San Fernando Valley State College

A STUDY OF THE EFFECTIVENESS OF A
SELF-INSTRUCTIONAL PROGRAM ON THE TEACHING
OF STILL LIFE PAINTING

A thesis submitted in partial satisfaction of the
requirements for the degree of Master of Arts in
Art
by
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The thesis of Edward Francis Lennert is approved.

Committee Chairman

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CHAPTER I

INTRODUCTION

This study proposes to deal with three main areas: (1) an investigation of the adaptability of programmed learning techniques to the field of art, (a) the creation of a programmed unit which will produce a positive gain in a student's artistic performance, (3) the testing of the program's validity, and (4) the implications for future programming of art in education.

NEED FOR THE STUDY

Vincent Lanier, Director of the NAEA Uses of Newer Media Project wrote:

Art educators do not seem to be aware of the newest and most innovative technological devices available in the media field, nor is the production of materials for these devices in adequate quantity to suggest that awareness, interest and experimentation will soon be forthcoming.(13:8)

These words were written in 1964 as part of an exploratory study on the uses of modern technology and materials in the teaching of art. Unfortunately the results of this national study made very little impact on those who are teaching art today. Educators in general, have not accepted the creative challenge of twentieth century technology. Art instructors, in particular, are perhaps the most suspicious as to the adaptability of their subject field to technology and
automation. This study is not concerned with all of the many avenues of exploration which technology has to offer, but rather with one aspect only - programmed learning. The principles of programmed learning have been a part of educational practice for centuries; perhaps starting with Socrates in the fifth century B.C. Today, we find that this form of teaching has been revitalized by the combined fields of psychology, education, science, and engineering. Within the past ten years mathematics and science have utilized programmed materials with astounding success. However, such prosperity may be due to the objective structure of these disciplines. Basic to the rejection of programmed materials by art educators is the belief that self-instructional units cannot develop a quantity as subjective as artistic performance. Is the art teacher really the magical force in the development of ability, or can artistic performance flourish without the teacher's guidance and assistance?

The insistence that art educators fear an intrusion into their private domain is a contradiction of the basic principles they profess. A child will instinctively reject many foods he has not tasted with the assertion that he does not like the food. It is the wise mother who succeeds in exposing her children to many foods in order that they develop their likes and dislikes from a multiplicity of experiences. Education is too often the complacent mother who feels the effort of encouragement too perplexing a struggle. It is this writer's contention that art educators who exalt creativity and experimentation should practice what they preach and become the leaders of educational innovation.
DEFINITION OF TERMS

Programmed Instruction, or Self-Instruction are identical names for the method of constructing the content of a subject in order that the learner may teach himself. Programmed instruction is basically designed to tutor the individual student on a one to one ratio.

A program is a sequence whereby:

1. The content to be learned is broken down into the smallest possible self-sufficient bits.
2. These bits are ordered in a developmental sequence.
3. Some type of active student response is required upon assimilation of each or a number of these bits.
4. Some type of feedback to pupil response, such as confirmation of response, is built into the program.
5. The program is carefully tested with an appropriate pupil population. (13:6)

The presentation of an instructional program may take on several formats; programmed booklets, booklets plus conventional audio-visual devices, teaching machines expressly designed for a specific approach, and computers. This study works within the framework of the second format.

Traditional teaching, as used in this study, denotes all teaching methods which are not programmed or conducted on an individual basis. Lecturing, demonstrating, using audio-visual aids, etc. would be considered traditional classroom approaches.
CHAPTER II

REVIEW OF THE LITERATURE

This chapter is composed of four sections: (1) a review of the theories and techniques of programmed instruction, (2) a review of programming, as it specifically applies to art, (3) a critique of the published programs, and (4) a biography of current researchers.

PROGRAMMED LEARNING

The theories behind programmed instruction are not unique to contemporary educational thought. Plato relates the story of how Socrates led an ignorant slave boy, Meno, to solve a complicated mathematical problem by applying the strategies we today call programmed instruction. Meno was led step-by-step in a question-answer sequence which proceeded from simple knowledge the boy understood, to a complicated mathematical objective. The key to Socrates' questioning technique was to involve the learner physically as well as mentally in responding to each question. The questioning method was not unique to Socrates. Historical references to questioning as a teaching procedure are numerous. The practical application of questioning is difficult because the procedure involves a thorough understanding of the knowledge to be taught, as well as a keen insight into how this knowledge can be segmented into digestible parts.

Early in the 1920's, psychologists rather than educators,
began to formulate learning theories which were first based on earlier experiments with animal learning. Such was the "stimulus-response" theory of E. L. Thorndike. In 1924, Sidney Pressey (18) expanded Thorndike's theories of a "stimulus-response-reinforcement" pattern of learning, which, in a sense, paralleled Socrates' questioning method. Like Socrates, Pressey felt that the learner must be immediately informed as to whether he was right or wrong. Pressey, using the technology of the twenties, constructed a multiple-choice testing device. This instrument was the forerunner of today's teaching machines and computerized instruction. However, Pressey's machines were too radical to stir up much more than amusement with the educators of the 1920's.

Three decades later, Dr. B. F. Skinner (22), an experimental psychologist from Harvard University, re-examined the theories of Pressey. In 1954 he published a paper in the Harvard Education Review, in which he supported Pressey's "stimulus-response-reinforcement"; the learner is made aware of his negative or positive progress immediately after giving his answer. Skinner's theories and leadership have dominated the field of programming to this day. Inspired and intrigued by Skinner's findings, investigators have gradually expanded the possibilities of programming. One such investigator, Norman Crowder, disagrees with Skinner's repeated cycle of "stimulus-response-reinforcement-stimulus," which gives only the right answer, without explanation or clarification of why a mistake may have occurred. Crowder (15:286) developed the "branching" system where a learner's reinforcement may be one of several answers. A
positive answer will direct him forward in the program; a negative answer will route him back through the material for remedial or review work. The presentation procedure is only a minute particle of the entanglement of factors which might influence any program. It is generally accepted that the majority of programs are successful tutors. How they teach is sometimes a mystery. Each step of the program, the stimulus, information question, the response by the student, the reinforcement process, has been subject to investigation, with little significant evidence as to the most important variable. Inconclusive findings have necessitated better and more efficient methods of investigation which are currently in progress.

PROGRAMMED ART

The Skinnerian linear system of programming, the most popular today advocates that the learning process is composed of units which are referred to as steps. These units contain a single concept or known truth. Specific knowledge can be comprehended by carefully following a planned sequence of instruction. This concept is not unique to modern day programming. Art education has for centuries followed the same pattern. The medieval guilds based their educational structure on a similar format. Developing skills, copying ancient artifacts, and imitating masters' styles were traditional activities which led young apprentices to the acquisition of artistic skills and knowledge. As journeymen, the students tested and experimented. Only after mastering the prescribed steps, were the students allowed to develop their own
particular approaches to art. Although this system dominated our
society from prehistoric times, the modern educator is opposed to
many of the above activities in varying degrees. Imitating recog-
nized masters is shunned as unimaginative, skill development is often
sacrificed for creative involvement, and copying is authoritatively
branded taboo.

