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By-Vasil, Thomas, Ed.; Gillespie, Donald J., Jr., Ed.

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The primary objectives of the project were to develop non-book instructional materials for use in Music Education, to put these materials into use, and to subsequently evaluate and refine the materials. The audiovisual materials and the equipment needed to present them included an overhead projector and various types of transparencies. The use of varied media in music education showed advantages over traditional modes of presentation in teaching and learning efficiency, meaningful reinforcement, and creative use of color for added motivation and interest. The media approach offers variety and caters to individual differences in learners. A list of specific situations in which transparencies can be used (i.e., to illustrate the concept of enharmonic tones) follows a description of the advantages of using an overhead projector. Although project members encountered difficulty in the reproduction of high quality sound, use of available sound equipment proved to be adequate. The techniques employed and the equipment needed are described in detail. Funding for the project was provided under Title IV of the Elementary-Secondary Education Act of 1965. This is a layman's version of ED 029 500. A glossary is appended. (RP)

SPECIAL REPORT
Project No. 6-2131-1
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A PROJECT FOR THE IMPROVEMENT OF MUSIC EDUCATION AT ELEMENTARY, JUNIOR HIGH, SENIOR HIGH, AND COLLEGE LEVELS THROUGH THE USE OF NON-BOOK INSTRUCTIONAL MEDIA

August 1968

U.S. DEPARTMENT OF
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edited by

Thomas Vasil
Project Director

Donald J. Gillespie, Jr.
Assistant Project Director

August 1968

The research reported herein was performed pursuant to a contract with the Office of Education, U. S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

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- Dr. Frank DiGiammarino, Instructional Materials Consultant to the project, for allowing us to reflect his cumulative thinking on the concept of technology and its relation to and integration with the total process of education.

- The project staff and the institutions and school systems with which they are affiliated, the latter for providing proving grounds for materials which have been developed. Special commendation is due to the entire project staff who remained intact over the three-year-period of conception, revision, and evaluation of their materials, foregoing other opportunities in their dedication to the completion of their tasks.

We wish to express thanks to the following publishers and recording companies for the courtesy extended to the project by permitting the use of copyrighted materials within the limited context of the project work. It should be pointed out to the reader that the permissions granted were very explicit regarding limitations or use. Any further use of the materials developed by the project favored by these permissions would require proper processing of copyright directly with those who hold said copyright.

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INTRODUCTION

To understand the project the reader should have some information regarding the beginnings of the original proposal.

The first significant event was the association of the author with the instructional materials consultant to the project who was at that time the audio-visual director for Lexington High School. The instructional materials consultant helped the author solve a teaching problem relative to orchestral score by devising a means of reproducing it on overhead transparencies. The success of this led both parties to consider the potential of media for music education.

A simultaneous development was the author's association with the research and development activities of the Massachusetts Music Educators Association under the direction of Dr. Robert Choate. The sub-group with which the author was associated was concerned with uncovering innovative techniques being used in the state. Not only were these comparatively few in number but there was a notable lack of serious use of media. Based on the author's relative success with the transparency procedure, the sub-group decided to devote its efforts to media as a meaningful innovation for music education. After the group's reaching this decision, Dr. Choate advised us as to the possibility of gaining federal aid to finance our proposed efforts.

After securing the formal approval of the Lexington Public Schools and the Massachusetts Department of Education, a proposal was written, submitted, and ultimately accepted for funding under Title IV of the Elementary-Secondary Education Act of 1965 by the U. S. Office of Education.

The basic problem was to establish the relative worth of media to music education with emphasis on the medium of overhead projection and the medium of recorded sound. The objectives, both as stated in the original abstract and the section titled General Objectives, reflected these limitations.

Objective Number One from the abstract was "To develop non-book instructional materials for use at all levels and areas of instruction in Music Education." This was accomplished by providing the necessary equipment and technical assistance. The coverage of levels and areas was accomplished by the organization of the project staff by educational levels and the assignments within levels to diverse areas.

Objective Number Two from the abstract was "To put into use in as many situations as possible the developed materials." This was accomplished by the following:

a. By utilizing the geographical division of the Massachusetts Music Educators Association as reflected in the original sub-group of the research study activities total coverage of the state was made possible.
b. By gaining from the participants' respective school systems assurances of cooperation the implementation of developed materials was guaranteed.
c. By allowing participants to create materials for their respective teaching situations implementation was further guaranteed and relevancy assured.

Although the use of materials was limited in most cases to the one situation for which they were created in the first academic year, systematic sharing of materials within the project staff greatly expanded material use for the second academic year.

Objectives Three and Four refer to the construction and use of evaluation instruments. In terms of assessing curriculum improvement, this was satisfactorily achieved. Upon advice of a psychometric consultant, no attempt was made to employ standardized tests or to compile statistical data based on the relatively limited use of materials and their companion evaluation instruments. A more informal approach was felt not only to be justified but essential. The most important fact was that serious evaluation with some controlled objectivity was used.

An anecdotal approach rather than a formal instrument was used in evaluating change in teacher attitudes and behaviors. Each participant in contributing to the findings and analysis section of the Final Report had the opportunity of recording his anecdotal record. The author would like to comment from his perspective as project director that without exception changes in attitude toward media use occurred to a significant degree. The more sophisticated became even more enthusiastic and the novice moved from confusion to awareness. All recorded that teaching improved. This appeared to be due partly to the materials themselves but at least as much if not more so to the meticulous organization of materials as made necessary by media use. It was obvious that excellent materials and organization in and of themselves could improve teaching, but with some of the universal limitations instruction in any form has always had. The prime factor in this case is the musical and intellectual ability of the teacher. Understand, however, that the improvement for all with all limitations taken into account was most definitely significant.

Objective Number Five was "To provide for refinement, revision, deletion, or addition of materials based on evaluation results." This was accomplished by following the over-all pattern of operation for the total proposal as follows:

a. A First Summer Conference was held in 1966 for the purpose of the initial development of materials.
b. A Second Summer Conference was held during which materials were able to be refined, revised, deleted, or new materials developed.

Objective Number Six was "To make available to the educational community at large, via government published report or reports, the process of development, manner of usage, evaluation results, and suggestions for further development and study thus placing into some kind of meaningful perspective the values and techniques of developing non-book instructional materials as a means of improving curricula in Music Education." The organization and writing of the Final Report for the U. S. Office of Education was the primary means of meeting this objective. Copies of the Final Report are available through the Educational Research Information Center (ERIC). The total project staff was concerned that some attempt be made to reach the field by an exposure of the larger issues raised by our work without the technical detail required of a formal final report. A request for writing such a document was made and approved. This booklet is the end result. In this document we have chosen to focus on the following problems:

1. The problems of technical hardware as it pertains to the production and presentation of software materials.
2. The problems and values of utilizing various means of projecting musical notation in order to enhance the use, understanding and appreciation.

3. The values in using multi-media materials for quick help or reference purposes.
4. The problems of sound production and reproduction as an especially important and integral part of all multi-media materials in music education.
5. Systems analysis as it pertains to the problems of learning.

We sincerely hope that our efforts in dealing with these problems will shed some light on the value of applying technology to music education.

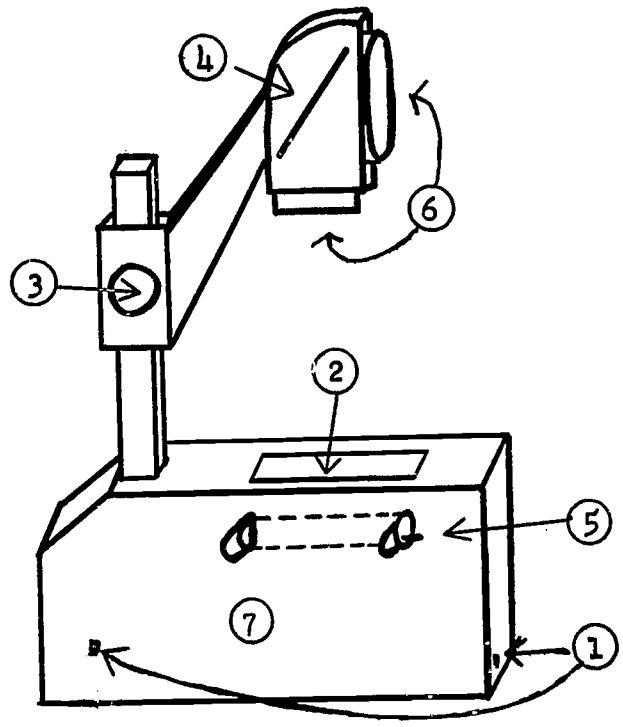
CHAPTER I

AUDIO-VISUAL MATERIALS AND EQUIPMENT - PRODUCTION, USE, CARE

INTRODUCTION

This chapter deals with audio-visual materials and the equipment needed to produce and present these materials as they were related to the project. It does not purport to be a set of instructions, but rather a reporting of the experiences germane to the subject. It is hoped that it will enable the reader to make best use of audio-visual equipment and materials (hardware).

