A SURVEY OF THE PROGRAMMED INSTRUCTION RESEARCH CURRENTLY BEING CONDUCTED IN MUSIC EDUCATION

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A SURVEY OF THE PROGRAMMED INSTRUCTION RESEARCH CURRENTLY BEING CONDUCTED IN MUSIC EDUCATION

An Abstract

Presented to

the Graduate Council of

Austin Peay State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

in Education

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by

Frank Arther Pasteur, III

August 1968

ABSTRACT

The problem was to discover what research is currently being conducted in programmed instruction in music education in the United States today.

The study took the form of a comprehensive survey of all college and university members of the National Association of Schools of Music (NASM). The survey was designed in two parts, a letter of introduction and a survey form. The letter of introduction told the researcher about the study and what it was attempting to accomplish. It also asked his help in the research by filling out the survey form and returning it in the self-addressed, stamped envelope which was enclosed with each survey form. The survey form consisted of four parts. Its design was flexible and allowed the researcher enough space to report any type of programmed research in his field. The researcher was also allowed space to indicate his interest in obtaining a copy of the results of the study. The survey forms were used to tabulate the findings of this study reported in Chapter VI.

Some programmed instruction research in music education is found in almost every area of music but is mainly centered in two areas: music theory and music appreciation. On the basis of the data discovered and assimilated in this study much research in programmed instruction in music education is being conducted today; consequently, much duplication of research was discovered.

A SURVEY OF THE PROGRAMMED INSTRUCTION RESEARCH CURRENTLY BEING CONDUCTED IN MUSIC EDUCATION

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by

Frank Arther Pasteur, III

August 1968

To the Graduate Council:

I am submitting herewith a Thesis written by Frank Arther Pasteur, III entitled "A Survey of the Programmed Instruction Research Currently Being Conducted in Music Education." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Music Education.

Thomas W. Cowan
Major Professor

We have read this thesis and recommend its acceptance:

Lewis B. Burns
Minor Professor

Aaron Schmidt
Third Committee Member

Accepted for the Council:

Wayne E. Stamper
Dean of the Graduate School

ACKNOWLEDGEMENTS

The author wishes to express sincere appreciation to Dr. Thomas Cowan, Chairman of the Department of Music, Austin Peay State University, who was a constant guide and who aided and counseled him during the course of the study; to Dr. Aaron Schmidt, Department of Music, and Dr. Ellis Burns, Department of Education, for their suggestions and constructive criticisms of the manuscript. Gratefulness is also extended to Mr. Jerry Jones, Department of Education, Appalachian State University, for his guidance in preparing and conducting the survey.

The author wishes to thank Miss Judith Marie Hodde, for her invaluable assistance in preparing the original drafts of the thesis, and Mrs. Peggy Waters in preparing the final copies.

With sincere gratitude for the opportunity and motivation to continue my education through the Masters degree, I dedicate this thesis to my Grandmother, Mrs. Linnie W. Pasteur.

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CHAPTER I

INTRODUCTION

For the past thirteen years (1955-1968) members from almost every subject discipline have engaged in various aspects of research in the relatively new technology of programmed instruction or machine teaching as it is sometimes called. Music has been no exception.[1] At the present time research in this important area of education is being conducted at many universities throughout the United States. More and more educators are writing programs in every area of music education. Enormous amounts of material have already been adapted and the quantity increases each day.

In the foreword to one of the presently available programmed music texts (Fundamentals of Music) William McBride stressed the debt programmed instruction owes to traditional methods:

> The concept of programmed instruction which has begun to permeate American education at all levels, is not new, but rather a precise organization of some of the best approaches to learning that successful teachers have used for many years. What is both new and highly encouraging is the increasing desire on the part of some music educators, as well as teachers to reexamine

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[1] Walter Ihrke, "Trends in Music Education Research" Council for Research in Music Education, (University of Illinois, College of Education, School of Music, Bulletin No. 2, Winter 1964.) p. 29.

> methods and materials in terms of primary objectives. The application of programmed instruction to the teaching of music is a logical and productive step, which is among those factors helping to form some exciting new directions for music in this country.[2]

E. L. Thorndike foresaw, or at least hoped for such a development as early as 1912:

> If, by a miracle of mechanical ingenuity, a book could be so arranged that only to him who had done what was directed on page one would page two become visible, and so on, much that now requires personal instruction could be managed by print. . . . A human being should not be wasted in doing what two phonographs can do. Just because personal teaching is precious and can do what books and apparatus can not, it should be saved for its peculiar work. The best teacher uses books and appliances as well as his own insight, sympathy, and magnetism.[3]

The survey which resulted in this thesis, gathered material from most of the NASM (National Association of Schools of Music) schools in the United States. The material related to present or past programmed instruction research in music education at these schools.

Several professional music journals offer the programmed researcher at regular intervals condensations of research recently completed in programmed instruction; however, only a few references are made about the research

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[2]Robert A. Barnes, _Fundamentals of Music: A Program for Self-Instruction_ (New York: McGraw-Hill Book Co., 1964), p. v.

[3]E. L. Thorndike, _Education_ (New York: The Macmillan Company, 1912), pp. 165-67.

currently being conducted in the field. This is a definite disadvantage to the researcher as he has no way of knowing what others within the field are doing. Thus, it is possible and even probable that two or more researchers could be working on the same material with no knowledge of the other. These two individuals could certainly assist each other if they were aware that they were not alone in their study. Their awareness of others doing similar research in the same general area could save them much time and money.

This thesis could not solve all of the problems faced by the researchers in programmed instruction today; but, the author hopes that it will shed some light on one of the problems researchers face, i.e. duplication of research. The writer of this thesis attempted to gather enough information in this area to justify the establishment of a system designed to avoid duplication of research and keep all researchers informed of current research in progress. In the final chapter suggestions will be made which relate to the economical establishment of such a system.

CHAPTER II

THE PROGRAM - WHAT IS IT?

Historical Introduction

In ancient Greece the Socratic dialogues point toward future developments in spite of some essential differences. "Sons of aristocrats and slaves were led step by step through statements that constructed enthymemes and syllogisms, getting cues from leading questions, giving responses in a permissive atmosphere, and gaining immediate feedback."[1] The famous dictum of Jerome Bruner's stated "any subject matter can be taught to anybody at any age in some form that is honest." This dictum was anticipated in the Socratic dialogue as a method of arriving at truth. Fundamentally, programmed learning applies to both the tutorial (Socratic) method of teaching by questions and the Cartesian method of breaking course material down into small pieces arranged in order of importance.

We can also find information about some non-programmed devices. H. Chard was granted a patent by the U. S. Patent Office in 1809 for a device which taught reading.[2] A device

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[1]Wayne Lee Garner, Programmed Instruction (New York: Center for Applied Research in Education, 1966), p. 2.

[2]*Ibid.*, p. 8.

to teach spelling was developed and patented in 1866 by Halcyon Skinner. In the opinion of B. F. Skinner this was the first real teaching machine. Charles I. Foltz refers to a device designed to teach a proper trigger squeeze to U. S. Army recruits (1918) as the first truly mechanical self-instructional device put to widespread use.

Sidney L. Pressey of Ohio State University is generally credited with developing practical machines that could teach as well as test. During the 1920's he presented a paper at the Washington, D. C. meeting of the American Psychological Association. Pressey's machines were multiple choice test program devices. They immediately informed the student of the correctness or incorrectness of an answer. In the event of an error, the question remained, the error was tallied on a counter, and the student made another try. Pressey had faith that his devices and programs were capable of producing changes in the effectiveness of instruction. However, his faith was not blessed with a receptive audience and in 1932 he dropped all his work on such projects.

Pressey's concept was completely ignored until 1954 when B. F. Skinner, a noted psychologist, proposed a similar theory. Skinner stressed that the science of learning is now in existence and that learning laws exist and should be applied to education.[3]

Definition of Programmed Instruction

Programmed instruction is the teaching of subject matter, procedures, concepts and skills, by means of carefully sequenced units called programs. Through the use of programmed instruction, a student progresses, by self-instruction, to a desired level of achievement by means of carefully sequenced small steps leading to mastery of the subject with minimum error. Each step of the program is so constructed that the student can confirm the correctness of his response while progressing to more complex material.[4]

Programmed instruction is the kind of learning experience in which the program takes the place of a teacher for the student. It takes him through a series of predetermined behaviors which are sequenced to make it more probable that he will behave in a given desired way in the future. Sometimes a program is housed in a "teaching machine" and sometimes in a "programmed textbook." It is important to realize that the outstanding thing about programmed instruction is the program. A program is usually

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[3]B. F. Skinner, "The Science of Learning and the Art of Teaching," Harvard Educational Review, Vol. 24, (1954).

[4]Selection and Use of Programmed Materials, (Division of Audiovisual Instructional Service of the National Education Association, 1964), p. 57.

a series of items, questions, or statements, to each of which the student is asked to make a response. His response may be of several varieties. He may be asked to fill in a blank, answer a question, or select one of several answers. As soon as he has responded to a certain question, he is allowed to confirm the correctness of his response. The items are so skillfully written and the steps between them are so small, that the student generally practices correct responses. In other words, the items are so skillfully arranged that they take the student from responses he knows through new responses that he is able to make because of the ones he already knows to the final responses it is intended that he should command.[5]

Many lists of the characteristics of successfully-programmed instructional materials can be found. However, usually these are limited to three or four principal concepts. The following discussion will take into consideration subdivisions of concepts and the contributions of many writers.

The material in a program should be presented in a logical series of steps. In their own teaching, programmers

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[5]W. Schramm, "Programmed Instruction Today and Tomorrow," Fund for the Advancement of Education. (Nov., 1962), pp. 7-8.

find that they leave a great amount to the students, omit essential steps, and neglect relevant points. As students respond to a program major gaps may be revealed that demand major revisions. This is especially true if the programmer is attempting to guarantee a correct response at every step.

The material to be learned must be carefully organized and presented in the form of numerous, small, logical, and graduated steps (or frames) leading from the known to the unknown. In this manner the student has to focus his attention on a limited amount of material at one time. Peter Pipe says that "programs often look like fragments interspersed with questions" but goes on to say that he admits the possibility of generating a program with this technique and that someone may actually learn from such a program "since students will persist in thinking, no matter how they are abused."[6] Learning theorists debate the size of desirable steps in a program. Edgar Dale wrote that changing the step size or the number of steps would not be an adequate solution. He suggested that steps be as large as the learner is able to understand. He is therefore implying that he advocates a rather complex "branching" type

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[6]Peter Pipe, Practical Programming (New York: Holt, Rinehart and Winston, 1966), p. vi (footnote).

of program.[7]

A response (written or unwritten) should be elicited from the student to each (or at least most) of the frames. Continuous and active student response is required at moments when student interest and curiosity are at a peak. Some disagreement is apparent about whether the student response should be overt or covert. Skinner advocates the constructed response (necessarily an overt response) because the student is forced to think more and learns more rapidly than if he had to choose from a series of alternate (multiple choice) answers. The program becomes more of a teacher than tester in this operation because it demands positive effort. Furthermore, the constructed response reinforces only correct responses and offers no opportunity for an incorrect response to be learned. John D. Krumbolty and Ronald G. Weisman assert that conclusive evidence is available indicating that more learning takes place when students are required to make overt responses.[8] Susan Meyer Markle, on the other hand, favors covert responding

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[7]Edgar Dale, "Instructional Resources," The Changing American School (Chicago: National Society for the Study of Education, 1966), p. 104.

[8]Robert J. Hutcheson, Jr., "Programmed Instruction and Music Education," Missouri Journal of Research in Music Education, Vol. 24, No. 2, (Autumn, 1967), p. 12.

and states that research studies have found them adequate and far less time-consuming than writing out a response.[9] An overt response may take the form of any externalized responding action such as checking an answer or pressing a key.