The traditional "trade" approach to learning assumes that
there is a correct way of practicing art. This concept dominated
art education in the United States until the early 1900's. Fifty
years ago there was a right and a wrong way to draw or paint.
Aesthetic standards were well established by tradition; programming
art experiences would have undoubtedly met with universal approval
at this time. The acceptance of contemporary abstract art movements
and philosophies have made obsolete the old concepts of art training.
"Creativity" and "freedom of expression" are terms voiced often by
contemporary educators. Surrounded by today's automated world, many
educators are reluctant to relinquish the one quantity which they
believe the machine cannot successfully duplicate - the ability to
teach.

Programmed art instruction was present as early as 1850
when the "how-to-draw" concept appeared in our schools. Such early
systems contain elements basic to modern programming; the line and
shading elements of a picture were segmented in small steps, pro-
gressing from simple to complex, the student responded by imitating
these steps, he was assured of his satisfactory progress by checking
his work with the printed drawings, and on completion of the drawing
the student compared his work to the professional quality of the master craftsmen. This procedure is well known in today's "how-to-do-it" society. Although art education has snubbed this technique, the general public has adopted it whole-heartedly. Commercial enterprises have fostered its development and expanded the possibilities in many directions.

Coloring and tracing books have traditionally, yet reluctantly, comprised a large portion of the art curriculum. Teachers with little or no training find these experiences satisfy the time they must devote to art. An outgrowth of the coloring book was the development of the number painting in the early 1950's. By the end of the decade number painting kits were a traditional part of the American culture. Combining the "how-to-do-it" concept with the basic concepts of number paintings produced the craft kits, ranging from mosaic murals to intricate furniture kits. David W. Ecker suggests,

...these activities have an analogy to teaching machines in that they seek only to teach the correct response to fixed problems; to expect to find the right line color, shape or texture appropriate at each and every step; to discover the true artistic solution known by others before the student begins his work. (5:3)

All this supposedly kills creativity, yet, according to Ecker, this is not necessarily so. He writes, "To see a historically new extension in one's own or another's artistic behavior is the basis for calling it creative." (5:4) World War I gave dramatic impetus to twentieth century technology and industrialization. Both art and education were influenced by this event. In 1920, education
was not yet enthralled with technical achievements. Pressey's first teaching machines (1921-1924-1929) stimulated little more than amusement among this colleagues. At the same time, the direction of art was ironically channeled into a philosophy based on technology and science. The innovator of this philosophy was Walter Gropius, founder of the group and school known as the Bauhaus. Many of today's renowned craftsmen, designers, artists and architects were teachers or students at the Bauhaus school in Weimer, Germany. These individuals have contributed immensely to the aesthetic development of the twentieth century. The machine was not a "Frankenstein" to the Bauhaus. The machine was an intricate aspect of life and the individual had to learn to develop its potential. Many contraptions were devised to stimulate, motivate, and even teach art principles. These contraptions were, in some ways, prototypes of today's teaching machines.(2)

In 1962, the "single concept" film loop was introduced, along with the development of an eight-millimeter projector, which showed a cartridge film with a maximum time limit of four minutes. The short format of the film necessitated concise developmental sequences which presented information or demonstrated skills. Often the student was asked to do something; draw, paint, or mold. Here the similarity to formal programmed instruction ceases. The student is not reinforced with an answer or solution to the proposed artistic problem. With slight variations and programmed reinforcements, many single concept films can develop as excellent programmed instructional units.
PUBLICATIONS

During the past ten years, hundreds of programs have flooded the market. The fact that programmed learning can teach is now well established. The question today is no longer technology, how to make the machines, but what to put into the program; what to teach. Programs may vary in price, from dollar booklets to computer programs costing thousands of dollars. The capabilities of present technology border on the realm of science fiction. Many unbelievable machines lay idle because we do not have the program content to feed into them. In many ways, it is unfortunate that the developers of programs have been commercial and industrial personnel rather than educational personnel. Profits have often been more important than content. Many programs are inadequately tested before they reach the public. The programmed learning industry has doubled its profits every year since 1961. Most of the currently available programs are produced by subsidiaries of the larger educational and audio-visual companies. In the last ten years, many nationally-known companies have merged various sections of their plants in order to concentrate on educational packages. Education is the biggest industry in the United States and commercial enterprises have already captured a significant portion of that industry. Many educators feel that commercial enterprises dictate much of the content currently being taught. (23) Education is fighting a losing battle unless it is willing to accept the responsibility of leadership which it has relinquished so
willingly in the past.

A limited range of commercial programs are available in the
area of art. *Color and the Color Wheel* was developed for Hughes
Unitutor Publications by Corrigan Associates.(4) This program util-
ized a strict linear technique accompanied by numerous underlined
prompts and required written responses by filling in the blank spaces
of each sentence.

The Hughes program emphasizes the scientific aspect of color,
color mixing, and the color wheel arrangement. Unfortunately,
neither pre-tests nor post-tests are supplied nor is any artistic
experience required of the student. The program is available in
booklet form or may be used in the Unitutor, a simple teaching
machine.

The Graflex Corporation's *Introduction to Color Concepts*
by Florence Hayner (11) is a more complex statement of a true
programmed course. Set I teaches primary, secondary, and intermedi-
ate colors and culminates in a rather mediocre painting exercise.
Set II teaches hue, value, and intensity and terminates in a color
mixing experiment. The program in booklet form (18 pages, 65
frames) comes complete with a teacher's manual and a pre-test and
post-test. The publishers have accumulated data pertaining to error
rate, pre-test and post-test results and the reactions of individual
students.

Learning Incorporated (1) has devised a linear program called
*Art History* which uses frequent prompts, underlined concepts, and
completion type responses. The purpose of this program is to relate
factual information about periods in art history.

Encyclopedia Britannica (12) has developed a programmed course, Interior Decoration. Interior decoration principles are paralleled with the elements of art in explaining the basic concepts of good decorating. Learners are usually asked to respond to multiple-choice or completion type questions. The program consists of 1589 frames accompanied by numerous drawings and illustrations. The format may provide inspiration for more complicated programs utilizing similar subject content.

Programmed Instructional Press produced two programs in the art field, Programmed Drawing, and Form in Visual Art.

Programmed Drawing (10) includes six basic drawing concepts: location, size, surface lines, overlapping, shading and, foreshortening. The learner is asked to fill in the blank, complete sentences, and complete a drawing or create a composition. Reinforcement is supplied in the form of factual statements or drawings which illustrate answers. The subject development is uniquely sequenced. The presentation format will undoubtedly serve as a model for future booklets.

Although Form in Visual Art developed by Evan Lindguish (16) involves an enormous number of facts and concepts, it has presented them well. The result is a program booklet which teaches information relating to the Plastic Elements (color, space, texture, line and shape). The program should be most beneficial as review or remedial work. It is conceivable that sections of this booklet may be expanded to full program size. The format, presentation style,
questioning and reinforcements are well done.

The important contribution of the above programs is their published existence. Perhaps the efforts of these programmers will stimulate interest in the design and publication of more extensive programs for art. Appendix A contains examples of frames from these programs.