OVERHEAD PROJECTOR



NOMENCLATURE

1. On-Off Switch (Fan and Lamp)
2. Glass Stage
3. Focus Control
4. Tilt Mirror
5. Roll Attachment
6. Lenses
7. Lamp Housing

THE PRODUCTION OF TRANSPARENCIES

The Master

The production of a transparency involves many procedures and techniques from its inception to its completion. There are three major methods of processing: diazo, thermal, and photocopy.

1. Diazo - makes use of ultra violet ray light exposure of the diazo film and an ammonia developer. The equipment used varies greatly in degree of sophistication and price from the slow manual exposure and developing to the high speed self contained unit. For this process, a translucent or transparent material must be used for the master. Special care must be taken to insure a completely opaque image on the master. This may be accomplished by using any opaque masking

material: black drawing ink, cardboard cut-outs, lettering aids, or commercially prepared pressure-sensitive materials.

2. Thermal - transfers the master image directly onto heat-sensitive film by using infrared light as a heat source. The thermal method is sometimes referred to as heat transfer or dry copy. Any type of paper may be used for the master. It is necessary that the material used to design the image contain a carbon base. A black lead pencil, India ink and various carbon based lettering aids may be used.
3. Photocopy - uses a contact photographic process. The master is exposed against the negative which is then placed in contact with a sheet of film positive and developed. The master may be made by photographing an image.

Only the diazo and thermal methods were used in the Lexington project.

After choosing the developing process one must select the appropriate tools or materials for preparing the master copy. When lettering is to be a part of a completed transparency, the following methods may be used:

1. draftsman's ruling pen
2. technical point pen
3. adjustable scriber used with template guide
4. bold faced typewriter
5. paper cut-outs
6. pressure sensitive adhesive transfer letters

Wet copy masters are used for special purposes. A wet copy is the result of a photocopy process which produces an image on a translucent or transparent sheet. This process is used when:

1. it is necessary to enlarge or reduce the original image (this would involve the use of a photo-modifier, reducer-enlarger).
2. strengthening of original image is desired.
3. various elements have been combined on a single rough master in a paste-up fashion.
4. multiple copies of a standard partial master are desired in order to add material.

When using technical point pens on wet copy masters, special care must be taken since the needle point may lift or tear the fibers and cause the ink to blot.

The use of the reversal and trans-lift techniques can produce variety. The reversal technique stimulates visual interest through reversing the light and dark areas. Trans-lift technique can lift a colored picture onto a transparency. However, it must be borne in mind that only images printed on clay coated paper can be translifted and that the original picture is destroyed.

After the transparency has been produced from the master, it is then ready for assembly.

ASSEMBLY OF PROJECTUALS

The developed acetate is taped to the underside of a cardboard frame. When two or more acetates are combined they must be taped to the frame separately and in alignment with each other. These ace-

tates may be of different colors. The one or more acetates affixed to a frame are referred to as a static.

An overlay is a transparency or mask which is placed on a static. Depending upon its use, the overlay may be attached by commercial hinges, tape, slide track or a fastener that allows rotation. It may also be unattached and placed upon the static as desired. Care must be exercised in alignment of overlays.

Pin bar holes in the frame should be covered with an opaque tape to avoid distraction.

VISUAL REINFORCEMENT AIDS

Any long and sharply pointed object, such as a pencil or conductor's baton, may be used to point directly on the transparency to those elements where reinforcement is desired. A transparent pointer avoids obscuring any image on the screen.

Grease pencils and water soluble felt tip pens are available for purposes of clarification and emphasis of transparency content. With these aids the teacher can add directions, symbols or other notations on the transparency, thereby bringing attention to specific examples. The aids are available in assorted colors and may be removed by erasing with a soft cloth or dampened material when no longer needed.

PERMANENT COLOR HIGHLIGHTING

Translucent paints (originally manufactured for painting on glass) may be applied to a projectual to identify specific elements. However, the application of these paints tends to create wide variation in color intensity, and brush marks are obvious. Thus, the effect is not smooth.

Borgue paper (contact paper) is adhesive transparent material of various colors which may be affixed to any portion of an acetate. However, it tends to blister from the heat of the projector and/or peel from the acetate.

A felt tip pen with alcohol base may also be used where desired. However, like the translucent paints, there is variation in color intensity. This would be superior, however, to the translucent paint due to the ease of application and because the variation of color intensity is not as great.

Overlays may be utilized to isolate or highlight parts of the transparency via color, brackets or other indicators. They may be manipulated so as to add, remove, reveal portions or build a composite image. Clear acetates with colored areas are preferred for highlighting because of the evenness of their color and their mobility. They may be used as an overlay or as part of the static.

SCORE-ON-ROLL

A special use of the transparency would be for score-on-roll which is the process of reproducing score on a continuous roll of acetate. In most cases a photo-modifying (enlarging-reducing) process is necessary to provide a master of uniform density and adequate size.

Score-on-roll must be produced by a machine which is capable of a continuous developing process. For optimum results, masters must be taped together in proper alignment and sequence.

GENERAL SUGGESTIONS

The following suggestions are offered for the efficient operation of the overhead projector.

Before using any piece of equipment, the teacher should read thoroughly the instructions on its care and use and should take advantage of in-service training in instructional media.

In order to obtain satisfactory results for classroom situations, a bulb of at least 500 watts should be used. Machines of higher wattage will be advantageous since the image on the screen will then be sharper and clearer. A clear glass stage on the overhead, as opposed to one of frosted glass, will tend to increase the projected light, thereby brightening the image.

Stage glare may be reduced by placing a tinted film or colored cellophane directly on the stage.

It is imperative that the fan in the lamp housing be on whenever the projector is in operation. The fan on some machines will start automatically when the lamp switch is turned on; others have separate switches for fan and lamp. Another type machine contains a thermostat which energizes the fan when the lamp reaches a certain temperature. After the lamp is extinguished the fan will continue to run until the lamp is sufficiently cooled.

Keystoning, the term used when opposite sides of the projected light area are of unequal length, e. g. top wider than bottom or one side wider than the other, can be eliminated by making certain that the screen and projector lens are in parallel relationship with each other.

The lenses and stage as well as the projectuals should be cleaned periodically with a lens cleaner to insure optimum clarity of projection.

When using score-on-roll, it is necessary that the projector be equipped with a side to side roll attachment.

Use of an overhead projector with center rear focus post might tend to make manipulation of top mounted or vertically sliding overlays difficult.

SLIDE PROJECTOR

Simple slide projectors require the operator to insert each slide in a holder, feed it by hand into the projector, remove it by hand, and so continue with each slide in a series. The process is slow and requires much care to keep slides arranged properly.

Newer projector models which preheat slides in a magazine are completely automatic, even permitting wireless remote control (including focus as well as slide changing). Such units eliminate all the problems inherent in the hand placement of slides - inversion, wrong sequence, or off-cue changes. Magazines for some projectors have capacities as high as 80 slides, thus permitting a long program to be set up in a single loading.

THE AUDIO TAPE RECORDER

With the audio tape recorder, the teacher may standardize the aural presentation and organize musical examples as to desired content and sequence.

Refer to the chapter on Sound for a detailed description of the audio tape recorder.

The following suggestions are offered for the efficient operation of the audio tape recorder and the use of tapes.