The student should be immediately informed (feedback) of the accuracy or inaccuracy of his response to each question. Wayne Lee Garner indicated that an error-rate of five to ten per cent should be regarded as accurate and that, if an error does occur, the fault is the programmer's, not the student's and advocates the necessity of a revision.[10] Garner seemingly favors programs that are as error-free as possible so that the student is almost always correct. Theoretically reinforcement of correct answers as well as correction in the event of erroneous answers is provided when student interest is at the highest point. Various studies have shown that optimum learning conditions result when a correct response is reinforced one-tenth to one-half second after it is made. The longer the time interval the less the average amount retained. Stolurow, Jacobs, and Maier wrote that step-organization, required

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[9] Susan Meyer Markle, Good Frames and Bad; A Grammar of Frame Writing (New York: John Wiley and Sons, 1964), p. xi.

[10] Garner, Loc. cit., p. 10.

response, and immediate feedback constitute the learning cycle.[11] This cycle is repeated many times throughout a program. The response a student makes to a question will either allow him to continue to the next step in the program immediately (a Skinnerian, or linear, program) or will refer him to more advanced material, review work, or an explanation of an error (a Crowder,[12] or branching, program). One programmed music text written by Chakerian and Ventolo prefaces its program with this view of error-rate: "Learning should be fun. However, in the early stages of learning a subject, students make many mistakes. As a result, they often conclude that they do not like the subject. They would be more correct to conclude that they do not like to make errors."[13]

A hoped-for consequence of the response the student makes is that active student involvement is insured in a manner not possible in a lecture approach or any unindividualized approach. Charles Foltz says that a survey of

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[11] L. M. Stolurow, Paul I. Jacobs, and Milton H. Maier, A Guide to Evaluating Self-Instructional Programs (New York: Holt, Rinehart and Winston, 1966), p. 1.

[12] Hutcheson, Loc. cit., pp. 13-14.

[13] Lan Chakerian and William Ventolo, Fundamentals of Music (Albuquerque, N. M.: Teaching Machines, Inc. TMI-Grolier, 1961), p. iv.

classroom teaching showed that the average student is actively engaged or interested in classroom activity only 20 per cent of the time.[14] By requiring continuous active response programmed materials hopefully overcome passivity and inertia on the part of the student.

The self-instructional nature of programmed materials should permit the student to determine or follow his own learning pace. He can then move as rapidly or as slowly as his comprehension level and interest require or permit. In this manner the slow learner is assured an infinitely patient tutor and the learner who wishes to continue the lesson for a long period of time is assured an untiring teacher. The variables of time limitation, student numbers, and different individual learning rates are inhibitions on effective teacher classroom instruction. Programmed instruction attempts to aid in the assimilation and retention of knowledge by overcoming such blocking factors.

The above seem to be the most frequent characteristics cited in reference to programmed materials at the present stages of development. For a more complete understanding of the subject we might also add the following

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[14] Charles I. Foltz, The World of Teaching Machines (Washington: Electronic Teaching Laboratories, 1961), p. 18.

points:

1. Machine operation should be almost completely "self-contained" so that a minimum of the student's attention includes pure manipulation of the operational process of the machine.

2. Skinner wrote that the purpose of a teaching machine can be stated: to teach rapidly, expeditiously, and thoroughly a large part of what we now teach slowly, incompletely, and with wasted effort on the part of both students and teachers.[15]

3. Feedback data allows designing improvements and making revisions from experience. The sequence the student goes through is carefully graded and has to some extent been demonstrated to produce learning. Chakerian and Ventolo wrote:

   > With conventional textbook and lecture procedures, it is impossible for the writer or teacher to assess accurately at what point the student makes errors or "loses the point." Programmed presentations, however, have been evaluated experimentally. This course has been through a series of thorough revisions on the basis of responses actually made by the students. In this way, ambiguous statements and instructions have been added and removed to difficult portions. . . .[16]

4. A program must provide for individual differences. This is especially true with the "branching" type program.

5. With the advent of teaching machines and programmed texts the teacher is afforded the class time to do all the things he previously could not find time for. Most of his class time can be devoted to idea

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[15] B. F. Skinner, "Teaching Machines," Scientific American (November, 1961), p. 9.

[16] Chakerian and Ventolo, Loc. cit., p. iv.

and concept teaching, leaving drill processes to the machine and the students' time. Of course, as knowledge of programming develops, we might find that highly sophisticated materials might be presented in programmed format.

6. Assuming a relatively perfect program, the student has a master teacher at his disposal.

7. A good program assumes an adequate philosophy of education and an understanding of the learning process. This idea is supported by this statement:

> Programming gives us control over the content and processes of learning. It, therefore, requires us to think more deeply and cogently than ever before on basic educational questions: What are we trying to teach? Is it really worth teaching? To some? To all? What activities other than pure instructional should we include in a total school program? Etc. Programming doesn't commit us to a philosophy of education; it forces us to build one.[17]

Writing a Program

Although program preparation is not our primary concern, we will take a brief look at the subject. Obviously, if care is taken to construct a useful program, substantially more time will be consumed than would be the case in writing a textbook of a more conventional nature. Norman Crowder has estimated that between 100 and 150 hours would be required to program adequately the material covered in an hour lecture.

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[17]James McClellan, "Inside Opinion," C.P.I. Bulletin, Vol. 1 (May, 1961), p. 1.

The following outline of program preparation was prepared by Philip Lewis:

1. Establish definite educational objectives for the unit or course.

2. Identify the body of content, the skills to be developed or the processes to be involved in achieving the objectives.

3. Divide the content area into learning increments (small bits of information or instruction, each of which can be easily mastered by the learner). The increments are also called frames.

4. Arrange the increments in a learning sequence (simple to complex, concrete to abstract).

5. Insert cues and prompts in the sequence where these are deemed necessary to assist the learner.

6. Insert review increments as the program progresses to keep the learner refreshed on materials learned earlier.

7. Provide a challenge for the learner to accompany every increment. This may be a question to be answered, a problem to be solved, or an operation to be performed.

8. Arrange for the learner to have immediate knowledge of results of his response to the question or problem before he begins the next increment.[18]

In a program many varieties of "items" are used. One must be thoroughly familiar with these to write a successful program. Gilbert (associated with Educational Design of Alabama) presented the following outline of item types:

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[18]Philip Lewis, "Teaching Machines Have the Beat," _Music Educators Journal_ (November-December, 1962), p. 94.

1. Lead-in Items neither give new information nor require the rehearsal of old skills. Almost a synonym for thematic prompts, their function is to orient the student to a problem and prepare him for new information.

2. Augmenting Items are items that supply new information to a student but do not require him to make a relevant response. Response required in such items may usually be of a kind that will help insure the students' careful reading of the item.

3. Interlocking Items are items that require a student to review established skills while new information is presented.

4. Rote Review Items present a problem identical to one earlier presented. Various studies show that there is little value in repeating items that have been answered once or twice correctly. It is here that the value of branching becomes obvious.

5. Restated Review Items require the rehearsal of a skill where the problem is restated in a different syntactical arrangement.

6. Delayed Review Items allow for the further practice distributed in time. They will differ from other items only in the time of presentation.

7. Fading Items are items that not only require the student to review what has been presented to him, but also have information withdrawn from item to item.

8. Generalizing Items present a verbal statement pointing to a common characteristic of several specific problems already presented to the student.

9. Specifying Items are items which exemplify a general rule in a specific case.

10. Dovetailing Items require the student to make separate responses to separate stimuli that otherwise become confused.[19]

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[19]Foltz, Loc. cit., pp. 22-23.

Types of Programs

Two types of programming techniques, have dominated the scene and have received most of the attention, although several types are in existence. The Skinnerian (or "linear") program is one in which all the subjects follow the frames step by step, skipping none, and follow the same order or sequence of frames. This form of programming is an elaboration of Thorndike's "law of effect," and takes as its point of departure the attitude that the learner has had no previous experience with the subject at hand. One difficulty, therefore, is experienced in determining where to begin the program.

The strongest opposition to Skinner's programming methods is led by Norman Crowder of the Western Design Division of U. S. Industries (Sidney L. Pressey also appears to disagree with Skinner in this respect). Crowder has written about the programming form he advocates. His format is termed the "branching" or "intrinsic" approach. The Crowder design employs larger learning increments and multiple choice answers. The alternate answers (besides the correct answers) are planned to take into account logical misinterpretations of the questions. They are not supposed to "trap" the learner, but to point out the area or areas where review or clarification is needed. Crowder believes that to merely confirm student responses by presenting the correct answer is not sufficient and that explanations are very important to the learning process. The student is told why he is correct or incorrect in a Crowder program.

In programmed instruction the dispute over format is not at all settled, and Carlsen[20] compared the performance of subjects in a constructed-response program and found no significant difference in their performance as a function of programming technique.

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[20] Hutcheson, *Loc. cit.*, p. 16.

CHAPTER III

THE PSYCHOLOGICAL FOUNDATION OF PROGRAMMED INSTRUCTION

The Consequences of Behavior

Whether a reflex is conditioned or unconditioned, its main concern is with the internal psysiology of the organism. At the time, however, our main concern is with behavior which has some effect upon the surrounding world. The consequences of behavior may "feedback" into the organism. When they do so, the probability that the behavior which produced them will occur again is changed.[1]

Learning Curves

E. L. Thorndike made one of the first attempts to study the changes brought about by the consequences of behavior in 1898. His experiments were the result of a controversy of considerable interest at that time. Darwin had questioned the belief that man was unique among the animals in his ability to think, basing this opinion on the continuity of species theory. Around the turn of the century experiments in which animals seemed to show the

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

power of reasoning began to be published in great numbers. When terms which had previously been applied only to human beings were thus extended, questions arose concerning their meaning. One such question was, "Did the observed facts point to mental processes or could these evidences of thinking be explained in other ways?" Many years passed before this same question was raised concerning human behavior. Thorndike's experiments and his alternative explanation of reasoning in animals were very important steps in that direction.

"If a cat is placed in a box from which it can escape only by unlatching a door, it will exhibit many different kinds of behavior, some of which may be effective in opening the door." In his experiments, Thorndike found that whenever a cat was placed in such a box escape became quicker and quicker until eventually escape was as simple and quick as possible. In this experiment, Thorndike observed no "thought process" and argued that none was needed. He described his results simply by stating that "a part of the cat's behavior was 'stamped' in because it was followed by the opening of the door."

Behavior is stamped in when followed by certain consequences. Thorndike called this, "The Law of Effect." He observed that certain behavior occurred more and more readily in comparison with other behavior characteristics of the same situation and by noting the successive delays in getting out of the box and plotting them on a graph, he constructed a "learning curve." This curve revealed a process which took place over a considerable period of time and which was not obvious to casual inspection. Many such curves have since been recorded.

Learning curves do not describe the basic process of stamping in. By averaging many individual cases, we may make these curves as smooth as we like. Also, curves made under many different circumstances may agree in showing certain general properties. When measured in this way, learning is generally "negatively accelerated." This means that improvement in performance occurs more and more slowly as the condition is approached in which further improvement is impossible.

Learning curves demonstrate how the various kinds of behavior evoked in complex situations are sorted out, emphasized, and recorded. The process of the stamping in of single act causes the change to come about, but it is not reported directly by the change itself.[2]

Operant Conditioning

To get to the core of Thorndike's Law of Effect, the

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[2] *Ibid.*, pp. 59-62.

notion of "probability of response" must be clarified. When we discuss human behavior, we often refer to "tendencies" or "predispositions" to behave in particular ways. Terms such as "excitatory potential" and "determining tendency" are used in almost every theory of behavior. The question is, "How do we observe a tendency and how do we go about measuring one?"

Let us assume that a sample of behavior can exist in only two states. In one state, it always occurred and in the other it never occurred. In this situation, we would have no choice but to follow a program of functional analysis. It is to our great advantage to assume instead that the "probability that a response will occur ranges at all times between these all-or-none extremes." With this assumption, we can then deal with the variables which do not cause behavior to occur but simply make the occurrence more probable.

"The everyday expressions which carry the notion of probability, tendency, or predisposition describe the frequences with which bits of behavior occur." We cannot observe a probability directly. We say that someone is "enthusiastic" about bridge when we see them play a great deal and talk about it often.

When we characterize a person's behavior in terms of frequency, we assume certain standard conditions; he must be able to execute and repeat a particular act, and other behavior must not interfere. We cannot be sure of the extent of a man's interest in something if he is always busy with other things. When an organism is placed in a quiet box where its behavior can be observed through a one-way screen or recorded mechanically, this is not an environmental vacuum, for the organism will react to the features of the box in various ways. Its behavior will eventually reach a reasonable stable level, and when this occurs, the frequency of a selected response may be investigated.