RESEARCH

A paper devoted to an extensive search for research papers on programmed learning in art would undoubtedly reveal a wealth of information. Research at the graduate or post-graduate level is extremely scarce, with less than a dozen individuals who have contributed to the literature. Only half that number have worked on action research. Two names who dominate the list of researchers are Lillian Quirke and David Ecker.

Lillian Quirke (20) was the first major contributor to a meaningful study which was concerned with art. As part of her doctoral program at Columbia University, she designed and tested a self-instructional program. The program she created was effective in producing better picture-making performances by junior high school students, and in influencing the student to make more extensive and creative use of materials. Quirke has written a number of short programs for use in a college design course she teaches. She feels self-instructional programs are an excellent method of achieving a minimal entering knowledge-level for all students. The programs she uses are intended as remedial or review work for all students,
with weak artistic backgrounds. The concepts which were taught in these programs are primarily factual knowledge with simple concepts. Quirke is currently investigating the use of computers in programming art. Appendix A contains a sample of her proposed computer program.

The possibilities of creating a complicated branching system are endless when using Computer Assisted Instruction (C.A.I.) systems.

David W. Ecker, Ohio State University, is the leading theorist of programmed learning in art. He has written numerous articles prophesying the use of programmed materials in art. Ecker has directed much of his writing towards the possibility of programming for creativity. He believes that certain levels of creativity may be successfully programmed, but at the same time, raises the age old question as to what creativity is. Several of Ecker's theories are presented in the remaining chapters and therefore will not be reviewed in this section.
CHAPTER III

PROCEDURE OF THE INVESTIGATION

This chapter consists of four sections: (1) the rationale for the development of the program, (2) the procedures which constituted the design of the program, (3) the testing conditions, and (4) the evaluation procedures.

RATIONALE

In order that a program be considered successfully meaningful to art education, it must impart a quantity which would be considered teachable only by human communication. Information, concepts, and skills do not present a real problem in programming. Although little actual work has been formulated in these areas, it is the general consensus that such areas could be successfully programmed.

The questionable area in programming art is creativity. Can a program teach creativity? This study is not concerned with the confusion of definitions which can confuse the term "creativity". In order that a program be of value to individual teachers, each must apply his own standards of what he feels a program should do or be. Does Lillian Quirke's program foster creativity when it positively changes the picture making performance of students? Does it not produce evidence of positive effects in an area believed to be teachable only by human communication? The degree and quality of change exhibited by the student's artistic performance determines the creativity of the art
work. It is safe to say that there are different levels of creativity. Although the learner may not be capable of functioning at what Munro (16) calls the "level of genius), there are numerous situations in which the student might act creatively. The term, act, is important because a learner may act creatively in one situation and yet not be considered a creative individual. In the broadest sense of the term, everyone is creative any time he discovers anything which is new to him, not new to the world, but simply new to him, as an individual.

David Ecker suggests,

...it may be possible to program answers to artistic problems which the child discovers for himself after prolonged effort. Only then is he shown the answers, i.e., shown to what degree his product is considered valuable by others (the programmer, adults, the teacher). Since it would be possible to develop a scale of qualities, ideas, techniques in art work representing successive artistic goals for children, we could 'shape' or reinforce only that behavior we consider educationally desirable. We need not work with the assumption that there is only one correct answer to each problem; we could program a range of appropriate answers to each problem. And as with learning about art through auto-instruction...programming self-learning in art would depend upon the principle of immediate reward - in this case, reward for further discovery.(6:14)

In the classroom this experimenter follows three basic procedures when dealing with art activities. The first procedure is the introduction and at this time the student draws, paints, builds, constructs, etc. Properly planned, a unit will be diverse enough to allow students to branch out in several directions.
The second procedure is the production. At any given time during production each or every student may have branched off in an entirely different direction. The art class is somewhat unique in that it can accept this diversity while still remaining structured. At this point the teacher counsels and guides the student toward the successful fulfillment of the objectives. The degree of communication between student and teacher is also individualized and dependent upon the student's needs.

The third procedure is evaluation. This juncture offers many possible avenues. The teacher often makes an objective judgment of the work and then assigns specific grades. In addition to the grade, a teacher may also critique the student's work. Students are sometimes asked to participate in evaluating their own and their classmate's work. This type of self-evaluation can be verbal or written.

OVERVIEW OF THE DESIGN AND CONTENT

The question arises, what aspects of the above three areas can or should be programmed? It is conceivable that all introductory activities can be programmed successfully. Application or programming techniques often used in other disciplines can be applied to the teaching of introductory activities. The advantages in doing so would be the flexibility that such a packaged program would offer the teacher. This way, students could begin a unit at any time, thus lessening the needless wait, busy work, and discipline problems usually associated with idleness. Remedial sections can supplement the main program as a help to students deficient in a particular
sub-area. For instance, when painting still life objects the student needs to be familiar with compositional factors, color-mixing, painting, techniques, etc., by following a programmed sequence in one or all of the sub-areas.

One of the greatest advantages of programming is the self-pacing structure it affords learners. Perhaps, one of the more unpredictable variants in the teaching of art is the "time of involvement." Programming can eliminate the traditional problem of time by placing each student on a schedule commensurate with his ability and potential. Counseling and guidance constitute an important responsibility of the teacher during the student's production process. The type of counseling and guidance required are usually determined by the specific objectives of each unit. Within any given unit the learner will encounter specific problems which he must solve independently, or with the assistance of the teacher. The problem-solution combinations are usually predictable factors which can be programmed. The learner can examine his work against a check list of problem-solution combinations and thereby employ only those solutions which can aid his progress. Programming can develop a sequence of discovery principles which do not just give the correct solutions, but guide the learner in discovering acceptable solutions. The program can lead the student to self-discovery in the same fashion as the experienced teacher guides his pupils' progress. However, existing programming techniques cannot execute the actual evaluation procedures associated with grading a work of art. A program should attempt to critique, but not necessarily grade the student's perfor-
The critiques would, however, call for changes in the art works which are appraised as sub-standard. Self-evaluation is a method which offers unique possibilities in programming. The objective of the program would be to establish a check-list of desirable performances which are unique to the particular subject being studied. The learner can then evaluate himself on the criterion established in this manner. Students are very often less inhibited when evaluating their own work on an independent basis than they would be in front of a class or a teacher.

In summarization, this writer feels that programmed material can accomplish the following: (1) present factual information, teach skills and tool manipulations, and motivate, (2) guide and counsel the learner through the production period by programming the most common question-answer and problem-solution combinations, and (3) establish a criterion list against which the student can evaluate his own progress or performance.

EXPERIMENTAL DESIGN

Painting a still life was chosen as the subject to be programmed because the variables involved could be more readily controlled than in other subject areas. The initial procedure, as in all programming, was to first establish specific objectives in terms of behavioral changes which could be exhibited during the artistic performances of the learners. What should the student actually do? These objectives were selected by five individuals; three high school art department chairmen, one high school art supervisor,
and one junior high school art teacher. The chosen objectives were worked out in close co-operation with the instructor who was to work with the control group. From the beginning of the project it was carefully planned that the teacher and the self-instructional program would follow similar teaching procedures. Figure I contains the outline used as the basis for the methods each group followed. The self-instruction program created for this study is composed of two parts. Section I, Introduction, tells why still life is painted, gives a brief historical review, defines the styles of Realism, Abstraction and Semi-Abstraction, and then asks the student to choose a style for painting a still life.