When using a sequenced tape, it would be advantageous to use an audio tape recorder equipped with an edit-stop.

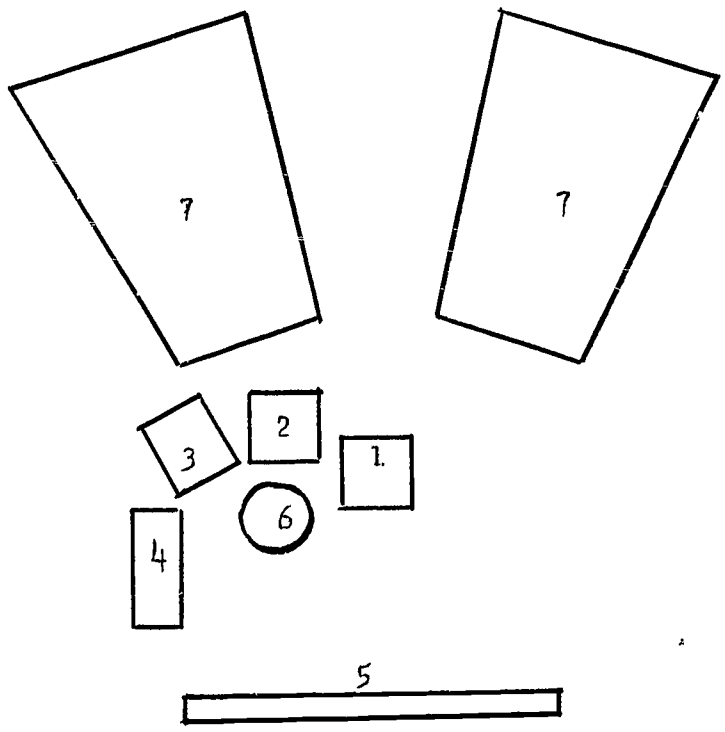
Make note of your machine's corresponding counter numbers for reference to a specific segment of tape.

For quick visual reference, colored leader tape may be used between large musical segments or movements.

Store tapes in a reasonably cool area to avoid possible damage.

POSITION OF EQUIPMENT

The position of equipment in the classroom is important from the standpoint of effectiveness and efficiency. Needless walking to and from equipment should be avoided to minimize distraction. The teacher should attempt to be as close to the aids as possible. Left-handed people may wish to reverse the position of equipment.



1. Overhead projector
2. Slide projector
3. Tape recorder
4. Piano
5. Screen
6. Teacher
7. Class

COMBINED MEDIA

Combined media involves two or more modes of presentation used conjunctively.

The audio tape recorder used in combination with visual media may provide for a more effective, efficient, and interesting presentation. Other combinations of media may be more appropriate in varying situations.

Automatic slide projector and tape recorder combination units offer the added feature of being able to put an inaudible signal on the tape which, at the proper instant, will set off a relay that causes a slide change. Such a unit accomplishes automatic projection of slides, correlated with narration. Separate "programing units" for use with most tape recorders and slide projectors (having remote-control outlets) also permit this operation.

THE LEARNING LABORATORY

The generally accepted concept of the language laboratory is rapidly changing. Through the evolution of its use and addition of a variety of presentation modes, it is fast becoming a learning center for many areas of the curriculum.

The use of the learning laboratory increasingly implies an experimental approach to the educational process.

The learning laboratory has the capability of presenting many programs simultaneously and, being learner oriented, allows students to proceed at their own rate by means of individual instruction and response.

INSTRUCTIONAL SUPPORT PERSONNEL

If the full potential of media is to be realized, the following people should be an important part of the instructional team.

Media Generalist

The media generalist is that member of the professional team who acts as a consultant to educators regarding the creation, development, design, and implementation of messages or concepts which are intended to lead to learning.

Media Specialist

The media specialist is that member of the professional team who is the instructional materials resource consultant. He aids in locating, storing, and furnishing materials and information.

The Technician

The technician is a para-professional who is concerned with the logistics, production, and maintenance of media materials and equipment.

SUMMARY

Although the chapter deals with the technical aspects of the equipment and materials (hardware), the teacher's main concern is content (software).

For sources of additional information, refer to the chapter bibliography.

It should be stated again that the content of this chapter should not be considered instructional procedures for the production and/or presentation of audio-visual materials but rather a guide to the better use of non-book instructional media.

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CHAPTER II

PROJECTED MUSICAL SCORE

INTRODUCTION

The use of projected musical score to introduce, enhance, and reinforce musical subject matter, which has in the past been presented primarily through aural means and individual scores, can help to provide an effective teaching-learning situation. Successful motivation and dynamic presentation continue to be inherent in the teacher's role; but through the use of slides and transparencies, he is better able to meet these challenges with flexibility and versatility. Visual media may assist the teacher in developing his own ideas in clear, meaningful, and vital presentations. A significant advantage of using such media is that it offers the teacher an increased opportunity to express his own individuality and creativity.

MODES OF PRESENTATION

The Lexington Project explored the potential use of the overhead and slide projectors as possible visual modes of presentation to be used in conjunction with aural modes.

On the basis of admittedly informal evaluation techniques, it was found that visual reinforcement of that which is being heard and discussed increases retention of facts and ideas. It is generally agreed that the visual sense plays a greater role in learning than does the aural sense. Thus, in aiming for optimum retention, the teacher can increase the learner's efficiency by involving his eye as well as his ear.

Since the student's vision will naturally be focused on the luminated screen, the teacher will find in using either of the media mentioned above that the length and depth of concentration is likely to be increased. The effective use of color will tend to motivate the learner and hold his interest. Color can also be used to highlight certain aspects of a total visual image.

The clearest and most effective way to present a concept is often through visual media; hence they are of value to both teacher and learner. However, one must realize that the development of materials for such use involves careful organization and preparation. This initial effort is rewarded by the fact that these materials are a more effective teaching tool and can be used over and over again.

When the desired image can be photographed more readily than drawn, 2 x 2-inch slides may be used. Individual slides from any given sequence may be selected for quick review or specific study. These slides may be used in conjunction with a synchronized tape recording which may contain narration and/or musical excerpts. Synchronization of the magazine-loaded slide projector and the tape recorder can be accomplished by the use of an automatic changing device.

The overhead projector is extremely versatile. The teacher may guide the learner by pointing directly on the transparency thus minimizing screen obstruction. The teacher or members of the class may also write on the transparency by using water-soluble pens or

grease pencils. Overlays and scores-on-roll offer varied possibilities for presentation.

IMPLEMENTATION OF THE PROJECTED SCORE

The learning process involved in reading a score, be it instrumental or vocal, one line or many, can be facilitated through the use of individual transparencies, 2 x 2-inch slides, and transparency rolls. In single line scores, pictorial images can be used to show melodic movement and rhythmic patterns. Through the use of individual transparencies, such graphic representations of melody and rhythm can be both dramatic and effective. Materials which use pictures, words, numbers, or notation as a means of dealing with the reading and interpretation of rhythmic elements may be sequenced from the simple to the more complex and made more interesting and valuable by the use of overlays and adjustable slides. This sequential material must first be designed for one or more presentation modes and allow for ease and logistics of learner operations of specific musical tasks.

Single line melodies are important in the overall development of score reading skill. Transparencies are helpful in studying scale patterns, intervals, melodic fragments, and complete melodies in both vocal and instrumental contexts. Visual examples of thematic material may also be used for analysis of form, mode, mood, dynamics, tempo, rhythm, instrumentation, transposition, and rhythmic figures, may be emphasized through the use of colored overlays or pressure sensitive tape. Choice of color may be used to illustrate the mood of a composition as well as its overall form. This addition of color not only enhances the appearance of the materials but also increases its instructional value.

In addition to the previously enumerated types of analysis to which single line melodies and rhythms readily lend themselves, the visual presentation of the full conductor's score provides further opportunity for developing musical understandings. For example, the projected score becomes a source of such learnings as transposition, instrumentation, and orchestral balance. Musical terminology and markings become more meaningful when drawn from the context of a specific work, perceived aurally and reinforced visually.