In order to study what Thorndike called "stamping in," we must have a "consequence." Giving food to a hungry pigeon worked for Skinner. In this particular experiment, Skinner fed the pigeon from a small electrically operated food tray. At first the pigeon reacted in a way which interfered with the planned observation process but after being fed from the tray repeatedly, it ate readily. He was then ready to make this consequence contingent upon behavior and to observe the result.

The chosen behavior must be simple and capable of being freely and rapidly repeated. It must also be easily observed and recorded. He chose as his experimental subject a pigeon. The behavior selected was raising the head above a certain height. He placed a scale on the wall of the box and sighted over the pigeon's head. Skinner first determined the height which was normal for the pigeon's head and selected a height which was reached only infrequently. Watching the scale he opened the food tray quickly whenever the head of the pigeon rose above the line. An immediate change in the frequency with which the head crossed the line was observed. He then raised the line which the bird had to cross to determine when food was presented. Shortly the bird's posture had changed so much that the head seldom fell below the original line he chose.

The expression "trial and error learning," which is often associated with Thorndike's Law of Effect is clearly out of place in this experiment. Even the term "learning" is misleading. The barest possible account of what happened in this process is: "We make a given consequence contingent upon certain physical properties of behavior (the upward movement of the head), and the behavior is observed to increase in frequency."

Any movement of an organism is customarily referred to as a "response." The word comes from the area of reflex actions and implies an act which answers a prior event--the stimulus. However, we can make an event contingent upon behavior without identifying, or being able to identify, a prior stimulus. i. e. The environment of the pigeon to "elicit" the upper movement of the head was not altered. Skinner states that the word "response" is not wholly appropriate but because it is so well-established, he uses it in his discussion.

A response that has already occurred cannot be predicted or controlled. However, we can predict that "similar" responses will occur in the future. Skinner said that the unit of a predictive science is not a single response but a class of responses. He used the word "operant" to describe this class. The term "operant" emphasized the fact that the behavior "operates" upon environment to produce consequences. These consequences, in turn, define the properties with respect to which responses are called similar.

A single instance in which a pigeon raises its head is a "response." The behavior called "raising the head" is an "operant." It can be described as a group of acts defined by the property of the height to which the head is raised.

The term "learning" may be saved in its traditional sense to describe the rearrangement of responses in a complex situation. We can borrow from Pavlov's analysis of the conditioned reflex the necessary terms for the process of stamping in. Pavlov called all events which strengthened behavior "reinforcement" and all the resulting changes he called "conditioning." However, in Pavlov's experiment, a reinforcer is paired with a "stimulus"; whereas, in operant behavior it is contingent upon a "response." Operant reinforcement is a separate process and requires a separate analysis. In either case when the strengthening of behavior results from reinforcement we appropriately call it "conditioning." When we make a response more probable (occur more frequently) by strengthening an operant, we call this "operant conditioning." However, in Pavlovian or 'respondent' conditioning, we simply increase the magnitude of the response elicited by the conditioned stimulus and shorten the time which elapses between stimulus and responses. An organism is conditioned when a reinforcer (1) follows upon the organism's own behavior or (2) accompanies another stimulus. If an event does neither of these, it has no effect in changing the probability of a response. In the experiment with the pigeon, food was the "reinforcer" and presenting food when a response was emitted was the "reinforcement." The "operant" is defined by the property upon which reinforcement is contingent--the height to which the pigeon had to raise its head. The change in the frequency with which the pigeon lifted its head to this height is the process of "operant conditioning."[3]

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[3]*Ibid.*, pp. 62-66.

<u>Operant Extinction</u>

A response becomes less and less frequent when reinforcement is no longer forthcoming. This is called "operant extinction"; i.e., the pigeon will eventually stop lifting its head if food is withheld.

Operant extinction takes place much more slowly than operant conditioning. Therefore, the process can be followed more easily. Smooth curves are sometimes obtained in which the rate of response is seen to decline very slowly.

The condition in which extinction is complete is well known, but generally misunderstood. We call extreme extinction "abulia." This term is useful in that it implies that the behavior is lacking for a special reason. Many different variables make behavior strong or weak. It is the task of a science of behavior to identify and classify such variables. The result of prolonged extinction is a condition which resembles inactivity resulting from other causes; i.e.

> An aspiring writer who had sent manuscripts to the publishers only to have them rejected may report that 'he can't write another word'. He may still insist that 'he wants to write', and we may agree with him in paraphrase: his extremely low probability of response is mainly due to extinction.[4]

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[4] *Ibid.*, pp. 69-72.

What Events are Reinforcing?

The only way to find out if a certain event is reinforcing is to make a direct test on an organism. "We observe the frequency of a selected response, then make an event contingent upon it and observe any change in frequency." We classify the event as reinforcing to the organism under the existing conditions if there is a change in frequency.[5]

Conditioned Reinforcers

"We have already considered the acquisition of the power to 'elicit' a response; now we are concerned with the power to reinforce." We can demonstrate conditioned reinforcement more easily with stimuli which can be well controlled. If every time the light is turned on we give food to a hungry pigeon, eventually the light becomes a conditioned reinforcer. The light may be used to condition an operant the same as food. The more often the light is paired with the food the more reinforcing it becomes.

A conditioned reinforcer is "generalized" when it is paired with more than one primary reinforcer (i.e., sex, food, water, shelter, etc.). Because the momentary condition of the organism is not likely to be important,

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[5] *Ibid.*, pp. 72-75.

generalized reinforcers are useful. If a conditioned reinforcer has been used in connection with reinforcers appropriate to many conditions, at least one state of deprivation is more likely to prevail upon a later occasion. Therefore, a response is more likely to occur. Several important generalized reinforcers are: attention, affection, and the submissiveness of others.[6]

Why is a Reinforcer Reinforcing?

The "law of effect" is simply a rule for strengthening behavior. When we observe a change in the frequency of a reinforcement response, it is simple to report what has happened in objective terms. But we will probably resort to theory to explain why it has happened. "Why does reinforcement reinforce?" An organism repeats a response because it finds the consequences "pleasing" or "satisfying." It is the essence of the theory. However, this explanation is in no way within the frame work of natural science. These terms cannot refer to physical properties of reinforcing events because the physical sciences use neither of these terms or any equivalents.

"It is sometimes argued that reinforcement is effective because it reduces a state of deprivation. Here at

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[6]*Ibid.*, pp. 76-81.

least is a collateral effect which need not be confused with reinforcement itself." Obviously deprivation is important in operant conditioning. Skinner used a hungry pigeon in his experiments and he could not have demonstrated operant conditioning otherwise. The hungrier the bird gets the more often it will respond as a result of reinforcement. However, in spite of this connection, it is not true that reinforcement always reduces deprivation.

A biological explanation of reinforcing power is as far as Skinner went in saying why an event was reinforcing. "We must, therefore, be content with a survey in terms of the effects of stimuli upon behavior."[7]

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[7] Ibid., pp. 81-84.

CHAPTER IV

WHAT EFFECT HAS PROGRAMMED INSTRUCTION HAD ON MUSIC EDUCATION?

"The present trend in music education research is marked with a steady increase in the number of projects involving programmed instruction techniques," wrote Walter Ihrke in his article "Trends in Music Education Research."[1] Ihrke wrote this article to outline the types of research in programmed instruction which are in progress. This, he contended, would help decide which direction future research in this area should take. He made clear the point that a complete compilation was impossible because at the present time no machinery is set up to receive reports on research in progress. This is perhaps the most significant article in print which indicates the need for a system designed to report current research in progress.

The research being conducted in the programmed instruction area of music education at the present time is concerned primarily with programmed instruction techniques in the fields of music appreciation and music theory.

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[1]Walter Ihrke, "Trends in Music Education Research," Council for Research in Music Education (University of Illinois, College of Education, School of Music, Bulletin No. 2, Winter 1964.), p. 29.

Because the elements of music are specific in nature, music theory lends itself especially well to this treatment. Going on at the same time are attempts to program the operational aspects of music, such as listening and performance. Therefore, research in programmed instruction in music education can be classified into two main categories: First, there is the type where the material to be learned can be presented in a programmed textbook in which the material is presented in a frame and the students choose one of many responses available. This type of learning must, however, be balanced with the operational type to avoid a technical learning without sound and tonal understanding. The programmed instruction research of the second type takes the preceding factor into account. In this type the student's response is based on what he hears, or on what he is asked to do or perform, or both. Ihrke[2] calls the latter type the "operational approach" because the student is involved in a musical action either in hearing or in performance. Research in this area is again separated into two different approaches. The first approach is based on a response structured on material heard; however, it requires a performance response such as the playing of

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[2]Ihrke, Loc. cit.

rhythms on a keyboard. The second is based on a response which is made in reply to information that is presented aurally and requires a write-in response.

Carlsen[3] stated in his paper, "Implications of Recent Research Problems in Programmed Music Instruction" that some of the research in this field has been concerned primarily with the verbal or visual aspects of music. He said that the conclusions reached from such research have generally supported the findings of researchers in other fields involving visual or verbal concepts. The rest of the research has been basically concerned with the aural aspects of music. In both of these types of research (the verbal-visual and the aural) the general principles of programmed instruction have been found applicable. This means, (1) the material to be learned can be organized in series of steps, (2) the steps can be effectively sequenced leading from the known to the unknown, (3) the students can be led to respond to each item in the learning sequence, (4) students can be immediately informed of the accuracy or inaccuracy of their response, and (5) this immediate information can serve as reinforcement in the learning process.

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[3]James C. Carlsen, "Programmed Learning in Melodic Dictation," Journal of Research in Music Education, Vol. 12, No. 2 (Summer, 1964), pp. 139-148.

The researcher, wrote Ihrke,[4] must make an important decision concerning the importance of feedback. He must decide if the student should be notified immediately of his error, or if this should be delayed. If he should decide in favor of delaying this notification, how long after the learning experience should this feedback occur? An important point is that the write-in response does not provide immediate or even accurate feedback because it requires at least ten seconds to write and compare with the correct model.

Another problem cited by Ihrke to be studied by the researcher is the student's ability to read the correctness or incorrectness of his own response. Ability to do this accurately varies with the complexity of the response. For example, if the response consists of writing a checkmark in a response box, the comparison with the correct response is simple; however, if the student is asked to hear the difference between his wrong response and the correct one, this may be considerably more complicated. It may even require of him a proficiency and ability to discriminate which, at that moment, he does not possess.[5]

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[4]Ihrke, Loc. cit.

[5]Ibid., p. 30.

When the student uses this type of instruction, generally the teacher is not around. Therefore, we are faced with a problem in finding a worthy substitute. Ihrke stated that undoubtedly a teaching machine could be constructed to provide immediate and accurate feedback but he was doubtful if it could be done at a cost low enough to allow general distribution and use. Such a machine would have to incorporate the means of providing a completely operational approach. Also, an important point to remember is that the training method should control the design of the machine and its usage. The machine should never dictate the method no matter how expedient the latter may be.[6]

Another group of researchers are studying ways of improving testing procedures for freshmen entering college. New techniques are being developed from data received in programmed ear training material. This could lead directly to the improvement of all testing procedures, based on testing methods which are considerably more musically founded than those in common practice today. Later in this chapter we shall take a closer look at the work of Charles F. Spohn (Ohio State University). Spohn is now working to

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[6] Ibid., p. 31.

create a better test for students entering the university as music majors.

Ihrke stated that programmed instruction has taken a setback because of the many publicized programs that have failed for one reason or another. Most of them contained serious flaws such as hasty publication, no regard to student proficiency level, etc. He suggested that more care be taken at the outset to outline what needs to be taught in any given area and to select for programmed instruction only those matters which lend themselves to this technique.

Parker LaBach, Associate Professor of Education at Kent State University, made a study engaged in the problem of developing an electronic device through which some of the problems which cause students to drop out of music programs might be alleviated. The problems he cited which too often lead to dropping out are these:

(1) A teacher may meet with the students relatively infrequently, so that a sufficient check of progress and practice habits cannot be made often enough.

(2) There may not be time in a lesson to adequately explain or demonstrate new material to be practiced.