Section II, Programmed Realism and Programmed Abstraction, has the learner follow only one of the two programs. The format of each program is basically the same and adheres to the following process: (1) terms are defined, (2) composition is investigated, (3) sketches are produced and evaluated, (4) compositional corrections are made, (5) color theory and psychology are defined, (6) painting techniques are suggested, (7) a painting is produced and evaluated, and (8) corrections are made on the painting.

Parts 1 and 2 of Programmed Realism deviate radically from the same parts in Programmed Abstraction. The information therein is directly related to the style, Realism or Abstraction, being programmed. Parts 3, 4, 5, 6, 7, and 8 contain only occasional differences; concepts within these sections are almost identical.

In deciding on a presentation format, the most perplexing decision was how to present the stimulus-response-reinforcement
FIGURE I

CONTENT OUTLINE USED BY BOTH THE EXPERIMENTAL AND THE CONTROL GROUPS

INTRODUCTION

A. Justification for the teaching of still life painting.
   * To inform the student of why artists paint still life.

B. History of the still life.
   * To develop an appreciation of the problems involved in still life painting.

COMPOSITION

A. Art terms.
   * To develop a vocabulary of terms.

B. Discussion of art principles related to composition.
   * Analysis of the elements involved in arrangement.

C. Organizational aspects of still life painting.
   * To incorporate what the student has learned about organization into a workable arrangement of the objects.

D. Discussion of styles.
   * To acquaint the student with the basic theories and techniques involved in the styles of Realism and Abstraction.

E. Drawing Activities
   * To incorporate what thus far has been learned by exposure to art principles, into an individualistic still life.
F. Evaluation of the sketches in progress.

* To evaluate the effectiveness of the composition in terms of the art principles which are applicable to a still life drawing.

G. Finished Sketches.

* To revise the compositional sketch(s) in view of the above evaluation.

PAINTING

A. Definitions of approaches, material, and techniques.

* To develop an understanding of vocabulary and terms.

B. Painting composition.

* To relate various aspects of techniques to specific styles.

* To explore the tools and materials.

C. Evaluation of the painting.

* To evaluate the effectiveness of line, color, and the use of materials as a compliment to the styles of sketch.

D. Finished Painting

* To revise the painting in view of the above evaluation.
sequence, without revealing the reinforcement before a response was made. The response might be a written answer to a question or a drawing in response to an artistic problem. Equally perplexing was how the illustrative material could best be presented. The presentation format finally decided upon was a loose leaf binder containing from fifty to seventy frames. Each frame consisted of either information, a question or a drawing problem. Each written frame corresponded to a visual frame presented on two projectors, projected on a 12" x 24" rear projection screen positioned in front of the learner as he read the booklet.

The slide projectors were worked by a remote control device at the student's side. Reverse controls allowed the student to review frames at any given time. Reinforcement frames usually appeared on the back of the question or problem frame. Occasionally the reinforcement was a visual which was then shown as a projected image. Since each frame was covered with a plastic sleeve, written responses were completed directly under the question using a washable felt pen. Some drawing problems were completed in the same manner, sketching directly on the plastic covering. The responses were wiped off the plastic covering after the student had completed the program. This procedure eliminated reproducing a large number of copies. One copy served the twenty-four students of the experimental group. All preliminary sketches for the final painting were drawn on ordinary unlined notebook paper. These pages could easily be removed from the binder. The sketching paper was supplied in the booklet and replenished when necessary. All the paintings were done on 18" x 24"
gray bogas paper which could be cut to any size and shape the student desired.

TESTING AND EVALUATION

This part deals with the testing of the final format or design of the self-instructional program. It is arranged in three sections: Population, Administration, and Evaluation.

Population. In selecting the sample groups, the population available to the study was analyzed. Eight samples of beginning art classes constructed the population. The final selection of a control group was purposely based on a wide distribution of intelligence quotients. The control group consisted of twenty-four students within a given classroom structure. Pupils falling within a given I.Q. range were as follows: 80 to 90, four students; 100 to 120, sixteen students; 125 to 145, four students.

The experimental group consisted of twenty-four individuals selected from the remaining seven beginning art classes. Although called a group, each individual of the experimental group worked independently of one another throughout the day. Each individual of the experimental group was matched as closely as possible to an individual of the control group in three ways - age, intelligence and sex. Figure II presents an overview of the population.

Administration. Both groups were assigned the pre-test of painting a still life, from the same set of objects, using the same materials, within a given time limit, in either a realistic or abstract style. The painting of the pre-test averaged five hours
#### FIGURE II

**OVERVIEW OF THE POPULATION**

<table>
<thead>
<tr>
<th>SEX</th>
<th>AGE*</th>
<th>GRADE</th>
<th>I.Q.**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>E</td>
<td>C</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1.</td>
<td>M</td>
<td>M</td>
<td>14</td>
</tr>
<tr>
<td>2.</td>
<td>M</td>
<td>M</td>
<td>14</td>
</tr>
<tr>
<td>3.</td>
<td>M</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>4.</td>
<td>F</td>
<td>F</td>
<td>15</td>
</tr>
<tr>
<td>5.</td>
<td>M</td>
<td>M</td>
<td>14</td>
</tr>
<tr>
<td>6.</td>
<td>M</td>
<td>M</td>
<td>14</td>
</tr>
<tr>
<td>7.</td>
<td>M</td>
<td>M</td>
<td>14</td>
</tr>
<tr>
<td>8.</td>
<td>F</td>
<td>M</td>
<td>14</td>
</tr>
<tr>
<td>9.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>10.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>11.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>12.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>13.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>14.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>15.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>16.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>17.</td>
<td>F</td>
<td>F</td>
<td>15</td>
</tr>
<tr>
<td>18.</td>
<td>F</td>
<td>F</td>
<td>15</td>
</tr>
<tr>
<td>19.</td>
<td>F</td>
<td>F</td>
<td>16</td>
</tr>
<tr>
<td>20.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
<tr>
<td>21.</td>
<td>F</td>
<td>F</td>
<td>13</td>
</tr>
<tr>
<td>22.</td>
<td>F</td>
<td>M</td>
<td>14</td>
</tr>
<tr>
<td>23.</td>
<td>M</td>
<td>M</td>
<td>16</td>
</tr>
<tr>
<td>24.</td>
<td>F</td>
<td>F</td>
<td>14</td>
</tr>
</tbody>
</table>

* Age at the beginning of the school year, September.

** A freshman I.Q. was based on testing completed at the end of the eighth grade year.

A sophomore, junior or senior I.Q. was based on testing at the beginning of the sophomore year.

*** C = CONTROL GROUP, E = EXPERIMENTAL GROUP.

**NOTE:** All students were part of Beginning Art I classes.
with both groups. The control group was then directed to paint the
same selection of still life objects a second time. During the
second painting, the classroom teacher formally counseled and guided
the class and/or individuals in various degrees. The experimental
group was also directed to paint the same selection of objects a
second time. The individual students of the experimental group were
guided and counseled by the self-instructional program as they de-
developed their paintings. The painting of the post-test averaged
seven hours with the control group, and six hours with the experi-
mental group.