Scores on transparency rolls are especially helpful in developing in the pupil a feeling for the continuity of the music. Instead of isolated melodic moments, themes can be seen and heard as integral and cohesive elements of the work's overall form. With transparency rolls the student sees what is heard at any given moment; and if the teacher uses a pointer skillfully to guide the student as he follows the score, the possibility of losing his place is reduced. Another advantage of the transparency roll of a score is that it can be stopped at any point for more detailed study and discussion of specific musical aspects.

IMPLICATIONS FOR FUTURE DEVELOPMENT

An effective means of adequately preparing students in the fundamentals of score reading might be created by use of animation by digital computer connected to a cathode ray tube (similar to a televi-

sion tube). When the desired image has been produced on the cathode ray tube, it could be filmed by a 16mm. movie camera which is facing the tube. The camera would focus on the score one brace at a time. As a page of score is being photographed in this manner, individual measures could be animated as they are heard. Measures could be highlighted via intensified focus, thickened lines, or the illusion of perspective. This process would focus the viewer's attention on the correct measure or melodic line at each moment. Moreover the effect would be heightened by a continual "wipe out" of measures after they have been heard, directing the viewer's eye to the measure being performed.

By using a "filmed score with wipe out animation" as an introduction to the skill of reading a score, the student may gain reinforcement of correct reading technique. Score reading often entails seeing horizontal and vertical relationships. The full potential of animated score projection has not been explored, there are obvious possibilities for effectively making these relationships clear. In the beginning stages of acquired skill in score reading the student must learn to perceive the most predominant characteristic of the music before becoming aware of more subtle aspects. In general this seems to mean that following the apparent peregrinations of a melody line should be the first endeavor. Thus, the initial emphasis in score reading is on the horizontal aspect.

Another issue of interest to the music profession at large is the need for commercial production of transparencies and score-on-rolls. Publishers could easily provide score in both book and score-on-roll form. Interest in using score-on-roll has certainly been engendered by extensive demonstrations at district, state, and national conferences in the last few years. Availability of score-on-roll would provide opportunities for in-depth study never possible before in a traditional classroom situation. It is felt that music educators are becoming more aware of these possibilities and thus are a potential market, awaiting the first imaginative publisher's debut in this field.

By the same token, there is a need for commercial publication of material for individualized instruction in music skills. Packets of carefully sequenced material should be developed by music educators actively involved in teaching. These materials should be creatively designed and represent a fresh point of view.

SUMMARY

The scope of the Lexington Project clearly illustrates the versatility and instructional value of the projection of various types of musical score. This visual medium reinforces the aural aspects of music and creates a clear, colorful, and efficient presentation of musical elements.

The materials developed in Lexington should indicate to music educators the unlimited potential for practical application as shown by the many areas of concentration and emphasis, the varied manners of presentation, and the different styles and design. For example, the all-inclusive subject of music literature and listening has been approached through the use of transparencies of individual themes and full score-on-roll. The more specific skill of score reading was facilitated by transparencies of piano and string quartet scores which were used for introductory reading tasks, and a transparency roll of

full score which was used as the culminating learning activity. The piano and string quartet scores were ideal as developmental materials since they were visually uncomplicated and, although they emphasized the horizontal aspect of following and reading score, could be utilized for concentration on vertical elements. The full score-on-roll reinforced previous learnings, and aided in further development and refinement of reading skill.

Melodic and rhythmic concepts relating to all instructional levels were successfully exposed through visual presentation. Materials relating to instrumental instruction, as well as vocal and instrumental rehearsal situations, show further evidence of the variety and practicality of visual media for any teaching situation.

Although the work of the project was primarily concerned with exploring the potential of the overhead projector, this medium should not be utilized to the exclusion of other visual modes. The use of varied media in music education has shown advantages over traditional modes of presentation in teaching and learning efficiency, meaningful reinforcement, and creative and varied use of color for added motivation and interest.

CHAPTER III

QUICK REFERENCE AIDS

INTRODUCTION

In order to perform, compose, or listen intelligently to a piece of music it is necessary that a group of students have a fund of like skills and concepts from which to operate. They must have the same understanding of a given term, must follow a direction in the same way, perform a skill in a like manner, and have a knowledge to do the task in the required style. In performing organizations or music classrooms there is usually a wide variety in the abilities, motivation, background and concept development of individual members.

Allowing for these individual differences and a difference in the teacher's objectives, a need may arise for a group of resources for quick help and ready reference. The more precise and concise the presentation of the information, the more efficient the use of the learning time will be.

MEDIA

One of the most effective media for imparting this information is the overhead projector for the following reasons:

1. Because of its relatively low cost, the overhead projector is available in most schools or can be readily obtained. For greater efficiency the projector should be permanently placed in the music classroom or in the rehearsal area. If this is not possible, the teacher should arrange for one to be set up for each of his teaching periods. Without this availability, quick aids lose their effectiveness and time saving characteristics.
2. The equipment is used in a lighted room. Disturbances caused by turning off lights or pulling shades are eliminated. The screen or wall reflects the information that is needed.
3. The equipment is used with the teacher facing the class or group so the teacher always controls the attention.
4. A particular section of a transparency is easily indicated by any pointer available - baton, pencil, etc., and the group attention is focused where desired.
5. Transparencies can be filed in or on a desk or file and coded for quick selection. They can be made as elaborate or simple as time and facilities allow. Clear acetates and blank staffs should be available for marking with grease pencil or felt-tipped pen for blackboard type explanations or unforeseen problems.
6. The cost factor in making transparencies is relatively low, and time required to produce one is little when compared with its effectiveness and usability.

A transparency is a piece of clear or lightly colored plastic film on which an opaque or translucent image has been made. The simplest form is to write or draw on the acetate with grease pencils

or felt-tipped pens (black or colored). Pressure sensitive colors and tapes can add shapes, design and color interest. Transparencies can be made by three processes - diazo, thermal, or photo. The choice would be determined by what is available, the desired results, and the amount of time that can be devoted to preparing the master or original.

Diazo is the most permanent process, with a sharp image and the clearest colors. The master must be made on transparent or translucent material and the image must be opaque.

Thermal is the quickest process, but tends to produce a less sharp image, and color is limited to background use only. (Some companies are experimenting with better color material). The master can be made on any paper but the image must be made with a carbon agent. The machine used in this process is the one that reproduces a printed page directly.

Photo copy is the most accurate process but does not reproduce color except as shades of black. The master can be any page or picture and the copy is exactly like the original.

Every master should contain only one basic idea in as simple a form as is complete. The lettering should be uncrowded and 1/4-inch high. In general, the less on a master the more effective the transparency. Statics may be overlayed with masks for revealing part of the material at a time, with hinged transparencies for adding information slowly, or with slides for movement of part of the material. (See section on AV Materials and Equipment for further information.)

USES OF PROJECT MATERIALS

The use and choice of these aids depends on the age and previous experiences of the group as a whole and of its individual members, on the specific objectives, on the available time, and on the relative importance of the material at the moment. The transparencies may be used to teach, to review, to clarify, or to remind as the situation demands. Any area of music instruction, performance, composing, or listening could have appropriate transparencies prepared, and most materials would be interchangeable among music classes.

Following are some examples of situations in which transparencies might aid in a teacher's explanation. The references are to single transparencies from project packets.

1. The concept of the relationship between the staff and the keyboard could be clarified by superimposing the keyboard on a staff. (Thiebe, Developing Sight Reading Skills)
2. The concept of enharmonic tones can be dramatically illustrated by overlayed arrows on an ascending and descending chromatic scale. (Kinyon, 12 Tone Technique)
3. The directions of a tone row and its transpositions are effectively diagrammed on transparencies. (Kinyon, 12 Tone Technique)
4. Syncopation can be more easily explained by showing a melody with an overlay which shifts measure bars and accents. (Fiske, Understanding Music - Rhythm)
5. The ranges of instruments of the string family, the brass family, and the woodwind family can be charted for comparison. (Kaplan, Orchestration)

6. The comparison of the major to the minor scale can be made by a chart with overlays. (Amelotte, Skills Related to the Bass Clef)

Some entire packets were developed as quick aids for the following situations.