(3) Students practicing at home often get little positive help or criticism from parents whose knowledge of music may be small.

(4) The teacher is often not a competent performer on many instruments which he nevertheless must teach, and thus he is unable to demonstrate proper tone

and technique in a lesson.

(5) Students left alone to practice individually often dawdle, fail to keep tempos, misplay rhythms, and repeat errors unknowingly.[7]

LaBach did not design the machine to replace the teacher, but rather to supplement her instruction with programmed practice materials which utilize some of the principles of a good teaching machine.

The machine, as it was finally constructed, consisted of a professional two-track tape recorder, a tape loop cartridge mechanism, speaker, microphone, metronome, and a group of power operated relay switches and controls. The student sits with a page of exercises on the music stand in front of him. Before beginning the student establishes the tempo from the metronome. He then turns on the first segment of the exercise. Immediately following this he hears his performance played back to him. Following the playback he hears the same segment played expertly. He can then audibly compare his performance with the expert one. He then moves on to the second segment where the same process is continued. This machine allows the student to pace himself according to the speed

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[7]Parker LaBach, "A Device to Facilitate Learning of Basic Music Skills," Council for Research in Music Education (University of Illinois, College of Education, School of Music, Bulletin No. 4, Winter, 1965), p. 7.

he is capable of going, however, it does not allow him to dawdle.

LaBach pointed out that it is certain that various kinds of audio-visual equipment incorporating characteristics of true teaching machines will be developed. And from this type of research valuable new instructional techniques in the field of music will emerge. He stated:

> The nature of music as an art need not hinder efforts aimed at more efficiency or, even automation, in the learning process. The music studio and the science laboratory need not be as far apart as some may have thought.[8]

Carlsen[9] in his article referred to several experiments which have been conducted or which are currently in progress. All of the experiments he cited deal with the aural aspect of programmed music instruction.

Betty Kanable is now conducting a study which will be submitted in partial fulfillment for the Ph.D. degree at Northwestern University. This research study is completed for the most part and a more detailed report of it will be found in chapter five of this thesis. She is comparing the effectiveness of two methods of teaching sightsinging. In one method the student uses a programmed

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[8] *Ibid.*, p. 10.

[9] Carlsen, *Loc. cit.*

course of study and a multi-track tape recorder. In the other, he is taught by the conventional teacher-classroom method of sight singing. The tentative results of the study indicate no statistically significant difference between the two approaches. However, a correlation study appears to indicate that the conventional classroom approach does not exploit the tonal memory of students as effectively as does the programmed approach.[10]

Edward Maltzman has been working closely with B. F. Skinner at Harvard University for the past several years studying the effectiveness of programmed instruction in developing simple tone matching skills. Maltzman is currently engaged in a study of certain dimensions of discrimination, studying specifically the aspects of same-difference, higher-lower, and the major second-major third. He limited the musical materials for this study to the "do-re-me" tones of the major scale and did not involve any rhythmic concepts in the study. The results he has obtained thus far in his study indicate that developed skills in any one of these discriminations do not transfer to another and that each discrimination requires independent training.[11]

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[10] Ibid., p. 31.

[11] Ibid., pp. 31-32.

In 1958-59 Charles Spohn studied the effectiveness of supplementary drill in the development of melodic comprehension skills. The materials used by Spohn were musical elements consisting of pitch groupings and rhythms in various permutations which were organized in a programmed instruction fashion. The main concern of the study was to compare the effectiveness of structures outside preparation with that of the unstructured approach.

Currently, Spohn is engaged in another study in which he is attempting to evaluate aural and visual presentation modes and voice and written response modes in the development of music reading skills and aural comprehension. The materials he is using in the experiment are programmed. The study will seek to:

> (1) analyze and study the problems related to the developing of skills in interval identification, rhythmic discrimination, and tone groups, and
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> (2) increase present knowledge and to formulate hypotheses for subsequent research concerning speed at which students learn the skills of interval identification, rhythmic discrimination, and tone groups.[12]

In 1961-62, Carlsen himself conducted an experiment at Northwestern University which explored certain variables pertaining to the development of melodic perception. The

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[12] *Ibid.*, p. 30.

program consisted of contextual music materials and was used in lieu of the teacher rather than as supplementary drill. The purpose of the study was to compare linear programming techniques with branching programming techniques in teaching nonverbal concepts. The study revealed no significant difference between the two techniques.

Currently, Carlsen is engaged in another study to determine whether practice (or drill) is intrinsic to the development of aural perception skills. If this study should reveal that it is, then the experiment will also attempt to provide data which will reveal to what extent and where in the sequence such practice should be programmed into melodic perception materials.[13]

At the University of Connecticut, Walter Ihrke has been doing experimental research work with a rhythm training device. His major concerns are: (1) to develop equipment in which the response is rhythmic performance, (2) to develop equipment which provides immediate and instantaneous feedback to the student, and (3) to develop an effective training method or program.[14] Later in this chapter I shall present in greater detail the work of Ihrke in regard to programmed rhythmic training.

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[13] Ibid., p. 31.

[14] Ibid.

Charles F. Spohn in his article "Programming the Basic Materials of Music for Self-Instructional Development of Aural Skills," revealed the research he had done at Ohio State University in regard to using programmed instruction for developing aural skills.

He stated that the use of recorded teaching materials can assist instruction in two ways. First, there is an existing need to improve the presentation of materials used to develop the aural skills of students in music. Secondly, a way is needed to study the problems related to the development of these skills.[15] The use of recorded materials offers the possibility of controlled presentation on an individual basis.

In the traditional music fundamentals classroom the student has been dependent upon the teacher to present the correct stimuli. The student must also depend upon the teacher for the reinforcement of the desired responses. The better students often need the stimuli presented several times before the desired behavior is achieved and poor students need even more. The total number of stimuli to be presented in a music classroom multiplied by the number of reinforcements needed for each student to achieve the desired criteria would result in an astounding figure!

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[15] Spohn, Op. cit., p. 91.

Spohn stated that at the Ohio State University School of Music new methods have been developed and used for the self-presentation of the elemental materials of music. The process, he explained, is similar to the training of foreign language students and the foreign language labs are used for the instruction.

The first of these methods was developed from research in 1958 when Spohn found that for an experimental group using tape-recorded self-presentation music materials in comparison with a control group taught traditionally, the average percentage decrease in the number of errors made by the control group was 57.68 per cent, while the corresponding decrease in the number of errors made by the experimental group was 80.33 per cent.[16]

Spohn found in his experiments that through self-presentation methods the ability to identify both melodic and harmonic intervals can be improved. In his study, not only did the students have the advantages of self-presentation and machine teaching but the instructor had much more extra class time normally spent on interval training for other teaching.

In his article "Automated Music Training" Walter

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[16] Ibid., p. 93.

Ihrke disclosed the findings of his recent study of rhythmic training by machine teaching.[17] The study was an attempt to improve the present state of music training. Rhythm was selected as a starting point because it was capable of being treated with the most precision. The training machine was designed to be a modification of the usual tape recorder.

The audible channel gave the student instructions concerning the training items, tempo and meter indications, and metronome sounds to set the tempo. The student response was then made by tapping the rhythms presented in a printed manual on a keyboard. The inaudible channel on the tape contained the magnetic signals on the training item which the student was to match in his performance. If the single tap was early or late, appropriate error-lights automatically flashed this information to the student. The only other manipulation of the machine required of the student was pushing the start button when he was ready for another item. The machine stopped at the end of each item. If the student wanted to repeat an item, he simply pressed the reverse button.

Student subjects were selected from a group of

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[17] Ihrke, Op. cit., "Automated Music Training," p. 6.

volunteers in a music appreciation class. Generally, the students had no previous experience; however, a few with background experience were selected to see if earlier training would act as an aid or a deterent in this new type of training.

The results were encouragingly positive. The students made very few errors, and if an error was made, it was usually corrected in a single repetition. Ihrke found that the material was paced well. In only two instances out of several hundred items was the student unable to complete an item after the preceding one had been done correctly.[18]

Surprisingly enough, the pilot test results indicated that the musically unlearned had very little more difficulty in the program than the experienced. Ihrke believes that a test based on this new method might be able to indicate innate musical ability much more effectively than the usual tests.[19]

In closing this chapter I want to present a list compiled by Charles Spohn (Ohio State University) of the advantages of machine teaching.

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[18] Ibid., p. 7.

[19] Ibid., p. 8.

(1) Adequate controls can be exercised.
(2) It is possible to obtain suitable data.
(3) Reinforcement of the correct answer is immediate.
(4) The entire class may be supervised while the individual students work at their own rate.
(5) After an absence, a student may easily begin where he left off.
(6) Material can be organized so that each problem can depend on the preceding one with the result that progress to an eventually complex repertoire may be controlled.
(7) Mistakes can be recorded; therefore, drills may be modified as experience dictates by substituting, modifying, or adding tasks or steps.
(8) Flexibility of time schedule allows each student to practice.
(9) Consistent presentation of material is in skillful hands.
(10) Each student can progress in a sequence of learning which best fits his particular needs.
(11) The teacher can devote more class time to activities of a non-drill nature.[20]

Although the above list does not contain all of the advantages of programmed instruction or machine teaching, it does support the findings of researchers in other fields. Programmed instruction can be a powerful tool in the hands of skilled teachers in all fields of instruction.

In closing his article, "Trends in Music Education Research," Walter Ihrke made several important statements. These statements are ultimately characteristic of programmed instruction and all future programmed researchers could possibly benefit by being familiar with them. Therefore the writer uses those same statements to close this

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[20]Spohn, _Op. cit._, pp. 96-97.

chapter:

If we truly believe in the possibilities of this new training method, care must be taken at the outset to painstakingly outline what needs to be taught in any given area, to select only those matters which lend themselves to this technique, to outline the beginning and ending training levels, and finally to program within that framework. Programmed instruction is not a cure-all, but it is the first truly new light to be cast on the instructional scene in the last half century. In the field of music training the urgent need for revision of instructional techniques is self-evident, and researchers should be encouraged to explore new training techniques.[21]

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[21]Ihrke, Op. cit., "Trends in Music Education Research," p. 31.

CHAPTER V

THE STATE OF THE PROGRAM

An assessment of where we are in regard to programmed instruction will perhaps emerge from a discussion of some of the questions that have been asked, and are still being asked, about the medium.

Do students really learn from programmed instruction? They do indeed, and from all kinds of programs. Research has left no doubt of this.

Do they learn as well as from a teacher? Here a generalization cannot be made, because such comparisons reflect the quality of the individual program and the ability of the individual teacher. There have been many studies which have shown programmed instruction to be as efficient, or more so, than the conventional kind, but the results of such studies must always depend upon what kind of programs are being compared to what kind of teachers. It has been said that the main advantage of a good program is that the student can learn by himself. However, it is becoming more and more apparent that programmed instruction _plus_ instruction by a teacher is better than either alone. Within a class, the student may learn at his own rate. He need not be frustrated by trying to keep up with others; if he learns rapidly or if he has previous knowledge of the subject, he is not held back while waiting for others. The teacher has more time to help individuals and to teach beyond that which is programmed.

Are teaching machines better than programmed textbooks? One of the earliest studies of this question was made by Eigen and Komoski,[1] and there have been others. The answer is, "Not necessarily." Machines may have an advantage at first, when they are a novelty, but the effect soon wears off. We should remember, however, that most of the research on teaching machines has been concerned with those which present the same kind of verbal and pictorial material that a book can present. More recent computerized machines do much that a book cannot do, and tape recordings, which are being used widely in music and foreign language teaching, serve as audio models. These are teaching machines in a broad sense of the term; programmed textbooks can be used in conjunction with them, but not in place of them.

What are the characteristics of good programmed instruction? In 1964, the director of the Institute for Communication Research at Stanford University, compiled an annotated bibliography of most of the research on

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[1]Lewis D. Eigen and P. Kenneth Komoski, Automated Teaching Project. Research Summary No. 1, Collegiate School, New York, 1960.

programmed instruction that had been reported at that time.[2] Then taking a long look at it, he made a statement to the effect that the question of what is good programmed instruction would have to be answered differently than it would have been answered four years and 165 research papers earlier. This was in 1964. Now in 1968 the old answer must be modified by seven years and several hundred research papers. Traditionally, an efficient program was believed to have (1) an ordered sequence of information, (2) presented in small steps called frames; (3) each frame called for the student to make an overt response which was (4) immediately confirmed or "reinforced." By now, each of these characteristics has been tested many times.