Evaluation. A group of seven graduate professional art edu-
cators evaluated the paintings by applying a criterion test, Figure
III, developed specifically to test this program's content. The areas
evaluated were: (1) overall aesthetic quality, (2) originality of
the design, (3) the use of composition, (4) the handling of color, and
(5) the manipulation of materials and techniques. Each area was rated
on a 1 to 5 point scale: poor, 1 point; below average, 2 points;
average, 3 points; above average, 4 points; excellent, 5 points. The
total score possible was twenty-five points.

During the evaluation, the paintings were identified only by
numbers. The judges were not aware of whether the painting was pro-
duced as part of the experimental or controlled group, nor were they
aware of whether the product was a pre-test or post-test painting.

NOTE: A copy of the self-instructional program used by the
experimental group is on file in the Art Department.
FIGURE III

CRITERION RATING SCALE

JUDGING INFORMATION

NAME AND STATUS

NOTE: EACH PAINTING MUST BE JUDGED ON THE FOLLOWING 5-POINT SCALE:

1. POOR
2. BELOW AVERAGE
3. AVERAGE
4. ABOVE AVERAGE
5. SUPERIOR

I. AESTHETIC QUALITY: OVERALL
   AESTHETIC QUALITY OF THE WORK.

II. ORIGINALITY: INDIVIDUAL ORIGINALITY, AND SPONTANEITY
    SHOWN IN THE WORK.

III. COMPOSITION: THE PAINTING'S COMPOSITIONAL ELEMENTS, i.e.,
     UNITY, BALANCE, AND PROPORTION.

IV. COLOR: CONSIDER THE STYLE OF PAINTING, REALISTIC OR
     ABSTRACT, WHEN EVALUATING THE EFFECTIVE USE OF COLOR.

V. TECHNIQUE: THE ABILITY TO HANDLE THE MATERIAL (TEMPERA).
CHAPTER IV

ANALYSIS OF THE DATA

The null hypothesis of this study is that there is no difference between the mean artistic performance gains of the control group and the experimental group. The alternate hypothesis is that the mean artistic performance gains of the control group and the experimental group are not equal. Therefore, a difference does exist between the artistic performance exhibited by the group taught in the traditional manner and the artistic performance exhibited by the group taught by the self-instructional program which cannot be attributed to chance.

The hypothesis as stated above compares the total scores of the two groups as the primary basis for the acceptance or rejection of the null hypothesis.

A test of the equality of two means, called the t test was applied to the evaluation scores (8:167). When tabulated, Table I, t equalled 0.1403. This was not significant beyond the .05 level. Therefore the null hypothesis was accepted as valid for this study.

Further analysis of samples within the population again verified the null hypothesis of no significant difference. The samples, Table II, were composed of individuals possessing low, average, and high intelligence quotients.

When the mean gains of each criterion category were compared between groups, Table III, no significant differences were found.
### Table I

The Significance of the Mean Difference of the Experimental Group over the Control Group

<table>
<thead>
<tr>
<th>Judge No.</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Mean Difference = .10</th>
<th>t Test*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>pre-test</td>
<td>post-test</td>
<td>gain</td>
<td>pre-test</td>
</tr>
<tr>
<td>1.</td>
<td>17.5</td>
<td>22.0</td>
<td>4.5</td>
<td>16.5</td>
</tr>
<tr>
<td>2.</td>
<td>14.8</td>
<td>20.3</td>
<td>5.5</td>
<td>16.8</td>
</tr>
<tr>
<td>3.</td>
<td>14.6</td>
<td>19.1</td>
<td>4.5</td>
<td>15.1</td>
</tr>
<tr>
<td>4.</td>
<td>16.3</td>
<td>21.5</td>
<td>5.2</td>
<td>17.5</td>
</tr>
<tr>
<td>5.</td>
<td>15.3</td>
<td>21.2</td>
<td>5.9</td>
<td>15.6</td>
</tr>
<tr>
<td>6.</td>
<td>12.0</td>
<td>19.2</td>
<td>5.2</td>
<td>13.6</td>
</tr>
<tr>
<td>7.</td>
<td>12.9</td>
<td>18.6</td>
<td>5.7</td>
<td>14.0</td>
</tr>
<tr>
<td>Mean</td>
<td>14.6</td>
<td>19.8</td>
<td>5.21</td>
<td>15.6</td>
</tr>
<tr>
<td>% Gains</td>
<td>20.8</td>
<td></td>
<td></td>
<td>21.2</td>
</tr>
</tbody>
</table>


**Mean Difference - Gain of the Experimental Group over the Control Group.

Mean Difference = .10  

\[ t = 0.1403 \]
TABLE II

THE MEAN DIFFERENCE OF I.Q. SAMPLES

<table>
<thead>
<tr>
<th></th>
<th>EXPERIMENTAL GROUP</th>
<th>CONTROL GROUP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre-Test</td>
<td>Post-Test</td>
</tr>
<tr>
<td>IQ, 70-90</td>
<td>10.2</td>
<td>13.90</td>
</tr>
<tr>
<td>IQ, 100-120</td>
<td>15.1</td>
<td>21.0</td>
</tr>
<tr>
<td>IQ, 125-140</td>
<td>13.8</td>
<td>14.5</td>
</tr>
</tbody>
</table>

* Mean Difference

** Mean Difference Stated As A Percentage Gain.
### TABLE III

**MEAN GAINS OF CRITERION CATEGORIES**

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental Group</strong></td>
<td>0.80</td>
<td>2.33</td>
<td>1.39</td>
<td>0.51</td>
<td>0.28</td>
<td>5.31</td>
</tr>
<tr>
<td><strong>Control Group</strong></td>
<td>0.89</td>
<td>2.03</td>
<td>1.54</td>
<td>0.58</td>
<td>0.17</td>
<td>5.21</td>
</tr>
<tr>
<td><strong>Mean Differences</strong></td>
<td>-.09</td>
<td>+.30</td>
<td>-.15</td>
<td>-.07</td>
<td>+.11</td>
<td>+.10</td>
</tr>
<tr>
<td><strong>% Differences</strong></td>
<td>-2</td>
<td>6</td>
<td>-3</td>
<td>1.4</td>
<td>+2</td>
<td>+2</td>
</tr>
</tbody>
</table>

* Criterion Categories:

1. **Aesthetic Quality**
2. **Originality**
3. **Composition**
4. **Color**
5. **Technique**
When analyzing the performance gains, Table IV, of the pre-test over the post-test within groups, the following facts were derived: (1) individuals scored significantly higher on the post-test than on the pre-test regardless of the method instruction, (2) the greatest mean gains were apparent in the category of Originality. Gains also occurred in Composition, Color, and Aesthetic quality, (3) the lowest gains occurred in the area of Technique.
TABLE IV