1. In flutophone instruction, a projectual showing the correct hand position and a fingering chart could reinforce previous learnings. (Amirault, Supplementary Chart for Flutophone)
2. During flute, clarinet, or saxophone lessons or during band or orchestra rehearsal, fingerings on the above three instruments can be corrected or reinforced by a rotating fingering chart which reveals one note at a time on the staff with correct fingering. (Morrill, Fingering Charts for Elementary Woodwinds)
3. Explaining the relationship of transposing instruments to concert pitch or to other transposing instruments is facilitated by masked projectuals showing this relationship of keys. (Morrill, Unison Scales for Elementary Band)
4. Most of the choral problems related to reading the printed page can be diagrammed: names of lines and spaces, changing keys, key signatures, triads, intervals and inversions, stemming, and dynamic, tempo, expression, and direction markings. (Coffin, Choral Aids - The Printed Page)
5. Help with vocal techniques comes with visual representation of ideas for deep breathing, voice placement and range, pronunciation, and intonation. (Coffin, Choral Aids - Vocal Technique)
6. Ideas for the history and style of the various periods of music can be visually associated with the other arts and historical events of the time. (Coffin, Choral Aids - History and Style)

Prepared transparencies or masters for making transparencies are available from commercial companies.

SUMMARY

In today's classrooms there are many situations which call for an explanation, review, or reminder of music information for some or all of the class. Evidence suggests that we learn more through sight than through any of the other senses,* thus making a visual aid one of the most expedient ways to present this information. Having a file of labelled transparencies and an overhead projector as an integral part of the teaching environment is an efficient way to use the visual approach for quick aids to teaching.

* Brown and Thornton et. al., New Media in Higher Education; National Education Association, 1963.
Dale, Edgar, "Cone of Experience", Audio-Visual Methods in Teaching, Holt Publishing Co., 1954.
Educational Media Council, Educational Media Index, McGraw-Hill, 1964.
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CHAPTER IV

SOUND

INTRODUCTION

Since it was considered essential to obtain the highest quality sound in the development of recorded materials, every effort was made to do so within the limitations of the equipment available. A variety of results was achieved, since various phonographs, tape recorders and recording techniques were employed. Even with good equipment available, project members encountered problems in the reproduction of high quality sound.

The basic equipment used was the phonograph and tape recorder. Many of the participants taped musical excerpts from disc recordings to correlate with projected visual examples. This enabled the instructor to present the elements of a musical concept efficiently and effectively.

THE RECORDING PROCESS

Recording Equipment and Facilities

The soundproof recording studio at Lexington High School proved to be an adequate facility for most of the participants. The studio was equipped with two Altec Lansing microphones, two Bogen MTM transistorized preamp mixers, one Ampex professional monaural tape recorder, one Bell cartridge recorder, and provisions for connecting additional equipment. Those who found the high school recording studio inadequate for their use complained that the room was too small and lacked adequate ventilation, that the equipment as installed in the sound studio did not reproduce high fidelity sound, and did not function dependably.

Other participants found it more convenient to record in the high school auditorium, in one of the music rooms, or in one of the participant's homes.

Other equipment available at the high school included one KLH Model 15 stereo phonograph, one KLH Model 11 portable stereo phonograph, two Sony Model 530 stereo tape recorders, and one Tandberg Model 12 stereo tape recorder. The two Sony tape recorders and the portable KLH phonograph ultimately were used in the sound studio for recording and copying tapes.

Recording Techniques

After organizing the content of the material to be presented, the participants selected an appropriate recording process. There were basically two methods used. The simplest method employed was a continuous non-stop approach, that is, recording any combination of narration, disc recordings or instruments onto one tape. For the disc recordings, the process was to record internally from the phonograph to the tape recorder. In recording narration or instruments, a live recording process was used. Any errors in the tape were cut and spliced when the recording was finished. This taping process was

convenient and simple, and possibly could be done in one's home without too much equipment.

A more complicated process was the sequenced approach, that is recording examples in segments, then splicing sequences together into one tape. This approach was necessary when there were many different sound sources to be recorded, and when it was impractical to record in a single continuous session. The variations to this second approach were as follows:

1. The narration, disc recordings, and/or live instruments were recorded onto separate tapes, and then the several tapes were cut and spliced into one finished tape. This proved to be a long and tedious operation and occasionally the results were not worth the effort involved.
2. Multiple tapes were recorded and re-recorded onto a master tape. Although this method saved time over the first variation, there was a loss of fidelity in the copying process.
3. Each sequence (narration alternated with disc recording) was recorded directly onto the master tape. This involved recording one section (e.g. a portion of the narration), and then recording the section that followed (e.g. an appropriate musical excerpt as an example of what was explained in the narration). Due to the physical limitations of the sound studio, and specifically the lack of sound on sound capability, the main disadvantage with this approach was the time involved in having to set up different recording equipment after completing each narrated portion of the tape. Through this process, however, fidelity was not sacrificed, unnecessary noises could be eliminated, and dynamic levels between sequences on the tape could be more easily controlled. This variation seemed to produce the most satisfactory results.

After completing the recording session, errors in the tape were erased, the tape was cut and spliced, and copies were made.

Problems Encountered and Practical Solutions Employed

A constantly recurring and frustrating problem was the loss of fidelity in transfer from disc to tape. This was due partly to the lack of an adequate power amplifier in the recording equipment available for project use. Loss of fidelity sometimes resulted from the necessity of reducing recording levels to eliminate surface noise on the record. The use of new recordings almost always eliminated any surface noise. Where possible, new discs were purchased to alleviate this problem.

Another problem was that of "hiss" on the electromagnetic tape itself. All master tapes and copies made on the project were recorded on new tapes. Tape hiss was sometimes corrected by cleaning or "demagnetizing" the recording heads on the machine, or by reducing the recording level.

Other problems were as follows:

1. Synchronization of volume levels when recording a combination of pre-recorded and live sound
2. Distortion of pitch and timbre when recording instruments "live"

3. Pitch variation from the original sound source (perhaps as a result of speed fluctuation in the turntable or tape recorder)
4. Recording of isolated musical examples or phrases onto one tape with adequate "fading" in and out to avoid "clicks" on the tape

These problems necessitated careful re-recording and editing. Sometimes several different recording techniques were tried until a satisfactory solution was reached.

Since most of the project personnel were involved in some tape recording process, there was a problem in having enough equipment available to make both the master tapes, and all the copies during the six-week period of the project. The following section contains a list of equipment and supplies that would be adequate for a project of this size, and would alleviate many of the problems mentioned in this report.

A Suggested Guide for a Professional Sound Studio

To insure high quality sound, the equipment should be of professional calibre, and should be located in four separate professionally wired soundproof rooms. By visiting a reputable audio lab one may compare brands and prices. The following is a list of equipment and supplies needed to reproduce high quality sound.

EQUIPMENT

Four professional four track stereo tape decks with edit stop, monitoring, and sound-on-sound capabilities
One high speed tape duplicator
Four professional stereo turntables
Four professional preamp-mixers
Four solid state stereo playback amplifiers (70 watts)
Eight professional quality speakers
Eight professional quality microphones
Four professional quality stereo headphones
Two stereo headphone amplifiers
One bulk tape eraser
One head demagnetizer
One tape splicer

SUPPLIES

Supply of 1-1/2 mil acetate tape for mastering
Supply of 1 mil mylar tape for copying
One tape head cleaner kit
Supply of splicing tape
One tool kit for minor repairs

USE IN THE CLASSROOM

Modes of Presentation

The tape recordings developed by the participants in the project were designed for a variety of teaching situations. Some were

designed for use during only part of a class period, while others were to be used for an entire class period. Some were designed for use by the regular classroom teacher, while others were for the music specialist.

The material developed was designed for use either in a regular classroom, where class responses to the recorded material were desired, or in a learning laboratory, where individual responses could be made. In some cases the material was designed for use by an individual student, but not intended specifically for a learning laboratory situation.

The desired modes of response varied from those made verbally, by singing, or on an instrument. Some of the recorded material was designed to be presented with an overhead projector, some with 2 x 2 slides, and some only with the tape.