In the case of the first, the ordered sequence, it seems that what appears to the teacher to be an ordered and logical sequence is not always the most logical to the students; i.e., it may not best represent the way they learn. This is why collaboration between a programmer and the learner is important. The programmer decides what is to be taught, but his students show him how to teach it. There are numerous studies which confirm this, particularly

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[2] Wilbur Schramm, The Research on Programmed Instruction, Bulletin No. 35, 1964, Office of Education and Welfare, Washington, D. C.

those by Mager[3] and those by Roe.[4] One by Rothkopf[5] is unique. He determined experimentally the effectiveness of seven versions of the same program. Then he gave the programs to 12 high school teachers and principals to look over, asking each to choose the one he believed would be best. The rank correlation between the choices of the educators and the actual effectiveness of the programs was minus .75. It would seem that we cannot tell, by merely looking at a program, how good it will be.

As for the next of the classic characteristics, various studies have favored steps of various size. Like sequence of material, step size must be suited to the maturity, ability, and motivation of the learners. The complexity of the subject matter is also a factor. Nevertheless, if a program is in such short and simple steps that the dullest students, or even the average students, make no errors, it is much too slow and boring for the

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[3]Robert F. Mager, "On the Sequencing of Instructional Content," Psychological Reports (1961), pp. 405-413.

[4]Kiki Vlachouli Roe, Scrambled vs. Ordered Sequence in Auto-Instructional Programs, Report No. 48, Department of Engineering, University of California at Los Angeles, 1961.

[5]Ernst Z. Rothkopf, "Some Observations on Predicting Instructional Effectiveness by Simple Inspection," Journal of Programmed Instruction, 1963.

better students. The intrinsic, or branching, programs were devised to provide for individual differences. Proponents of this type of program point out that fewer steps do not necessarily mean longer leaps. The results of studies comparing linear and branching programs are as often in favor of one as the other.

Recently, questions concerning response and reinforcement have been receiving most of the attention and, again, there are all kinds of research results. The thing worth noting, however, is that there are studies, and very many of them, in which covert response has been found equal to overt response and to require less time.[6] Most, but not all, of these studies were done with college students or other adults as subjects.

A recent study by Pressey[7] is of particular interest because it was done by the man who is considered to be the inventor of the teaching machine and is credited, along with Skinner, with establishing the linear program as a prototype. He rewrote the first section of the Holland-Skinner

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[6]Vincent N. Campbell, Studies of Bypassing as a Way of Adapting Self-Instruction Programs to Individual Differences, American Institute for Research, San Mateo, California, 1962.

[7]Sidney L. Pressey, "A Puncture of the Huge 'Programming Boom?'" Unpublished Paper, The University of Arizona, Tucson, 1963.

program on psychology in six prose paragraphs. Three groups of university students were given, respectively, (1) the program, (2) the six prose paragraphs carrying the same content, and (3) the six paragraphs plus six objective Pressey-type questions. The first and second groups did equally well, but the second group spent about one-tenth the time on the material. The third group did a little better, but not significantly so.

All in all, the research leaves us without a specific answer to the question, "What are the characteristics of good programmed instruction?" We must ask it, and discover our own answer each time, in terms of "good for what and for whom?" Schramm predicts that the borders of this field of research will expand.

> As the generality of its problems becomes more apparent and the eccentricities of method less diverting, we rather expect research on programmed instruction to merge with the broader stream of research on instructional technology, to the benefit of both.[8]

Are there not some areas, such as music and the other arts, in which the subject matter cannot be programmed? Crowder,[9] the director of the Educational Science Division

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[8] Schramm, Op. cit., p. 1.

[9] Norman A. Crowder, "The Characteristics of Branching Programs," The University of Kansas Conference of Programmed Learning reported in Kansas Studies in Education, 11:2 (June, 1961), pp. 22-27.

of U. S. Industries and inventor of the branching program, says that he had always believed appreciation of English literature to be a good example of what cannot be programmed, until he received a manuscript on understanding modern poetry. He considered it to be the best piece of programming that he had ever seen, and thereupon he decided that what can be programmed depends upon the skill, ingenuity, and subject-matter knowledge of the programmer.

It has been obvious from the first that verbal facts about music can be programmed. However, in a thorough discussion of automated music training, Ihrke[10] reminds us that tones and chords themselves are facts; they are musical facts. While we must recognize that there is much in music that cannot be taught by either teachers or automated techniques, the specific elements of music adapt themselves remarkably well to automated training. There can be constant association with actual musical sound and even evaluation of tones played or sung by the student. In all musical learning it is important that the parts are not isolated from the total musical experience. Nevertheless, as Ihrke once said so well:

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[10] Walter R. Ihrke, "Automated Music Training," _Journal of Research in Music Education_, Vol. 2, No. 1 (Spring, 1963), pp. 3-20.

> We need great sensitivity to tonal materials in order to perform and listen effectively. . . . To experience in depth we must train in depth. Automated techniques can steadily and securely teach these sensitivities in a manner which is impossible under the costly methods of student-teacher relationships presently employed. . . . Then we must coordinate this automated training with classroom training to present a strongly integrated program.[11]

What has been the extent of experimental research in programmed music instruction? There has no doubt been considerably more research of this kind than has been published. As far back as 1949, Cookson (Northwestern University)[12] used recordings as tutors. In 1959 and 1960, Clough and his colleagues (Oberlin College)[13] carried out a project for the Ford Foundation which successfully demonstrated machine teaching of music fundamentals. Later, comparisons of conventional methods with programmed textbooks in the teaching of fundamentals were reported by Barnes (Ohio State University)[14] and by Ashford (Northwestern

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[11] *Ibid.*, p. 12.

[12] Frank B. Cookson, *Recording and Self-Tutoring*, The Brush Development Company, Cleveland, 1949.

[13] John Clough and others, "Oberlin Teaching Machine Project 1959-60," Report to the Ford Foundation, February, 1961.

[14] Robert A. Barnes, "Programmed Instruction in Music Fundamentals for Future Elementary Teachers," *Journal of Research in Music Education*, Vol. 12, No. 3 (Fall, 1964), pp. 187-198.

University).[15]

In the teaching of skills, Fischer (Sherwood Music School)[16] has given us the benefit of his experience in programming some aspects of string instruction. Ellingson (Evangel College)[17] has reported the development of an automated system for teaching functional piano skills.

As for research in the programming of tonal material itself, Spohn (Ohio State University)[18] and Carlsen (University of Connecticut)[19] have been the pioneers. Working separately they have demonstrated the feasibility of tape recording for the development of aural perception. Carlsen has summarized the principles and implications of

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[15] Theodore H. A. Ashford, "The Use of Programmed Instruction to Teach Fundamental Concepts in Music Theory," Journal of Research in Music Education, Vol. 14, No. 3 (Fall, 1966), pp. 171-177.

[16] Bernard Fischer, "Programmed Learning in Strings," The American Music Teacher, Vol. 15, No. 1 (September-October, 1965), pp. 29-49.

[17] Donald Ellingson, "Automated Teaching System for Functional Piano Skills," Missouri Journal of Research in Music Education, Vol. 1, No. 5 (Autumn, 1966), pp. 7-13.

[18] Charles L. Spohn, "Programming the Basic Materials of Music for Self-Instructional Development of Aural Skills," Journal of Research in Music Education, Vol. 11, No. 2 (Fall, 1963), pp. 91-98.

[19] James C. Carlsen, "Programmed Learning in Melodic Dictation," Journal of Research in Music Education, Vol. 12, No. 2 (Summer, 1964), pp. 139-148.

music programming in a recent MENC Contemporary Music Project publication.[20]

Programmed instruction in music has been produced at many institutions. In a 1965 survey, Dallin (California State College at Long Beach)[21] found 33 schools where faculty members were currently, or had been, engaged in developing programs. Most of this activity has no doubt employed experimental methods, but reports of the research are not yet widely circulated through journals, etc.

Is programmed music instruction available in the educational materials market? Another part of Dallin's survey was concerned with this question. His discussion of available materials was published in 1966 in the February-March issue of the Music Educators Journal.[22] At present there are many more books and articles to be added to the list and every indication is that more will be forthcoming in the future. The list of presently available published materials which I have compiled for this thesis is approximately five times as large as the one published by Dallin

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[20]Contemporary Music Project, Comprehensive Musicianship: The Foundation for College Education in Music, Music Educators National Conference, Washington, D. C., 1965.

[21]Leon Dallin, privately disseminated report, May, 1965.

[22]Leon Dallin, "A Survey of Programmed Music Teaching Materials," Music Educators Journal, Vol. 52, No. 4 (February-March, 1966), pp. 198-200.

in 1965.

The over-all research in programmed instruction, which has shown such a variety of techniques and formats to be effective, gives support to music programmers in their own experimentation. The resources of educational technology, video screens and electrowriters as well as tapes, have great import, perhaps particular import, for music teaching. Their value, however, will be determined by the quality of the material that is given them. Of one thing we can be sure, programming is not a routine process but a creative activity, just as any other form of communication.

CHAPTER VI

REPORT OF THE SURVEY

Introduction

The preliminary research performed in the area of programmed learning in the summer of 1966 revealed that up to that time only twenty programmed texts were available in music education. This was shown by Leon Dallin in a report published by the *Music Educators Journal*.[1]

During the summer of 1967 the format for the study was drafted. The study would take the form of a survey of all colleges and universities who were members of the National Association of Schools of Music. In November of 1967, 318 survey forms were mailed to NASM schools. When the final return was calculated over 51 per cent of the total mailing had been returned. The 163 forms which were returned demonstrated a national concern by educators everywhere for the current study. The remainder of this chapter will be devoted to a detailed report of the survey results. For this report all areas of programmed research will be divided into one of three categories: music appreciation, music theory, or other categories.

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[1] Leon Dallin, "A Survey of Programmed Music Teaching Materials," *Music Educators Journal*, Vol. 52, No. 4 (February-March, 1966), pp. 198-200.

Bertrand Howard (University of Texas) has published a book entitled Fundamentals of Music: A Program. The text is published by Harcourt, Brace, and World Company. Gary M. Martin has written a new music appreciation text entitled Basic Concepts in Music. It is published by Wadsworth Publishing Company.

Rodney Townley (Southern Colorado State College) has published a text entitled Thirty Hours With Music. The book was published by William C. Brown Company. Jeanne Foster Wardian (Lindenwood College) has published a music appreciation text entitled The Language of Music: A Programmed Course. This text is published by Appleton-Century-Crofts.

At Washington University Lewis B. Hilton is currently preparing a new programmed course entitled 20th Century Music for High School Students. This research project employs the use of teaching machines. The research is uncontrolled. At the School of Performing Arts, University of Southern California W. M. Triplett is currently preparing manuscripts for a new music appreciation text entitled Music Fundamentals: A Program for Self-Instruction. The study will be in the form of audio-programming employing tape recordings and response booklets. The research is controlled.

Music Theory

Dr. Charles H. Douglas (University of Georgia) has published a text entitled Basic Music Theory through McKenzie Publishing Company. J. Austin Andrews (East Wyoming State College) and Jeanne Foster Wardian (Lindenwood College) have published a theory text entitled Introduction to Music Fundamentals. Appleton-Century-Crofts is the publisher. Andrews, Lotzenhiser and Maxson (East Wyoming State University) published a theory text entitled Beginning Music Principals and Application. The American Book Company published this text.

John Clough (Western Maryland College) published a text entitled Scales, Intervals, Keys and Triads. Norton published the text. Bertrand Howard (University of Arkansas) has published a theory text entitled Fundamentals of Music Theory. Harcourt, Brace and World published the text.

Dr. Charles H. Douglas (University of Georgia) is currently performing research which will lead to three programmed texts dealing with music theory, music composition and musical form. All of his research is controlled. A. Loran Olsen (Washington State University) is conducting an uncontrolled research project in theory and dictation. This research employs prerecorded tapes but will lead to a programmed text. William Brandt (Washington State University) is currently conducting a research study in the use of pre-recorded tapes and programmed texts in teaching counterpoint. His research is controlled.