MEAN CRITERION GAINS, POST-TEST OVER PRE-TEST, OF THE EXPERIMENTAL GROUP

<table>
<thead>
<tr>
<th>JUDGES</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0.67</td>
<td>2.37</td>
<td>0.92</td>
<td>0.70</td>
<td>0.04</td>
<td>4.70</td>
</tr>
<tr>
<td>2.</td>
<td>0.78</td>
<td>2.40</td>
<td>1.61</td>
<td>0.68</td>
<td>0.13</td>
<td>5.60</td>
</tr>
<tr>
<td>3.</td>
<td>0.50</td>
<td>2.01</td>
<td>1.41</td>
<td>0.38</td>
<td>0.20</td>
<td>4.50</td>
</tr>
<tr>
<td>4.</td>
<td>0.47</td>
<td>2.12</td>
<td>1.40</td>
<td>0.56</td>
<td>0.35</td>
<td>4.90</td>
</tr>
<tr>
<td>5.</td>
<td>1.29</td>
<td>2.31</td>
<td>1.61</td>
<td>0.78</td>
<td>0.11</td>
<td>6.10</td>
</tr>
<tr>
<td>6.</td>
<td>0.91</td>
<td>2.52</td>
<td>1.27</td>
<td>0.20</td>
<td>0.50</td>
<td>5.40</td>
</tr>
<tr>
<td>7.</td>
<td>0.95</td>
<td>2.63</td>
<td>1.54</td>
<td>0.28</td>
<td>0.60</td>
<td>6.00</td>
</tr>
</tbody>
</table>

| Criterion Averages | 0.80 | 2.33 | 1.39 | 0.51 | 0.28 | 5.31   |

| % Gains | 16  | 46  | 28  | 10  | 5   | 21.24  |

* Criterion Categories:

I. AESTHETIC QUALITY
II. ORIGINALITY
III. COMPOSITION
IV. COLOR
V. TECHNIQUE
TABLE IV (CONTINUED)

MEAN CRITERION GAINS, POST-TEST OVER PRE-TEST, OF THE EXPERIMENTAL GROUP

<table>
<thead>
<tr>
<th>JUDGES</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>TOTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0.39</td>
<td>2.10</td>
<td>1.40</td>
<td>0.60</td>
<td>0.01</td>
<td>4.5</td>
</tr>
<tr>
<td>2.</td>
<td>0.60</td>
<td>2.00</td>
<td>2.00</td>
<td>0.60</td>
<td>0.31</td>
<td>5.5</td>
</tr>
<tr>
<td>3.</td>
<td>0.72</td>
<td>1.87</td>
<td>1.40</td>
<td>0.48</td>
<td>0.03</td>
<td>4.5</td>
</tr>
<tr>
<td>4.</td>
<td>0.70</td>
<td>1.80</td>
<td>1.90</td>
<td>0.41</td>
<td>0.39</td>
<td>5.2</td>
</tr>
<tr>
<td>5.</td>
<td>1.60</td>
<td>1.90</td>
<td>1.40</td>
<td>0.96</td>
<td>0.04</td>
<td>5.9</td>
</tr>
<tr>
<td>6.</td>
<td>0.90</td>
<td>2.15</td>
<td>1.23</td>
<td>0.50</td>
<td>0.42</td>
<td>5.2</td>
</tr>
<tr>
<td>7.</td>
<td>1.30</td>
<td>2.40</td>
<td>1.50</td>
<td>0.50</td>
<td>0.00</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Criterion Averages 0.89 2.03 1.54 0.58 0.17 5.21

% Gains 18 41 31 12 3 20.85

* Criterion Categories:

I. AESTHETIC QUALITY
II. ORIGINALITY
III. COMPOSITION
IV. COLOR
V. TECHNIQUE
CHAPTER V

CONCLUSIONS AND SUMMARY

This final chapter is composed of three major areas: (1) conclusions drawn from an analysis of the data, (2) recommendations cited by individuals who had evaluated the self-instructional program, and (3) suggested areas for future investigation.

CONCLUSIONS

Conclusions were drawn from several sources: (1) the mean gains between the experimental and the control group, (2) the mean gain of the post-test over the pre-test within each group, (3) the mean gain between the experimental and control groups within specific criterion categories and the mean gain of the post-test over the pre-test within specific criterion categories, and (4) the mean gains between samples and within samples.

Evidence proved that although both methods of instruction produced significant gains in artistic performance, neither method of instruction was significantly more successful than the other. For a possible explanation of this result, a review of the content is necessary. Both methods of instruction taught identical content; only the presentation of content was different. The teaching method of each group was derived independently from a common outline of content. This outline was developed by the designer of the self-instructional
program used by the experimental group and by the teacher of the control group. All the visuals used in the program were available to the classroom teacher who used about fifty percent of them. The sequence of viewing was changed to facilitate her presentation. Other aspects of the program presented further similarities.

The retention of the null hypothesis does not jeopardize the value of programmed art instruction. On the contrary, such a conclusion is encouraging. If the program created for this study is as effective as a teacher in the area of eliciting performance changes, then such programs can justifiably be included in the art curriculum.

If performance changes can be programmed - should they be programmed? The most noticeable benefit of self-instructional materials is to be found in the supplemental and enrichment areas. Programmed assistance has been welcomed by teachers in other subject areas. Whether art educators will accept programming as a supplemental aid is difficult to predict. To imply that programmed instruction will replace the teacher is an earth-shaking statement. Any material, whether a textbook, or a self-instructional program which becomes part of the learning environment, is, in effect, replacing the teacher. It is quite within the realm of probability that programmed instruction will some day greatly supplant and reinforce the role of the teacher.

The mean gains within groups, or the mean gains of post-tests over pre-tests in both groups, were significantly high. Such evidence confirms the logic of the internal organization of the content. The experimental and control groups both used a common organizational
structure. It is evident then, that the subject as organized does change performance but the method of instruction makes little difference. This conclusion seems to bear out what experimenters have suggested; that the precise organization of the content is the prime reason for the success of many programs and not the programming technique. With identical content as the basis of both methods, the real factor being tested was the effectiveness of communication, human or programmed, in eliciting performance gains. The results showed that both approaches communicated equally.

The mean-gains within specific criterion categories (Aesthetic Quality, Originality, Color, Composition and Technique) when compared between groups showed no significant gains. The analysis of the mean gains of the post-tests over the pre-tests in specific criterion categories presented this information. Originality gains were the most significant. Compositional gains were also high. The categories of Color and Aesthetic Quality exhibited minor increases in performance. Technique was not improved to any great extent by either teaching method. Appendix B shows three pre-test and post-test paintings produced by students in the experimental group. A close look at three typical art works produced by this study will indicate that the pre-test pictures were commonplace and realistic, while the post-test paintings were unconventional and abstract. Unsolicited comments by students indicate that the best liked sections dealt with Originality (particularly in Programmed Abstraction). The content of this section was ascertained to be new knowledge to the student. The low percent-
age gains in the category of Technique only indicates that little, if any improvement occurred. This does not indicate that the student's technique was poor, but only that the program was not able to increase the student's skill at handling technique. In retrospect, it is evident that the self-instructional program was not explicit enough when dealing with technique. It is difficult to measure the control group's commitment to technique development. Future programs might concentrate on developing skills in the handling of materials. Ironically, skill development is one area which is considered easily adaptable to programming.