There were two modes of presentation used for the tapes developed. The first mode was that of presenting a sequenced tape, in which a portion of the tape was played, directly followed by either a student response, class discussion, a visual example or another recorded excerpt. This type was designed primarily for classroom use, although the materials could be re-designed for individual instruction.

The second mode of presentation was that of a continuous tape. This type was designed primarily for individual instruction, containing all necessary directions and provisions for student responses.

Problems Encountered in Presentation and Practical Solutions Employed

Recording problems encountered in the use of the materials in the classroom were of four types:

1. Problems with the tapes
   A completed tape did not necessarily guarantee a fine quality product. Low audio levels, tape hiss, wavering sound level, clicks, and uneven volume levels were problems sometimes overlooked even in the recording process. Ideally, these problems should have been eliminated in the last stage of tape production, but in a complicated, segmented recording process, it was easy for some of these problems to pass unobserved. (Occasionally the copying process would record problems onto a tape that were not on the master tape, and particularly would lower the level of fidelity.)
2. Poor quality playback equipment
   As was stressed before, only the highest quality equipment will bring satisfactory results in sound recording and playback. Inferior equipment will not faithfully reproduce the music which has been recorded.
3. Procedures for using the materials
   The failure of audio visual materials can often be attributed to the handling of the equipment by the teacher. Careful preparation of the materials and a knowledge of the operation of the controls on the equipment contribute greatly to the carrying on of a successful lesson.
   The procedures listed below helped to insure success for project participants:

a. Organizing the materials and making sure certain equipment was available and ready for use.
b. Testing the volume level of the tape recorder or phonograph.
c. Locating and practicing the use of the volume control, treble-bass control, tape speed switch, and start-stop switch.
d. Making certain that the equipment was located in an easily accessible place.
e. Placing the speakers to provide optimum listening for all students.
f. Making note of the counter numbers on the tape recorder when it was necessary to refer to a specific sequence on tape.
g. Considering temperature, space and accessibility for storing tapes and recording equipment.

Smooth operation of the controls on the machines being used, especially the start-stop switch, helped to make the materials and equipment more useful in the presentation of the lesson. Without adequate preparation and practice with the equipment, an audio-visual approach can result in a confusing and awkward presentation. This was especially true of the equipment in the learning laboratory, for which some of the materials were developed. The time involved in becoming familiar with the equipment, however, was well worth the new range of possibilities these media offered to the teacher in the presentation of music.

4. Room acoustics

Although the design and structure of rooms was beyond the scope of the project, it was evident that the choice of a room in which to use the materials, and the positioning of the equipment within the room were important for satisfactory reproduction of music.

It may be concluded that the technique of operating equipment, such as the phonograph, tape recorder, or overhead projector should not be taken for granted by the teacher. Adjustments to a certain room or teaching situation have not been built into the equipment, only the potential for these things exist. Fine tone and technique are not automatically part of a musical instrument. Neither is fine audio or visual reproduction automatically part of electronic equipment. The teacher's practice and familiarity with the hardware involved is essential if satisfactory results are to be expected.

Music Systems for Classroom Use

In the following section, components for several music systems are listed. They are representative of several degrees of cost, function, and quality of sound. The teacher should evaluate each system in terms of these criteria.

Music Systems

	Approximate Cost
Unit #1	
One stereo preamplifier	$ 110.00
One stereo amplifier (60-70 watts)	116.00

	Approximate Cost
Unit #1 (continued)	
One turntable (33-1/3 rpm and 45 rpm)	$ 78.00
One cartridge with stylus	68.00
One stereo tape deck (with edit stop, monitoring, and sound-on-sound capabilities)	549.00
Two speakers (8 ohms; 3 ohms; 15 watts) at $128.00	256.00
Two microphones at $100.00	200.00
One stereo headphones	50.00
	$1427.00
Unit #2	
One stereo preamplifier	$ 110.00
One stereo amplifier (30-35 watts)	70.00
One turntable (33-1/3 rpm and 45 rpm)	78.00
One cartridge with stylus	35.00
One stereo tape deck (with edit stop, and monitoring capability)	200.00
Two speakers (8 ohms; 4 ohms;. 15 watts)	114.00
Two microphones at $50.00	100.00
One stereo headphones	50.00
	$ 757.00
Unit #3	
One stereo control amplifier (30-35 watts)	$ 140.00
One record changer (4 speeds)	45.00
One cartridge and stylus	40.00
One stereo tape deck	150.00
Two speakers (8 ohms; 4 ohms; 15 watts)	114.00
Two microphones at $25.00	50.00
	$ 539.00
Unit #4	
One self-contained phonograph system, including a stereo control amplifier, 4-speed record changer, cartridge, and two external speakers	$ 230.00
One stereo tape deck	150.00
	$ 380.00
Unit #5 (Listening Center)	
One stereo headphone amplifier	$ 45.00
One record changer (4 speeds) with cartridge	55.00
One stereo playback tape deck	100.00
Two stereo headphones at $50.00	100.00
	$ 300.00

IMPLICATIONS FOR FURTHER STUDY

Although the tape recorder was the recording equipment employed by the project, other equipment may become important and useful in future research.

Two of the project participants designed materials for use in the learning laboratory. They demonstrated that there is a potential for teaching music in such a setting. Other material developed by project personnel could be adapted to an individualized approach such as

1. Individualized use of tape modules within carrels
2. A learning laboratory capable of playing different cartridges at individual stations, or at least capable of playing simultaneously several different programs from a master console
3. Use of cassette tape recorders for instruction in school or at home

Computer assisted instruction suggests many useful possibilities for future research in music and for the development of material similar to the project material.

The importance of programed instruction and visual reinforcement of the aural image are two significant outcomes of the project.

One feature that would be useful for recording purposes would be the capacity to isolate a particular timbre from other recorded sources. In this way, a particular instrument or group of instruments could be separated from a disc recording and emphasized on another tape recording.

SUMMARY

Almost all project participants designed materials using recorded sound reinforced by visual images. Every effort was made by all personnel to obtain the highest quality of sound with the equipment available. Even with good equipment, project members faced recording problems for which solutions were sought. A suggested guide for a professional sound laboratory has been included. It is hoped that it might prove useful to the reader contemplating the production of quality tape recording in a similar manner to that undertaken by the project.

Tape recordings were designed principally for use by the music specialist, and in some cases by the classroom teacher. They were designed to be used in a variety of teaching situations, including both the classroom and the learning laboratory. Problems encountered by participants in presenting the finished tape recordings included problems with the tapes, poor quality playback equipment, procedure in using the combined audio-visual materials, and room acoustics. Solutions to some of these problems have been presented. Music systems for classroom use with comparative price ranges also have been included.

Although the project utilized only the phonograph and tape recorder, the way lies open for continued research with other equipment. Based on the significant outcomes of this project, experimentation with machines which combine both the audio and the visual elements is a fertile area for future research.

CHAPTER V

INSTRUCTIONAL SYSTEMS ANALYSIS: AN EXPOSITION

INTRODUCTION

Today's rapidly changing world challenges teachers to strengthen their skills and adapt their attitudes to meet ever-new situations. Historically, a teacher has been expected to assume three roles - those of tutor, counselor, and discussion leader. As tutor and discussion leader, his main function has traditionally been to impart information. Application of systems analysis has resulted in changing concepts of the teacher's role. As adapted from its application to military and industrial operations, systems analysis indicates that the teacher may be able to free himself from prime responsibility for imparting information, and to assume a new role as instructional systems manager.

No brief description of systems analysis in education can hope to cover all aspects or satisfy all who are active in the field. Indeed, conflicting viewpoints and variations in terminology are common. The following is offered as a frame of reference for the present discussion:

1. Systems analysis of instruction emphasizes the importance of clearly stated objectives. While recognizing that such generally stated goals as "developing good citizenship" may be useful in setting broad curricular guidelines, this approach stresses the need to explain specifically what kinds of things a student will be doing when he is displaying "good citizenship" and under what conditions he is expected to do them.
2. Systems analysis implies consideration in terms of cost/effectiveness of all the alternative means for achieving educational objectives. For instance, programed instruction, one of many ways of presenting information, might be the alternative selected because it seems to provide most efficiently for individual differences in rate of learning.
3. Systems analysis of instructional design should involve the varied skills and knowledge of an interdisciplinary team such as curriculum experts, media specialists, and guidance personnel.
4. Systems analysis of instruction is learner-centered, rather than teacher-centered or subject-matter-centered. As seen from the viewpoint of systems analysis, there is no such thing as pupil failure; it is the system that has failed. (As in industry, an unsatisfactory product is not a failure of the raw material but of the manufacturing process.)
5. The systems analysis approach involves continuous revision referring back to original objectives and cost/effectiveness of the chosen means of instruction. Under systems analysis, a learning sequence never becomes fixed; it is constantly undergoing modification to improve its efficiency.