William Maxson (East Wyoming State University) is conducting a controlled research project in form and analysis. Maxson is working on a doctoral dissertation but the text will be published. Dr. James Krehbiel (Eastern Illinois University) is conducting research employing teaching machines (tape recorders) to teach music theory. His research is uncontrolled. Betty Kanable (Drake University) is working with teaching machines and programmed texts to teach theory and sight-singing. Her study is partially controlled.

James C. Smith and Walter Britt (both of Florida State University) are currently engaged in programmed research dealing with music theory. They are employing both teaching machines and programmed texts. Their research is controlled. Both of these men are working toward doctoral degrees.

Dr. Thomas H. Carpenter, Chairman of the School of Music, East Carolina University, stated that several members of the theory department are experimenting with tapes for various classes. Also, one member of the faculty, George Knight, designed a programmed theory course for incoming freshmen at East Carolina University. This course employs a programmed text and is uncontrolled. Dr. Carpenter also stated:

> I am involved in a USOE-supported research project (No. 5-8306) dealing with the teaching of music via instructional television. The project is to be complete in the summer of 1968.

Jon Palifrone and John Ibleson (both of Indiana State University) are currently engaged in a research project in the area of music theory. Their research employs programmed texts and is uncontrolled. George R. Cribb and Melvin L. Daniels (both of North Texas State University) are currently conducting programmed research in music theory. Both are working toward doctoral degrees. Their study employs teaching machines and programmed texts. The study is controlled. David S. Lewis (Ohio University) is currently engaged in a programmed study of music theory. His research deals with teaching machines and is uncontrolled.

R. F. Noble (University of Wyoming) is currently developing a programmed high school music theory text. His project is controlled. James H. Wilcox (Southern Louisiana College) is performing research which will lead to a programmed music theory text. His research is uncontrolled. Sue Sonner (Texas Christian University) is currently preparing a thesis in partial fulfillment for the M.M.E. degree. Her thesis deals with self-instruction in music theory for high school students.

Dr. Doreen Grimes (Eastern New Mexico University) has published a text entitled Programmed Ear Training Series which will be available in the summer of 1968. Dr. Grimes is currently engaged in programmed research in advanced ear training and elementary part-writing. These projects employ teaching machines and are controlled.

Dr. Donald Chittum (Philadelphia Musical Academy) is currently engaged in a research project dealing with the programmed teaching of ear training. His study employs both teaching machines and programmed texts and is uncontrolled. Dr. Gilbert Trythall (George Peabody College for Teachers) is currently conducting programmed research in ear training. His research employs teaching machines (tape recorders) and it is uncontrolled.

Warren Rasmussen (University of Southern California) is currently performing research in programmed ear training. His work is toward a doctoral degree and is entitled "An Experiment in Developing Basic Listening Skills Through Programmed Instruction." His research employs the Edex machine.

Dr. Forest J. Baird (San Jose State College) is currently engaged in a programmed research project dealing with remedial work in melodic sight-singing for non-music majors. His research employs teaching machines (recorders and tapes) and is uncontrolled.

Other Categories

Robert C. Dolbeer (Ohio State University) is developing a programmed text for the teaching of conducting. His research employs the use of tape recordings and programmed booklets. The research is controlled. Dr. William English (Arizona State University) is currently performing programmed research involving both teaching machines and programmed booklets. The research will lead to a programmed text entitled "A Programmed Approach to the Training of Choral Conductors." Dr. Henry Bruinsma, Dean of the College of Fine Arts of Arizona State University, indicated a strong programmed instruction theory curriculum using tapes prepared at the school.

Howell Branning (University of Texas) has published a text entitled A Sequential-step Program for Elementary Acoustics. This text was published by the University of Texas Press. Dr. Walter Ihrke (University of Connecticut) is performing preliminary research dealing with musical aptitude learning. He is using a teaching machine and programmed booklets. The research is controlled.

S. Wassum and R. Folstrom (both of the University of Wisconsin) are currently engaged in the production of a programmed music text for the teaching of music education.

The research is uncontrolled. Dr. Robert Pence (Eastern Illinois University) is using teaching machines and programmed booklets in the teaching of music education at the school. His experiment is uncontrolled.

Genevieve Hargiss (University of Kansas) has published a programmed text for elementary teachers entitled _Music for Elementary Teachers: A Programmed Course in Basic Theory and Keyboard Chordings_. The text was published by Appleton-Century-Crofts. William Brandt (Washington State University) is currently engaged in developing a programmed text for teaching music history and literature. His research employs both pre-recorded tapes and programmed texts. The research is uncontrolled.

Neil O'Neil (Florida State University) is currently performing programmed research which will result in a text for teaching string instruction. His research employs both machines and programmed texts. The research is controlled. In partial fulfillment for the doctor of philosophy degree William M. Bigham (Morehead State University) developed a text entitled _A Comparison of Two Response Modes in Learning Woodwind Fingerings_. The text is published and is available through the Florida State University bookstore. Thomas Wasson (Louisiana State University) is developing a programmed text for teaching woodwind instruction. His research employs programmed booklets and is uncontrolled.

CHAPTER VII

CONCLUSION

The System

The introductory section of this thesis hypothesized that enough programmed research was being conducted in music to develop a system to avoid unnecessary duplication of research and designed to keep all researchers informed of current research in progress. The survey report in chapter five demonstrated that programmed research in music is increasing. Therefore, as such research continues to increase in the music field the need for a system to avoid duplication and keep the researcher abreast of the work of others in his field will also increase.

Who should assume responsibility for the system? A system which informs professional researchers in a given area should be the responsibility of a professional journal or publication within that area. Therefore, this writer believes that the *Music Educators Journal*, as one of the nation's largest music journals, should assume responsibility for development and control of such a system.

Information gained by this writer while conducting research leading to this thesis indicated that a system like the one described in the preceding paragraph would require the establishment of five fundamental steps. These steps are:

1. Develop a survey form which would provide the necessary information.
2. Conduct a survey at regular intervals of all programmed instruction researchers in music.
3. Group the findings according to areas of research.
4. After each survey is conducted print a booklet (could be printed or mimeographed) containing the information gained in step three.
5. Mail this booklet to any school or person who indicated interest on the survey form.

This writer believes that the establishment of a system such as the one above would greatly reduce the amount of duplication in programmed research. It would also keep researchers of programmed instruction informed of other current research in their field.

Summary

The research reported in chapter five demonstrated that programmed instruction in music is receiving much attention by music education researchers throughout the country. More than 45 schools presented evidence of current or past programmed research. In 1966, when Leon Dallin presented the results of his survey of published programmed materials in the Music Educators Journal he listed only 20 programmed music texts. The current survey and research connected with it revealed (see bibliography II) over 30 currently available programmed texts in music which have been published since the Dallin report. This increase in the number of available programmed music texts in the past two years is evidence of the growing importance of programmed instruction in music education. The information presented in the next paragraph is a breakdown of the current programmed research in regard to the area in which the research is being conducted.

Arranged alphabetically are the areas of current programmed research and the number of schools performing research within each area: appreciation, 7; conducting, 1; counterpoint, 1; composition, 1; dictation, 1; ear training, 4; elementary acoustics, 1; form and analysis, 2; history, 1; literature, 1; music aptitude, 1; music education, 2; music for elementary teachers, 2; partwriting, 1; performance, 1; remedial sight-singing, 1; scales and intervals, 1; sight-singing, 1; string instruction, 1; and woodwinds, 1.

BIBLIOGRAPHY

BIBLIOGRAPHY

I. Programmed Instruction in General

Campbell, Vincent N. "Studies of Bypassing as a Way of Adapting Self-Instruction Programs to Individual Differences," American Institute for Research, San Mateo, California, 1962.

Clough, John. "Oberlin Teaching Machine Project 1959-60," Report to the Ford Foundation, February, 1961.

Cookson, Frank B. Recording and Self-Tutoring, The Brush Development Company, Cleveland, 1949.

Crowder, Norman A. "The Characteristics of Branching Programs," The University of Kansas Conference of Programmed Learning reported in Kansas Studies in Education, 11:2 (June, 1961).

Dale, Edgar. "Instructional Resources," The Changing American School (Chicago: National Society for the Study of Education, 1966), p. 104.

Eigen, Lewis D. and Komoski, P. Kenneth. Automated Teaching Project, Research Summary No. 1, Collegiate School, New York, 1960.

Foltz, Charles I. The World of Teaching Machines, (Washington: Electronic Teaching Laboratories, 1961), p. 18.

Garner, Wayne Lee. Programmed Instruction (New York: Center for Applied Research in Education, 1966).

McClellan, James. "Inside Opinion," C.P.I. Bulletin, Vol. 1 (May, 1961), p. 1.

Mager, Robert F. "On the Sequencing of Instructional Content," Psychological Reports (1961), pp. 405-413.

Markle, Susan Meyer. Good Frames and Bad; A Grammar of Frame Writing (New York: John Wiley and Sons, 1964).

Pipe, Peter. Practical Programming (New York: Holt, Rinehart and Winston, 1966).

Pressey, Sidney L. "A Puncture of the Huge 'Programming Boom'?" Unpublished Paper, The University of Arizona, Tucson, 1963.

Roe, Kiki V. Scrambled vs. Ordered Sequence in Auto-Instructional Programs, Report No. 48, Department of Engineering, University of California at Los Angeles, 1961.

Rothkoph, Ernst Z. "Some Observations on Predicting Instructional Effectiveness by Simple Inspection," Journal of Programmed Instruction, 1963.

Schramm, Wilbur. "Programmed Instruction Today and Tomorrow," Fund for the Advancement of Education (November, 1962).

______. The Research on Programmed Instruction, Bulletin No. 25, 1964, Office of Education and Welfare, Washington, D. C.

Selection and Use of Programmed Materials (Division of Audiovisual Instructional Service of the National Education Association, 1964).

Skinner, B. F. Science and Human Behavior (New York: The Macmillan Company, 1953).

______. "Teaching Machines," Scientific American (November, 1961).

______. "The Science of Learning and the Art of Teaching," Harvard Educational Review, Vol. 24, (1954).

Stolurow, L. M., Jacobs, Paul I. and Maier, Milton H. A Guide to Evaluating Self-Instructional Programs (New York: Holt, Rinehart and Winston, 1966).

Thorndike, E. L. Education (New York: The Macmillan Company, 1912), pp. 165-167.

II. Programmed Material in Music

A. Books

Andrews, J. Austin. "Development and Trial of a Basic Course in Music Theory using Self-Instructional Materials to Supplement Training Received in High School," HEW Project No. 5-0261.

Andrews, J. Austin and Wardian, Jeanne Foster. Introduction to Music Fundamentals (New York: Appleton-Century-Crofts, 1964).

Ashford, T. H. A. "An Investigation of Programmed Instruction in the Fundamentals of Music Theory," Unpublished Ph.D. Dissertation, Northwestern University, Evanston, Illinois; June, 1965, Order No. 65-12-043.

Barnes, R. A. "An Analysis of the Effectiveness of Programmed Instruction as an Ancillary Learning Experience in a Music Fundamentals Class for Prospective Teachers," 1963, Ohio State University, Unpublished Doctoral Dissertation, Order No. 64-541; Appendix A, pp. 100-383 published by McGraw-Hill Book Company, Inc.

Batcheller, John. Musical Notation (Wilmette, Illinois: Encyclopedia Britannica Press, 1964).

______, and Betty Lou DuBois. Reading Music (Albuquerque, N. M.: General Programmed Teaching Corporation, 1962).

Bigham, William M. "A Comparison of Two Response Modes in Learning Woodwind Fingerings by Programmed Text," Unpublished Ph.D. Dissertation, Florida State University, 1965, Order No. 65-15-445.

Carlsen, James C. "An Investigation of Programmed Learning in Melodic Dictation by Means of a Teaching Machine Using a Branching Technique of Programming," Unpublished Ph.D. Dissertation, Northwestern University, Evanston, Illinois, 1962.

______. Melodic Perception: A Program for Self-Instruction (New York: McGraw-Hill Book Company, 1965).

______. "Programmed Learning in Melodic Dictation," Unpublished Ph.D. Dissertation, Northwestern University, 1962. Order No. 63-1274.