RECOMMENDATIONS

Semantics presented one of the most difficult by-passes in developing content. The definitions used in the final program were derived from a review of the literature. Unfortunately, the literature was usually ambiguous. Often the terms themselves were controversial and dependent upon individual interpretations. Art terms are seldom concrete, precise, or definable by a clear-cut statement. Programming, however, attempts to be clear-cut, precise and definable. All the currently available programs in art have been written by individuals. Therefore the terms used in these programs are individual interpretations. For instance, when developing a workable definition for the term abstraction (as applied to only art), fourteen separate interpretations were evaluated. The fourteen could be summarized in six separate definitions. It was then realized that when one definition was finally selected for inclusion in the self-instructional program its particular usage could be criticized for not
having included various aspects of the other five definitions. Art educators working in teams may find it easier to arrive at mutually acceptable definitions.

During the initial testing runs, four separate vocabulary re-writes occurred. Students recommended changing many words. The Lorge formula was used in developing a vocabulary. The basic content of the program was written at the sixth grade vocabulary level, which was recommended as an average level for ninth grade students. The self-instructional program was not entirely successful in achieving a readable content. Additional time needs to be spend in refining the vocabulary.

The graduate committee which reviewed this investigation recommended several changes, additions, deletions, etc., to the original self-instructional program. (Note: these recommendations were cited after the self-instructional program had been tested and did not effect its outcome.) Several historical inaccuracies and false implications were noted as part of the Introduction. A number of individual frames need to be reworded to better express the intent. Occasionally challenged were statements concerning rules or concepts as being too dogmatic. That rules are made to be broken is quite evident in art. Many masterpieces are contradictions of basic art principles. However, the goal of this study was to establish basic principles in order to build a foundation for learning. It is, therefore, advised that future programmers scrutinize the content of each statement very carefully.

It was recommended that in order to establish a basic vocabu-
lary, a glossary should precede the program, defining words as they were interpreted for this study.

The program developed for this study used slides presented on two slide projectors. In future programming of this type, visual material might be presented in the form of reproductions rather than slides. The reproductions would become part of the frame. This type of format would eliminate the technical problems involved with organizing and manipulating audio-visual devices. Future programmers should investigate sources of art reproductions, quality and expense. Many researchers have made reference to the fact that picture-booklets are often just as effective as complicated machinery. (10)

It is further recommended that this study be tested with a larger sample of the population. Several control groups taught by different teachers should be compared with the self-instructional program.

Instead of working from a common outline, individual methods of teaching still life painting should be compared with the self-instructional program. A mutually acceptable evaluation procedure should be first agreed upon.

SUGGESTIONS FOR FUTURE STUDY

For purposes of analyzing what future program research may soon develop, this writer suggests the following four divisions of the art curriculum.

1. Factual information: (lecture approach in conventional teaching terms).

(a) definition of semantic terms, (b) introduction to, and definition of art activities, (c) presentation of
2. Concept development:
   (a) investigation of the art elements and principles,
   (b) skill in manipulation of tools, (c) philosophical
   and historical concepts.

3. Skill development:
   (a) mastery of techniques, (b) skill in manipulation of
   tools, (c) recognition and exploration of the advantages,
   limitations, etc. of materials.

4. Artistic performance:
   (a) the production of art products based on acquired
   skills, and (b) creative production.

A similar scheme has been presented by Lillian Quirke in
her article Gamble with Teaching the Visual Art.

The basic questions to be answered concerning these categories
are: (a) can the subject be programmed, (b) what efforts have been
made in this direction, and (c) what are possible approaches (systems,
structures, technology, etc.) to programming the subject.

Factual Information is no more difficult to program in art
than it is in science or mathematics; simply translate the successful
format used in other areas to the verbalized aspects of art. The
effectiveness of programming facts is conclusive. Research proves
that programmed factual information can be more effectively learned
and less time consuming than the same material taught in the conven­
tional manner. (15) Needless to say the proven success of programming
facts should encourage the art teacher to investigate all the areas
of his curriculum which might be committed to this type of learning.
Art educators traditionally have asked for more time for individual
instruction. The increasing school population proposes the problem of whether the teacher can any longer hope to instruct the student on an individual basis. The answer to this problem is almost certainly, "no", unless many of his burdensome tasks can be eliminated. Ecker forecasts,

...it is entirely possible for an art teacher, or a team of teachers, to create what is known as a "scrambled book" of mimeographed sheets which would cover the desired material. In this self-instructional device the pages are numbered consecutively, but the contents are scrambled to prevent the reader from easily looking for the answer. The first page of "book" presents a portion of information about art, together with questions testing the reader's understanding of this material and the possible answers to the questions - "yes," "no," multiple choice. Any choice he makes directs the reader to another page in the book. This page will present either new information (if his answer was correct) or a review of the material he has just misunderstood. Thus, the bright student may skip ahead while the dull student may often be re-cycled through remedial work.(5:5)

Art teachers readily admit that presenting a new unit or project is often complicated by the student's lack of knowledge (entering behavior). Intellectual and artistic levels of development frequently span a vast continuum. Programmed instruction acts as a remedial aid in achieving a similar level of achievement before individuals can logically be allowed to construct new experiences. By pre-testing students and diagnosing their deficiencies, the teacher can select the appropriate remedial work which will enable the student to begin the new unit with greater expectation of success. For instance, in beginning a unit on painting it might be necessary for a student to review color mixing. Using a programmed
Concept Development is a rather ambiguous catch-all category. Concepts are usually based on one or several facts. Understanding of a concept goes beyond the simple retention or memorization of a basic axiom as might be programmed under factual information. Concept development demands thinking on the part of the student, and possibly of the machine which teaches it. This of course proposes one of the controversial aspects of programmed instruction, can a machine think? Most behaviorists usually refuse to discuss the subject. Francis A. Cartier (17) however declares that several aspects of thinking can be taught by present programming techniques. Formal logic, deferred judgment, consideration of alternative solutions, and discrimination skills have all been successfully programmed. The ability to make very subtle discriminations has been programmed by David Klaus with his program in art appreciation.

Concept Development must undoubtedly use an intrinsic (branching) system of programming. Formation of such a program would, (1) teach the concept as a series of facts, (2) explore (by question-answer, multiple choice or experimentation) the entire known realm of the concept, (3) explore the creative aspects or unknown aspects of the concept. The process encountered in the third step is called by behaviorists "transfer of learning." The highest order of this process can truly be defined as creative behavior. Once again the problem of programming this step is debatable and will be taken up in the last section of this chapter. On this subject Cartier has
Teaching creative thinking seems to require that we elicit, unique responses; unusual responses. What we want to reinforce cannot be stated in advance as a specific behavioral goal because what we want to reinforce is the unexpected, the invention. (17:41)

Skill Development currently exists in numerous programs, U. S. Steel, Eastman Kodak, A.T.T. and IBM are only a few large industries which have used programmed instruction extensively in their training programs. As mentioned earlier, art education has the means to program skills and techniques in the form of the single concept film, which does everything but reinforce the student with confirmation of his success or failure. The "how-to-do-it" books and films surprisingly accomplish their objectives of teaching skills and techniques. A detailed analysis of the "how-to-do-it" concept would undoubtedly be beneficial to programs which present learning tasks. Gerlack and Bergams (9:9) have pointed out that because of the minimal cost of production the single concept film can be tailor made by individual teachers to accommodate their distinctive approaches to teaching. These films can encompass any area of the art curriculum, teaching manipulative skills, including care of tools, lettering, drawing, painting, printing and graphic techniques. This writer suggests that the many commercially produced films can become more effective if the art teacher will develop response booklets to accompany the films. These books would contain questions pertaining to the films, with confirmation (feedback) to the students response. Since the "loop" cartridge film can be stopped and started instantaneously, small sections of information could be viewed, the projector
stopped, the questions asked, the response recorded in the booklet, confirmation (feedback) given, and the film started again. Gerlach and Bergams confirm the need of programming techniques,