In summary, systems analysis represents a rigorous application of scientific method to educational processes. This application, rather than the utilization of technological hardware, is the essence of educational technology. Detailed steps in the approach are discussed in the following sections.

PRECONSTRUCTION STAGE

Need

The first phase in the "Preconstruction Stage" is to state what prompted the analysis. This is analogous to the first phase to be found within the scientific method: "Identify the Problem". The statement should be an expression of a "felt" generalized need for assessment of a complete curriculum or any of its parts. Care must be taken to express the real need (rather than a synthetic sub problem.)

Definition: Need: A statement of the real problem being faced by the society under consideration - that statement of a problem which initiates consideration of an education/training system as a potential solution. (20)

The statement itself should then be expanded, through further writing, to include related literature. This expansion is a verification of the need and may take the form of related theory and/or research discussion. It is not enough to merely have a subjective opinion which may have prompted the analysis. Reasoning based only upon subjective assumptions must be avoided. Objectivity is desired in all phases of the systems analysis approach. Stating the needs is no exception.

Objectives

Once the need and its rationale are properly stated, learning objectives must be attained to satisfy the need. In this phase, decisions must be made as to what the student should be able to do after having completed the learning experience.

This is the most important phase of the systems analysis approach, because all subsequent phases are designed to ensure that the learning system meets those objectives. If the objectives are stated improperly, the systems approach will not lead to the proper solution.

During this phase actual usage is to be made of books from related disciplines. These tools may have been mentioned in the previous phase, but it is during this phase that they are actually used in defining the objectives.

1. The first step is to identify and categorize the dominant domain of the desired terminal behaviors. Psychology has provided a basic tool in this area: The Taxonomy of Educational Objective - Cognitive, Affective Domains. (1) (3) These may be used to define not only the domain, but also the behaviors needed to achieve the terminal objectives.
2. The second step is to identify and categorize the learning processes needed to achieve these behaviors. For this step Gagne's The Conditions of Learning (2) may be used.

3. The third and final step is to express the terminal objectives (which may have been refined by steps one and two) in measurable behavioral terms. Robert F. Mager's Preparing Instructional Objectives (4) may be used as a basic tool in this step. In essence, the terminal behaviors should be stated in measurable terms which will describe what the learner will be doing when demonstrating his achievement and how one will know when he is doing it. The final terminal objectives should be so clearly stated that they literally dictate the items of a criterion test.

Entry Behaviors

Once the terminal behavioral objectives have been stated, attention must be focused upon the behaviors and knowledge already possessed by the students under consideration. Pertinent behaviors and knowledge must be identified and defined.

During this stage, tests are to be constructed which will measure the learner's readiness for the desired learnings. Pre-knowledge of content and behaviors are measured. A most important step in this stage is the tryout of these tests on a sample of intended learners to determine the validity of the assumptions regarding the learner's readiness and knowledge concerning the course.

On the basis of the results of these measurements, adjustments to the stated objectives may be needed. Synthesis of course content should not be started until the adjustments have been made in the terminal and entry behaviors based upon results of the tryout of tests developed during this phase.

CONSTRUCTION STAGE

From the analysis of objectives, the existing (or available) presentation modes must be studied in order to choose that mode which will best present the learning sequence needed to produce the desired behavioral objectives.

Constraints and Alternatives

The constraints of the local school must be known, so that the cost/effectiveness and available facilities can be analyzed and adapted. The alternatives will then be understood and the best procedures can be determined. Alternative presentation modes are as broad as the entire spectrum of education and are limited only by the imagination and scope of vision of the instructional team. A limited list would include programed instruction, group discussion, research project, television, film, film loop, overhead projector, slide/talk, learning laboratory, simulation, or lecture.

Implementation

After the analysis of objectives and presentation modes, the learning sequence which is developed as the next logical phase is composed of the instructional steps that will affect the students' learning. These are efficiently and effectively arranged in an orderly

progression from concrete to abstract and/or simple to complex. The learning experiences are reduced to a series of small steps that will lead the learner to the desired behavioral objective. Each step should be sequenced from the knowledge needed to perform the task, in the natural order that would follow. The small steps help to keep the learner involved in the lesson thereby helping to minimize the distraction. Each small step will tend to leave the impression of success and a feeling of accomplishment for the learner. This positive reinforcement is planned to give the learner more confidence and encouragement as he is in constant interaction with the media.

Learning Sequence

These transitional steps may be arranged by the programmer in a linear program which has built in clues, aids, or suggestions, to help the learner arrive at the right answer before he is allowed to proceed to the next step. The answer usually is written or composed by the learner, thereby utilizing higher learning processes such as synthesis rather than simple recognition of the correct answer. This procedure is dependent on constant revision to assure that the sequence accomplishes the intended task without omitting steps which are essential if the "average" learner is to be almost always successful.

Systems Programing

The systems programmer has another choice in his design for a sequence of learning. He may wish to have a paragraph which contains the step to be learned, after which the learner must make a choice from a group of multiple choice questions. In this technique a correct response will branch the learner to a "sub program" or "sub sequence" which is designed to react to the answer given and correct that particular error in that particular area. When a correct answer is finally made, the learner is returned to the main sequence.

Measurement and Evaluation

After the learning sequence has been completed by the learner, a criterion test based on the desired behavioral objectives as previously discussed would be given to the learner to determine his success or failure in that given sequence. This criterion test becomes one of the diagnostic tools to be analyzed and evaluated for the repair, revision, or sub-sequencing of the "packet". The nature of learner failure and the sequence must be analyzed to determine the area of error and, if possible, to seek out the need for correction or reinforcement of the sequence or its elimination as a learning tool. At the same time, further consideration must be given to the validity of the stated behavioral objectives, as part of the evaluation of the student failure.

This is the basic tenet of the systems approach to programed learning, an ongoing examination of the needs and an evaluation of methods and material leads to continual revision, upgrading and evaluation.

APPLICATION

An application of systems analysis to music education has been made by Thiebe. (26) Believing that "the major concern of music education should be the development of the cognitive behaviors of music literacy", he has consulted experts from psychology, sociology, and musicology and developed a multi-behavioral learning sequence to achieve this goal. The general objective of this material is "to develop music literacy: to develop the behaviors of 'knowledge' (recall), 'comprehension' (dictation), 'application' (sight-singing reading), 'analysis' (simple form), 'synthesis' (composition - writing - 'creating'), within the content of musical notation." Students "received instruction in musical literacy with the use of individualized programed instruction and group seminars... The seminars provided a setting for group application of the knowledge and behaviors which were learned through individualized instruction. Selected items within the programed sequences served as criterion tests for entry into seminar groups." Results of a pilot study (one phase of this systems analysis approach) will now be used as a basis for revision of constructed material and a guide for further development.

SUMMARY

This chapter has sought to show that systems analysis of instructional design is a promising approach to complex problems currently confronting education. It has offered a brief and general discussion of some aspects commonly accepted as characteristic of the approach. It has discussed in some detail specific steps in the application of systems analysis to developing a learning sequence and illustrated the discussion with a specific example from research in music education. The purpose of the chapter will have been accomplished if it stimulates music educators to learn more about systems analysis and its importance to their field.

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CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

The ultimate conclusion of the project's work is that the use of non-book instructional materials is an effective means of improving music education but the misuse of such materials will almost as certainly cause harm.

Also concluded is that any excessive use of one medium to the exclusion of others is as inadvisable as is the perpetuation of teacher-oriented seminar or lecture presentation as the sole means of creating a learning environment.

