textile.
_____ 2. Textile fibers become fabric after they are woven.
_____ 3. A standard is the goal or measure of the adequacy of a product.
_____ 4. Textile products are standards.
_____ 5. When textile standards are enacted by the United States Congress they become law.
_____ 6. The American Standards Association sets voluntary standards.
_____ 7. The American Standards Association is the agency that enforces the consumer legislation enacted by Congress.
_____ 8. Labeling provides that mandatory or forced, fiber content by percentages be stated on the label.
_____ 9. A fabric composed of one single fabric is a blend.
_____10. The generic name is the last name of a fiber family.
_____11. The register mark follows the first or trade name of fibers.
_____12. Flammable fabrics are those that will not burn.
_____13. If a label states that a fabric is pure or 100%, that means it is a blend.
_____14. Synthetic fibers are man-made manufactured fibers.
_____15. The three categories into which natural fibers fall are natural, transitional, and synthetic.
_____16. Natural fibers do not absorb moisture.
_____17. Hydrophillic means water absorbent.
_____18. The natural fibers are wool, cotton, silk, and polyester.
_____19. Common characteristics of fibers means like characteristics of fibers.
_____20. The man-made transitional fiber that can be softened by heat is triacetate.
_____21. The natural fibers occur in natural sources.
_____22. Wool fibers are curly and warm.
_____23. Cotton is a warm fiber.
_____24. Silk is the natural fiber of regal elegance.
_____25. Acetate is a very coarse fiber.

_____26. Transitional fibers are those fibers that are man-made from cellulose and engineered to performance desired.
_____27. Transitional fibers are part natural and part man-made.
_____28. Rayon is a weak fiber.
_____29. High modulus rayon is a first generation rayon fiber.
_____30. Modacrylic fibers soften at low temperatures.

Directions: Read the statement carefully and then circle the letter in front of the best answer.

31. One of the categories into which all textile fibers fall are

a. fiber
b. natural
c. polyester
d. original

32. Which of the following is a transitional man-made fiber?

a. cotton
b. wool
c. acetate
d. linen

33. Which of the following is a natural fiber of natural origin?

a. cotton
b. acetate
c. triacetate
d. rayon

34. If fibers are said to be hydrophobic they

a. love water
b. fear water
c. will burn
d. will not burn

35. The laws that require textile products to be identified as to fiber content, size, use and care are called

a. regulations
b. procedures
c. standards
d. classifications

36. When groups in the textile industry establish standards on their own for their own use, they are_____standards.

    a. Mandatory
    b. Approved
    c. Adopted
    d. Voluntary

37. The organization that provides the framework for approving standards is known as

    a. American Standard
    b. Federal Trade Commission
    c. American Standard Association
    d. Consummer Protection

38. Textile standards have to be enacted by Congress to become

    a. Fibers
    b. Law
    c. Regulations
    d. Marketable

39. If you had a major complaint of some textile product, to get legal help would you

    a. Get rid of the product
    b. Tell your neighbor
    c. Tell the American Standards Association
    d. Tell the Federal Trade Commission

40. The labeling act that constitutes "truth-in-fabrics" and "truth-in-furs" is the labeling act called

    a. Textile Fiber Identification 1960
    b. Fur Products Labeling Act of 1951
    c. Wool Products Labeling Act of 1939
    d. Flammable Fabrics Act of 1953

41. The segment of government that enacts laws relating to textiles is called

    a. Congress
    b. Senate
    c. Judiciary
    d. House of Representatives

42. Which of the illustrations below shows the correct arrangement for fiber identification and register marks on labels?

    a. 65% Polynosic ® Rayon
    b. Combed ® Cotton
    c. Cotton Poplin ®
    d. ® DuPont Trade mark

43. Which illustration correctly identifies a register mark?

    a. 65%
    b. 35% Rayon Acetate
    c. 30% Dacron ® Polyester
    d. 100% Wool®

44. If a label reads 58% cotton, 40% rayon, what should the percentages of the other fiber be?

    a. 2%
    b. 10%
    c. 5%
    d. 20%

45. Which one in the list is not a piece of textile legislation that has been enacted by Congress to protect the manufacturer as well as the consumer?

    a. Fur Products Labeling Act
    b. Flammable Fabrics Act
    c. Hatch Act
    d. Textile Fiber Identification Act

46. The six major generic families of synthetic fibers include which THREE of the following?

    a. acrylic
    b. glass
    c. spandex
    d. linen

47. Fibers in the acrylic generic family are fur-like and are used in imitation fur, which characteristic below is NOT true of acrylics.

    a. are light weight
    b. feel like wool

c. rubbing causes little balls or pills
d. are very absorbent

48. Which unique characteristic is NOT true of glass fibers?

a. not affected by sunlight
b. are not brittle
c. needs careful washing
d. will not burn

49. Which of the following statements DO NOT describe the nylon fiber?

a. absorbs water easily
b. needs to be rinsed thoroughly to prevent greying
c. absorbs colors of other fibers
d. very strong fiber

50. Essay: In your own words

a. Write a definition for the term textiles
b. write a brief statement on the consumer's responsibility in textile regulations.

VITA

Doreatha Edwards Gaffney

Candidate for the Degree of

Doctor of Education

Thesis: THE DEVELOPMENT AND EVALUATION OF PROGRAMED INSTRUCTIONAL COMPONENTS FOR SELECTED CONCEPTS IN A COLLEGE TEXTILES COURSE

Major Field: Home Economics Education

Biographical:

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