Today, when art teachers everywhere are forced to defend the validity of the art program in the face of the advocates of a 'hard-core' and 'frillless' curriculum, it is essential that they develop a high degree of competence in evaluating objectives and goals in a highly scientific manner. This is not at all incompatible with good art education. Careful programming of instruction in art will inevitably result in an art course that has greater meaning and richer content for the learner. (9:10)

Can feedback to the student be programmed and still be called creative? This problem is dealt with by Lillian Quirke when she suggests, "...we must provide a kind of 'creative feedback' that will be relevant and reinforcing for all individuals taking the program, regardless of a wide diversity in the particular responses given by them." (21:10)

An example of what she calls creative feed-back follows:

Suppose, that we are training the student to think of unusual uses for an object. An effective feedback to his responses might consist of an illustrative set of varied and unusual ideas that could have been produced. The set would be intended to broaden the student's vision as to what constitutes unusual ideas; at the same time it should contain some illustrative ideas not too far removed in quality from the perhaps somewhat more pedestrian ideas that he would have given. In this way his sights may be elevated without unduly discouraging him about his own less impressive initial creative attempts. (21:10)

David Ecker (7:13) suggests that traditional art problems such
as those experienced in the creation of Cubism or Impressionism can be programmed. This implies the transfer of learning principle, whereby the student surpasses the progress of the past, extending his ability beyond the point of tradition. The branching system of programming can facilitate an extension of a student's basic inclinations by channeling his artistic expression; i.e., programs presenting many art movements could be used to identify the art movement which the student approximates most closely. Once this was established a branching system would enable him to discover various aspects of style, philosophy, technique, historical evolution, etc. Such programs would also be beneficial in producing change in one's style by extensive exposure to one or several distinct styles. Through a synthesis of many new elements it is hoped that unique and possibly creative style would evolve. Essentially these are the objectives which this study has tried to achieve.

In dealing with creativity as originality we are confronted with this query; can creativity be taught? If the answer to this question were "yes", an analysis of what constituted the teaching process would enable programmers to construct a similar process for a machine. But it seems apparent that factors involved in teaching creativity are intangible and possibly non-existent.

This writer suggests that the term "teaches" in this case is a semantic blunder. The achievement of creative behavior is brought about by the environment which the teacher manufactures. "Promotes", "motivates", "stimulates", "encourages", "influences" and "inspires" are terms which might appropriately describe the teacher's role in
producing creativity behavior.

The programming of artistic performance must be the primary goal of future programmers. A gigantic help in this area will undoubtedly be the computer. Unfortunately, these machines are not available for general experimentation. The ability of the computer to handle complex concepts is unlimited. Computer technologists tell us the day is not far off when computers will handle a substantial portion of an individual's education.

The structure of education will radically change as technology invades the classroom. Some educators view this invasion as a threat much in the same way as the worker views automation. Technology is not a threat to the educational profession, although it may mean the demise of the role of the teacher. This investigator believes it is only a matter of time before the teacher as we know him today disappears from the classroom, in fact, the classroom may vanish with him. In the not too distant future educators will function in new roles. There will be planners or co-ordinaters of educational experiences. Research potentials will be channeled into the creation of educational packages and personable individuals will M.C. those presentations. Creative, flexible thinkers will stimulate discussion sessions and counseling will take on new aspects of communication, a crucial element to an environment of technology. Educators must be prepared to accept these new roles or vanish like the worker replaced by machinery.
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APPENDIXES
APPENDIX A.

SAMPLE SECTIONS FROM SELF-INSTRUCTIONAL PROGRAMS


Post-Test (page 16)

1. Give the names of three primary colors.
   A. __________________ B. __________________ C. __________________

2. Give the names of three secondary colors.
   A. __________________ B. __________________ C. __________________

3. How many intermediate colors are there?

4. Choose three of the following paint mixing problems. Mix the paints and fill in the spaces indicated. Neatness does not count but your choice of color is important.

   Mix some paint the color of an orange.

   Mix some paint the color of a spruce or fir tree.

NOTE: Only two of the four illustrations have been reproduced on this page.
1. Each year more color is being used in the printing of magazines, newspapers, and other printed items, so it becomes essential that the printer know color and how to use it.

2. Blue, green, and yellow are all examples of different _______ colors.

3. Without light we cannot see any ________________ colors.

4. Therefore: The first requirement for you to _______ color is that you have sufficient _______ to see _______ light.

5. To reflect means "to bounce off" or "to jump away from". A ball "bouncing off" the surface of a wall is an example of _______ reflection.

NOTE: In the original program answers are covered by a cardboard sheet until the question is answered. The answer to each question appears along side the next question in the series.
These two elbows use the rule of 1. to control 2.

Which elbow appears to come forward? 3.

Which elbow appears to go back? 4.

NOTE: This format is slightly different from the original.
Few people have ever touched a rattlesnake, yet nearly everyone could describe the texture of the rattlesnake accurately just by looking at it. Therefore, textures may be sensed visually as well as by touch. In what two ways would it be possible for a brave person to sense the texture of rattlesnake?

**NOTE:** This format is slightly different from the original.
The following is the proposed dialogue of a student and a computer, using a typewriter as the means of communication. Visuals (slides) were presented to the student on a rear projection console above the typewriter.

C IF YOU ARE READY NOW, TYPE "READY"/THEN PRESS THE RETURN KEY.

S READY.

C FINE.

C NOW, TYPE YOUR NAME AFTER THE QUESTION MARK, THEN PRESS THE RETURN KEY.

S JOHN.

C THANK YOU, JOHN.

C NOW WE ARE READY TO LEARN ABOUT COLOR.

C THE THREE BASIC PROPERTIES OF COLOR ARE HUE, VALUE AND CHROMA.

C PROPERTY IN THIS SENSE MEANS A QUALITY BELONGING ESPECIALLY TO SOMETHING.

C THE NAME GIVEN TO A PURE COLOR IS ITS HUE.

C WE USE THE PROPERTY TO DISTINGUISH AMONG THE VARIOUS COLORS.

S HUE.

C RIGHT.

......................
APPENDIX B

EXAMPLES OF PRE-TEST AND POST-TEST

PAINTINGS BY STUDENTS OF THE EXPERIMENTAL GROUP
PRE-TEST PAINTING BY A STUDENT
IN THE EXPERIMENTAL GROUP.

POST-TEST PAINTING.
PRE-TEST PAINTING BY A STUDENT IN THE EXPERIMENTAL GROUP.

POST-TEST PAINTING.
PRE-TEST PAINTING BY A STUDENT
IN THE EXPERIMENTAL GROUP.

POST-TEST PAINTING.