______. "The Role of Programmed Instruction in the Development of Musical Skills," Report of Seminar in Comprehensive Musicianship (Washington, D. C.: Contemporary Music Project, MENC, Fall, 1965).

Chakerian, Lan and Ventolo, William. _Fundamentals of Music_ (Albuquerque, N. M.: Teaching Machines, Inc., 1961).

Clough, John. "Oberlin Teaching Machine Project 1959-60," Report submitted to the Ford Foundation, February, 1961.

_____. _Scales, Intervals, Keys and Triads: A Self-Instruction Program_ (New York: W. W. Norton and Company, 1964).

Dallin, Leon. _Introduction to Music Reading: A Program for Personal Instruction_ (Glenview, Illinois: Scott, Foresman and Company, 1966).

Daniels, M. L. "Programmed Learning in Harmonic Dictation," Unpublished Ed.D. Dissertation, School of Education, North Texas State University, 1964.

Harder, Paul. _Basic Materials in Music Theory: A Programmed Course_ (Boston: Allyn and Bacon, Inc., 1965).

Howard, Bertrand. _Fundamentals of Music Theory: A Program_ (New York: Harcourt, Brace and World, Inc., 1966).

Kanable, Betty M. "An Experimental Study Comparing Programmed Instruction with Classroom Teaching of Sight Singing," Unpublished Ph.D. Dissertation, Northwestern University, Evanston, Illinois, 1964. Order No. 65-3280.

Kraft, Leo. "First Year Ear Training Program," Queens College, Unpublished.

Kraus, Egon. _International Listing of Teaching Aids in Music Education_ (Cologne, Germany: International Society for Music Education, 1959).

Lewis (Barton), June. "Pilot Study in Programmed Learning," Washington University, St. Louis, Missouri, Unpublished.

Mandle, William D. "A Comparative Study of Programmed and Traditional Techniques for Teaching Music Reading in the Upper Elementary Schools," HEW Project No. 6-8164.

Nelson, Carl. "The Effectiveness of the Use of the Adjunct Programmed Analysis of Musical Works on Students Perception of Form," HEW Project No. 5-1084.

Reese, Virginia Denyer. "An Analysis of Musical Forms: A College Text," Unpublished Ph.D. Dissertation, University of Oklahoma, 1964.

Schwartz, Paul. Hearing Music With Understanding, Developed as part of the Great Lakes College Association Programmed Instruction Project (Chicago: Educational Methods, Inc., Records and Workbook).

Spohn, Charles L. "A Comparison Between Different Stimuli Combined with Two Methods for Providing Immediate Knowledge of Results in Learning Elemental Materials of Music," HEW Project No. 5-0840.

______. "A Comparison Between Different Stimuli Combined with Two Methods for Providing Knowledge of Results in Music Instruction," Title VII Project No. 1088, Ohio State University Research Foundation.

______. "An Exploration in the Use of Recorded Teaching Material to Develop Oral Comprehension in College Music Classes," Unpublished Ph.D. Dissertation, Department of Education, Ohio State University, 1959.

Wardian, Jeanne Foster. The Language of Music: A Programmed Course (New York: Appleton-Century-Crofts, 1967).

Woelflin, Leslie. Classroom Melody Instruments: A Programmed Text (New York: Scott, Foresman and Company, 1967).

B. Articles, Periodicals, etc.

Ashford, Theodore H. A. "The Use of Programmed Instruction to Teach Fundamental Concepts in Music Theory," Journal of Research in Music Education, XIV (Fall, 1966), pp. 171-177.

Barnes, Robert A. "Programmed Instruction in Music Fundamentals for Future Elementary Teachers," Journal of Research in Music Education, XII (Fall, 1964), pp. 187-198.

Carlsen, James C. "Implications of Recent Research Problems in Programmed Music Instruction," Council for Research in Music Education, Bulletin No. 4, 1965, pp. 30-35.

_______. "Programmed Instruction, a New Tool for the Music Educator," International Music Education, (ISME Journal) (March, 1966), pp. 426-431.

_______. "Programmed Learning in Melodic Dictation," Journal of Research in Music Education (Summer, 1964), p. 139.

Contemporary Music Project. Comprehensive Musicianship: The Foundation for College Education in Music, Music Educators National Conference, Washington, D. C., 1965.

Crowder, Norman A. "The Characteristics of Branching Programs," The University of Kansas Conference of Programmed Learning, Kansas Studies in Education, 11:2 (June, 1961), pp. 22-27.

Dallin, Leon. "A Survey of Programmed Music Teaching Materials," Music Educators Journal (February-March, 1966), pp. 198-200.

_______. A privately disseminated report (May, 1965), Unpublished.

Ellington, Donald. "Automated Teaching System for Functional Piano Skills," Missouri Journal of Research in Music Education, 1, 1966, pp. 7-13.

Fischer, Bernard. "Programmed Learning in Strings," The American Music Teacher (March-April, 1965), p. 20.

Goldiamond, Israel and Pliskoff, Stanley. "Music Education and the Rationale Underlying Programmed Instruction," Music Educators Journal (February-March, 1965), pp. 43-47, 190-195.

Hammer, Harry. "An Experimental Study of the Use of the Tachistoscope in the Teaching of Melodic Sight Singing," Journal of Research in Music Education, XI (Spring, 1963), pp. 44-55.

Hargiss, Genevieve. "The Development and Evaluation of Self-Instructional Materials in Basic Music Theory for Elementary Teachers," Council for Research in Music Education, Bulletin No. 4 (Winter, 1965), pp. 1-5.

Hutcheson, Robert J. "Programmed Instruction and Music Education," Missouri Journal of Research in Music Education, Vol. 24, No. 2 (Autumn, 1967), pp. 9-32.

Ihrke, Walter R. "Automated Music Training," Council for Research in Music Education, Bulletin No. 2 (Winter, 1964), pp. 6-8.

_____. "Trends in Music Education Research," Council for Research in Music Education, Bulletin No. 2 (1964), pp. 29-31.

Johnson, Barry W. "Programmed Instruction in Music," Instrumentalist (February, 1966), pp. 26-32.

LaBach, Parker, "A Device to Facilitate Learning of Basic Music Skills," Council for Research in Music Education, Bulletin No. 4 (Winter, 1965).

Lewis, Philip. "Teaching Machines Have the Beat," Music Educators Journal (November-December, 1962), pp. 94-98.

Nelson, Carl B. "The Effectiveness of the Use of Adjunct Programmed Analysis of Musical Works on Student's Perception of Form," Council for Research in Music Education, Bulletin No. 9 (Spring, 1967).

Sherburn, Merrell L. "Music in the Language Laboratory," Music Educators Journal (January, 1964), pp. 109-110.

Sherman, Robert W. "Aural and Visual Perception of Melody Presented in Tonal and Atonal Environments," Council for Research in Music Education, Bulletin No. 4 (Winter, 1965).

Shetler, Donald J. "Some Problems in the Evaluation of New Teaching Media," Council for Research in Music Education, Bulletin No. 2 (Winter, 1964).

Spohn, Charles L. "Music Instruction in the Language Laboratory," Theory into Practice (February, 1962).

_____. "Programming the Basic Materials of Music for Self-Instructional Development of Aural Skills," Journal of Research in Music Education (Fall 1963), Vol. XI, pp. 91-98.

_____. "The Use of Self-Instructional Materials to Teach the Basic Materials of Music," Journal of Research in Music Education, 1962.

Thomas, Ronald B. "A Study of New Concepts, Procedures, and Achievements in Music Learning as Developed in Selected Music Education Programs," Council for Research in Music Education, Bulletin No. 6 (Fall, 1965).

Trythall, Gilbert. "Ear Training and Programmed Instruction," Unpublished paper.

________. "Observations on Music Dictation Programming," School of Music, George Peabody College for Teachers, Nashville, Tennessee, Unpublished paper.

Woelflin, Leslie E. "Teaching Clarinet Fingerings with Teaching Machines," Journal of Research in Music Education, Vol. XII (Winter, 1964), pp. 287-294.

APPENDIX

APPENDIX A

GLOSSARY OF PROGRAMMED TERMS

Augmenting

A method of teaching a concept, working rule or principle by building up to it through small sequential bits of information. As the student learns the small easily assimilated steps, he will be led to formulating this concept or principle for himself without actually seeing it written out or explained.

Adversive Reinforcement

A way of negatively reinforcing a given action by an injurious or distasteful means such as spanking or subjecting a child to public ridicule for being wrong. In programming it is used to describe the technique of encouraging errors and then reinforcing the right answer by telling the student how wrong he is.

Branching

A type of programming which has built-in alternate sequences of items for the extra-bright or slow student. If a student makes a single or a number of wrong responses, he is led through an alternate sequence of steps to give him remedial practice and new explanations of a concept he cannot immediately grasp. ("Wash back"--backward branching). If the student demonstrates by a series of correct responses that he has quickly grasped the material, he may be skipped forward over additional material on the same subject. ("Wash ahead"--forward branching). In a sense, any departure from a sequence of items proceeding methodically towards a given learning goal. Intrinsic programming employs the branching technique. (Foltz)

Cartesian Method

A basic technique of programming devised by Descartes. It consists of breaking down a subject to be taught into its smallest component parts and then arranging these into a hierarchical order to aid the learning process. (Foltz)

CUE

Used interchangeably with prompt to mean any bit of information added to a program item to make it easier for the student to make the correct response. One of the objects of much current research is to determine how much material should be given to a student to enable him to get the right answer. This is called the problem of cue clarity. (Foltz)

Echoic Reinforcement

Reinforcing a student response by showing him the right answer. Merely telling him he is right or wrong is called non-echoic reinforcement. Current research indicated that echoic reinforcement is the better method of reinforcing correct answers and leads to longer retention. (Foltz)

Extinguishing

The process of forcing a student to unlearn a learned response or mode of behavior by failing to reinforce it each time it is emitted, or reinforcing it aversively or negatively. (Foltz)

Fading

The technique of lessening the number of cues or prompts as the program progresses, thus weaning the student slowly away from reliance on the program and forcing him to think more for himself. (Foltz)

Feedback

A technique essential for programmed learning which gives the student (and eventually the teacher) immediate knowledge of the correctness of his answers to items in the program. This acts as a type of reinforcement to correct answers. (Foltz)

Frame

A single step of a program usually containing information and a question to be answered in one form or another. So called because it is exactly the amount of material that will fill the space of a display panel of a self-instructional device. Used interchangeably with item. (Foltz)

Heuristic

Applied to arguments and methods of demonstration which are persuasive rather than logically compelling, or which lead a person to find out for himself. (Webster New Int. Dict., 2nd Edition, 1954). Serving to guide, discover, or reveal; specif: valuable for stimulating or conducting empirical research but unproved or incapable of proof--often used of arguments, methods, or constructs that assume or postulate what remains to be proven or that lead a person to find out for himself. (Webster New Int. Dict., 3rd Edition, 1961). This word comes from the Greek, Heuriska, to discover or to find out, a meaning that still holds. The student is given the basic responsibility of solving the problems that confront him. The term is essentially synonymous with problem method or development method. (Encyclopedia of Modern Education, 1943).

Law of Recency

A basic concept of reinforcement theory, stating that the last response reinforced is the one that is learned. A corollary is that the more rapidly a response is reinforced, the better it is learned. (Foltz)

Linear Programs

Also called straight-line, non-branching, or Skinnerian programs. These are programs where the sequence of items is fixed, unalterable and identical for each sequence. Crowder would call these extrinsic programs, because the rate and sequence of presentation are not built in but determined by an outside agency, the program writer or instructor. (Foltz)

Program

The textbook of the self-instructional device. It consists of course material broken down into small, easily digestible bits and arranged in sequence to lead the student to a fundamental understanding of concepts basic to the course. (Foltz)

Self-Instructional Devices

Also called learning machines, teaching machines, or auto-instructional devices. This includes any device which can present systematically programmed materials while making efficient use of reinforcement. That is, it has the facilities for displaying the programmed material, offers some method for making a response and showing whether the response is correct or not. (Foltz)

Socratic Method

The method of inquiry and instruction employed by Socrates, esp. as represented in the dialogues of Plato. It consists of a series of questionings the object of which is to elicit a clear and consistent expression of something supposed to be implicitly known by all rational beings. (Webster New Int. Dict., 2nd Edition, 1954).

Step

This is the space between one item and another in terms of the mental operations necessary to go on to the next item. Difference in step-size is practically impossible to measure, although a subject of much theoretical dispute. The question is how much mental effort can be demanded of a student in going between one item and the next. (Foltz)

Vanishing

Both a programming technique and a factor of device design. In programming it refers to the gradual withdrawal of prompts from the program item so that the student is weaned away from reliance on the program for clues to the correct responses. In devices it is the mechanical capability of dropping out questions which have been answered correctly before. (Foltz)

APPENDIX B

SCHOOLS THAT WERE SURVEYED

Alabama College
Albion College
Alverno College
American Conservatory of Music
American University
Andrews University
Anna Maria College
Appalachian State Teachers College
Arkansas Polytechnic College
Arkansas State College
Arkansas State Teachers College
Arizona State University
Augustana College
Austin Peay State University
Averett College
Baldwin-Wallace Conservatory
Ball State University
Baylor University
Belhaven College
Bethany College
Birmingham-Southern College
Boston Conservatory of Music
Boston University
Bowling Green State University
Bradley University
Brigham Young University
Bucknell University
Butler University
California Institute of Arts
Capital University Conservatory of Music
Carnegie Institute of Technology
Carson-Newman College
Catholic University of America
Centenary College of Louisiana
Central Methodist College
Central Michigan University
Central Missouri State College
Central State College (Ohio)
Chicago Conservatory College
Christian College
Cleveland Institute of Music
Coe College
Coker College
College of Wooster (The)
College of The Holy Names
College Misericordia
Colorado College
Concordia Conservatory of Music
Converse College
Cornell College
Cottey College
Del Mar College
Denison University
De Paul University
DePauw University
Detroit Institute of Musical Art
Douglass College of Ruters University
Drake University
Duquesne University
East Carolina College
Eastern Illinois University
Eastern Kentucky State University
Eastern Michigan University
Eastern New Mexico University
Eastern Washington State College
Eastman School of Music

Evansville College
Fisk University
Florida State University
Fort Hays Kansas State
College
Friends University
Furman University
George Peabody
Georgia State College
Greensboro College
Gustavus Adolphus College
Hamline University
Hardin-Simmons University
Hartt College of
Music (Conn.)
Hastings College
Heidelberg College
Henderson State Teachers
College
Hendrix College
Hollins College
Hope College
Houghton College
Howard University
Illinois Wesleyan University
Immaculate Heart College
Incarnate Word College
Indiana University
Ithaca College
Jacksonville University
Judson College
Kansas State College
Kansas State Teachers
College
Kansas State University
Kent State University
Knox College
Lawrence University
Lebanon Valley College
Lewis and Clark College
Limestone College
Lincoln University
Lindenwood College
Linfield College
Louisiana Polytechnic
Institute
Louisiana State University
Loyola University
MacMurray College
MacPhail
McNeese State College
ManHattan School of Music
Mannhattenville College of
the Sacred Heart
Mansfield State College
Mars Hill College
Mary Hardin-Baylor College
Maryl Hurst College
Marymount College
Maryville College
Marywood College
Memphis College of Music
Meredith College
Miami University
Michigan State University
Midwestern University
Millikin University
Mississippi College
Mississippi College for
Women
Morehead State University
Morningside College
Mount St. Mary's College
Mount St. Scholastica
College
Mount Union College
Mundelein College
Murray State University
Muskingum College
Nebraska Wesleyan University
New England Conservatory
of Music
North Central College (Ill.)
Northeast Louisiana State
College
Northeast Missouri State Teachers
College
Northern State College (S.D.)
North Park College
North Texas State University
Northwestern State College
of Louisiana
Northwestern University
Nyack Missionary College
Oberlin Conservatory of Music

Odessa College
Ohio State University
Ohio University
Ohio Wesleyan University
Oklahoma Baptist University
Oklahoma City University
Oklahoma College of
Liberal Arts
Oklahoma State University
Otterbein College
Ouachita Baptist University
Our Lady of the Lake College
Peabody Conservatory
Philadelphia Musical
Academy
Phillips University
Queens College
Richmond College
Richmond Professional
Institute
Ricks College
Rollins College
Roosevelt University
Rosary College
Sacramento State College
Saint Andrews Presbyterian
College
Saint Louis Institute of
Music
Saint Mary College
Saint Mary-of-the-Woods
College
Saint Olaf College
Salem College
Samford University
Sam Houston State Teachers
College
San Diego State College
San Francisco Conservatory
of Music
San Francisco State College
San Jose State College
Seton Hill College
Shenandoah Conservatory of
Music
Sherwood Music School
Shorter College
Simpson College
Southern Colorado State
College
Southern Illinois University
Southern Methodist University
Southern University (La.)
South Louisiana College
Southwestern Baptist
Theological Seminary
Southwestern College (Kan.)
Southwestern University (Tex.)
State College of Iowa
State University College (N.Y.)
Stephens College
Stetson University
Susquehanna University
Syracuse University
Temple University
Tennessee A and I
Texas Christian University
Texas College of Arts
and Industries
Texas Technological College
Texas Wesleyan College
Texas Woman's University
Tulane University
Union College
University of Alabama
University of Arizona
University of Arkansas
University of Chattanooga
University of Cincinnati
University of Colorado
University of Connecticut
University of Denver
University of Florida
University of Georgia
University of Houston
University of Idaho
University of Illinois
University of Iowa
University of Kansas
University of Kentucky
University of Louisville
University of Miami
University of Michigan
University of Minnesota
University of Mississippi
University of Missouri

University of Montana
University of Nebraska
University of New Hampshire
University of New Mexico
University of North
Carolina
University of Oklahoma
University of Oregon
University of Puget Sound
University of Redlands
University of South
Carolina
University of South
Dakota
University of Southern
California
University of Southern
Mississippi
University of Southwestern
Louisiana
University of Tennessee
University of Texas
University of the Pacific
University of Tulsa
University of Utah
University of Vermont
University of Virginia
University of Washington
University of Wisconsin
University of Wyoming
Valparaiso University
Virginia Intermont
College
Virginia State College
Viterbo College
Walla Walla College
Wartburg College
Washburn University
Washington State University
Washington University
Webster College
Wesleyan College
West Chester State College
Wester Reserve Academy
West Virginia University
West Virginia Wesleyan
College
Western College for Women
(Ohio)
Western Illinois University
Western Kentucky State Univ.
Western Maryland College
Western Michigan University
Westminister Choir College
Westminister College
West Texas State University
Wheaton College
Whitman College
Wichita State University
Willamette University
William Woods College
Winthrop College
Wisconsin Conservatory of
Music
Wittenberg University
Woman's College of Georgia
Yale University
Yankton College
Youngstown University

APPENDIX C

SCHOOLS THAT REPORTED NO CURRENT RESEARCH BUT WANTED A COPY OF THE SURVEY FINDINGS

Alabama College
Alverno College
Andrews University
Anna Maria College
Arkansas State University
Ashland College
Austin Peay State University
Baylor University
Belhaven College
Boston Conservatory of Music
Butler University
Carnegie-Millon University
Centenary College
Central Missouri State College
Coe College
Coker College
DePauw University School of Music
Findlay College
Fort Hays Kansas State College
Friends University
Gustavus Adolphus College
Hardin-Simmons University
Hastings College
Houghton College
Illinois Wesleyan University
Kent State University
Lewis and Clark College
Limestone College
Manhattan School of Music
Mansfield State College
Marywood College
Millikin University
Morningside College
Mount Union College
Nebraska Wesleyan University
North Central College
Northwestern State College
Northwestern University School of Music
Nyack Missionary College
Oklahoma State University
Otterbein College
Saint Scholastica College
Saint Mary College
Saint Mary-of-the-Woods College
Shorter College
Southwestern College
Southern Illinois University
Stephens College
Stetson University
Texas Technological College
Texas Woman's University
The College of Wooster
Union College
Union University
University of Southern California
University of Idaho
University of Iowa
University of Louisville School of Music
University of Maryland
University of Miami
University of Missouri
University of the Pacific
University of Southern Mississippi
University of Nebraska
Viterbo College
Westminister College
Winthrop College
Wisconsin Conservatory
Yale School of Music

APPENDIX D

SCHOOLS THAT RESPONDED NEGATIVELY TO EVERYTHING

Alverno College
Arkansas Polytechnic College
Bathany College
Boston Conservatory
Bowling Green State University
Bradley University
Capital University
Carson-Newman College
Central Methodist College
Central Michigan University
Colorado College
Cottey College
Denison University
Douglass College of Rutgers University
Georgia State College
Hollins College Virginia
Jacksonville University
Lebanon Valley College
Loyola University
Marymount College
Michigan State University
Newcomb College
New Mexico State University
North State College (S.D.)
Odessa College
Oklahoma City University
Ouachita Baptist University
Phillips University
Saint Olaf College
Southern Louisiana University
Southwestern Baptist Seminary
State College of Arkansas
State University College (N.Y.)
University of Alabama
University of Arizona
University of Mississippi
University of New Hampshire
University of Northern Iowa
University of Southern Mississippi
University of Southwestern Louisiana
University of Tennessee
University of Tulsa
University of Vermont
Virginia State College
Wesleyan College (Ga.)
West Texas State University
West Virginia Wesleyan College
Youngstown University

APPENDIX E

SCHOOLS THAT REPORTED PRESENT OR PAST

PROGRAMMED RESEARCH

Arizona State University
Drake University
East Carolina University
Eastern Illinois University
Eastern New Mexico University
Eastern Washington State College
Florida State University
Indiana State University
Lindenwood College
Louisiana State University
Morehead State University
North Texas State University
Ohio State University
Ohio University
Peabody School of Music
Philadelphia Musical Academy
San Jose State College
Sherwood Music College
Southern Colorado State College
Southern Louisiana State College
Texas Christian University
University of Arkansas
University of Connecticut
University of Georgia
University of Kansas
University of Southern California
University of Texas
University of Wyoming
Washington State University
Washington University
Western Maryland College
Westminister Choir College

SURVEY FORMS

November 11, 1967

Dear Sir:

I am currently engaged in research leading to a masters thesis at Austin Peay State University, Clarksville, Tennessee. I am surveying all colleges and universities who are members of the National Association of Schools of Music. The purpose of the survey is to organize all of the research in programmed instruction currently being conducted in all areas of music education. I am doing this in hopes of establishing a format which may lead to a permanent system designed to avoid costly and wasteful duplication of research in this new and important field.

Please forward to any member of your department who has completed or is currently performing research in this field, the enclosed survey form and self-addressed, stamped envelope. The help your department can give me in this survey will be greatly appreciated.

Sincerely,

Frank A. Pasteur

Frank A. Pasteur
Graduate Division
Austin Peay State University
Clarksville, Tennessee 37040

SURVEY FORM

1. Please list authors, titles, and publishers of published works in programmed instruction in music education by members of your faculty.

____
____
____
____

2. Is any such research in progress at this time?
Yes___ No___

    a. Does the research relate to teaching machines_____or programmed texts_____?
    b. Is this research controlled____ or uncontrolled____?
    c. Please list the name of author and area of research (i.e. theory, history, musical aptitude, etc.)

NAME	AREA
____________________	________________
____________________	________________
____________________	________________
____________________	________________
____________________	________________

3. Please place a check in the space to the right if you would like a copy of the results of this study. _____

    If you do want a copy of the results of this study please fill in your address below:

    ____
    ____
    ____
    ____

4. Are any materials available for purchase?
Yes_____ No_____

    Use the reverse side of this sheet, if extra space is needed in answering any question.

APPENDIX G

SURVEY RETURN CHART

Total mailing - 318

Total return - 163

69	Schools who have no current or past programmed instruction research but do want a copy of the survey findings.
56	Schools who responded negatively to all questions.
28	Schools that indicated some form of current or past programmed research on their campus and who do want a copy of the survey findings.
4	Schools that indicated either present or past research but do not want a copy of the survey findings.
6	Other returns not classifable above.

163 or 51.25 per cent