The final conclusion would be that a multi-media approach has its greatest value in allowing for a sufficient variety of presentation modes to provide adequately for individual difference in learners.

This leads to the primary recommendation which is that in order to select accurately suitable presentation modes, some systematic means of devising a basis of selection must be made. It is the author's opinion that the application of instructional systems analysis best provides such a means. The prime components of systems analysis are the accurate definition of measurable educational objectives and its provisions for ongoing evaluation throughout the process. These components would seem to allow for the selection of the most desirable presentation mode(s) in a given situation.

The author would suggest that institutions involved in teacher training consider the implications of this and other research in the area of technology. This should be done with an awareness of the fact that teachers usually teach as they have been taught and that to talk about methodologies and approaches to learning is not sufficient to insure their use. Higher institutions of learning must be willing to embrace in their approach to learning the changes they advocate for those they instruct.

Perhaps the greatest task for not only music education but all of public education to face is the retraining of the existing teaching force. The vast majority of learning environments which exist in our public schools are most definitely teacher-oriented. This fact by itself lessens the learning potential by the lack of sensitivity on the part of the teacher to the needs of the individual learner. Such an environment is not only naturally resistant to change of any kind but is especially resistant to the kind of change that educational technology requires. The application of technology to education requires the creation of a learning environment that is learner-oriented rather than teacher-oriented. Such a change means a rather drastic alteration in the role of the teacher. Only outstanding programs of teacher retraining can bring a smooth and effective transition in this shifting role of the teacher.

Further study and research to determine the optimum means of teacher training and retraining to apply technology more adequately to education is thus the most pressing recommendation of this report.

GLOSSARY

ACETATE - A sheet of transparent film upon which a reproduction of a master may be made.

ADJUSTABLE SCRIBER - A precision lettering instrument which may be used with interchangeable ink cartridge points. Templates of many letter styles and sizes are available.

AFFECTIVE DOMAIN - That area which is characterized by emotions, feelings, attitudes, or beliefs.

BEHAVIOR - In instruction, this refers to any visible response displayed by a learner.

BEHAVIORAL OBJECTIVE - An aim stated in terms of specific measurable performance.

BORGUE PAPER (contact paper) - Transparent colored adhesive paper used for accentuating portions of transparencies.

BULK TAPE ERASER - An electrical device which demagnetizes the entire reel of tape instantly upon contact.

CATHODE RAY TUBE - A device which translates computer input into an output form of graphic designs or diagrams. These diagrams appear on the face of the tube (as in a television tube.)

COGNITIVE BEHAVIOR - The responses arising from recognition, recall, or comprehension of specific knowledge.

COGNITIVE DOMAIN - That area which is characterized by recognition, recall, or comprehension.

COMPUTER INPUT - Information which is programed into the computer to be stored in its memory element.

COMPUTER OUTPUT - The result of processing information contained in the memory element of the computer.

CONSTRUCTION STAGE - The implementation phase of Systems Analysis including selection and arrangement of material, actual presentation, measurement, evaluation, and revision.

COST/EFFECTIVENESS - The cost of an operation related to the degree of efficiency in achieving its objectives.

COUNTER GUIDE - A numerical reference to tape recorded segments.

CRITERION - A standard or test by which terminal behavior is evaluated.

DIAZO - A chemical process used in the development of transparencies.

DIGITAL COMPUTER - A machine whose operational capacity is divided into two elements: memory and logic. The memory element stores information in sets. The logic element processes information. Since these elements are binary in nature, the information must be represented by binary symbols. (See COMPUTER INPUT and COMPUTER OUTPUT.)

EDIT-STOP, INSTANT STOP, PAUSE - The mechanism on an audio tape recorder and phonograph which permits the user to stop and start without any speed variation.

ENTRY BEHAVIOR - Attitude, knowledge, and skills possessed by a learner at onset of instruction.

FRAME - The mounting to which the completed acetate statics and overlays may be permanently affixed.

GOAL - The ultimate aim or intention in a learning process.

GREASE PENCIL - A pencil for writing on a transparency which produces a non-permanent marking that can be erased.

HARDWARE - The mechanical equipment used for the production or presentation of instructional materials.

INSTRUCTIONAL TEAM - A group of professionals who design and/or implement curricula.

LEARNING LABORATORY - An area equipped with instructional equipment and individual learning stations permitting instruction and response.

LEARNING SEQUENCE - A process of instruction which is structured with gradually increasing difficulty.

MASK - An opaque overlay.

MASTER - The original copy from which a transparency can be produced.

NARRATED TAPE - A sequenced tape recording containing narration with or without musical examples.

NON-BOOK INSTRUCTIONAL MEDIA - The means or instrument other than books used in teaching procedures.

OBJECTIVE - An aim toward which efforts are directed. (See also BEHAVIORAL OBJECTIVE.)

OVERHEAD PROJECTOR - A machine which sends a light through a glass staging, through and around any object on the stage, projects and focuses this light picture onto a screen or wall, by means of an overhead prism, in a lighted room.

OVERLAY - A transparency or mask to be super-imposed on a static.

PHOTO, PHOTO-COPY - A photographic process used in development of transparencies.

PHOTO-MODIFIER - A camera that can produce enlarged or reduced images of an original.

PRE-CONSTRUCTION STAGE - The planning phase of Systems Analysis including setting objectives and selecting instructional strategies.

PRESENTATION MODE - The medium or media to be used in a learning situation.

PRESSURE SENSITIVE TAPE - An adhesive backed tape of various widths, which is available in opaque and transparent colors, and some patterns.

PROGRAM - A unit of instructional material which has been arranged as a sequence of small informational increments and which provides for immediate evaluation of responses.

PROGRAMED INSTRUCTION - Presentation of a program.

PROGRAMED TAPE RECORDING (technique) - Pre-recorded tape of sequenced musical examples.

PROJECTUAL - A transparency prepared for use on an overhead projector.

REVERSAL - A projectual on which the dark and light areas are reversed.

SCORE-ON-ROLL - The reproduction of musical notation on a continuous roll of transparent film.

SEQUENCED TAPE RECORDING - Musical examples which have been presented in a specific order on electromagnetic tape.

SIMULATION - Artificial re-enactment of a life situation, in this case for educational purposes. Simulation may encompass role playing, especially designed games, or computer analysis of probable outcomes.

SINGLE LINE SCORE - A linear sequence of pictorial, verbal, and/or traditional notation.

SLIDING TRACK - A means by which overlays may be attached to a projectual allowing them to move either vertically or horizontally.

SOFTWARE - Content presented in teaching.
STAGE - The glassed portion of the overhead projector upon which a transparency is placed.
STATIC - Permanently mounted immovable acetate.
SYSTEMS ANALYSIS - The continuing evaluation of an operation (in this case an educational operation) in terms of input, process and output.
TAPE HEAD DEMAGNETIZER - A small electric tool which removes magnetic field buildup from recorder heads, thereby eliminating tape "hiss".
TECHNICAL POINT PEN - A pen with a needle point valve designed for precise line drawing.
TERMINAL BEHAVIOR - The behavior expected as the outcome of a given learning sequence.
THERMAL - A heat process used in development of transparencies.
TRANSFER TYPE - Pre-printed lettering which can be affixed to the master.
TRANSPARENCY - A clear acetate of film upon which an image has been produced.

APPENDIX

PROJECT STAFF AND INVENTORY SUMMARY

Project Director: Mr. Thomas Vasil
Instructional Materials Consultant: Dr. Frank DiGiammarino
Assistant Director: Mr. Donald Gillespie, Jr.

ELEMENTARY LEVEL

Coordinator: Mr. Robert E. Morrill
Scituate High School, Scituate, Massachusetts
1. Fingering Charts for Elementary Woodwinds
2. Unison Scales for Elementary Band
3. Rhythm Patterns

Mrs. Ruth C. Ashley
Easton Public Schools, North Easton, Massachusetts
1. Themes and Analyses of Musical Compositions from Adventures in Music Series, R.C.A. Victor

Mr. James D. Amirault
Hamilton-Wenham Regional High School, Hamilton, Massachusetts
1. Tape Recorded Units to Reinforce Correct Intonation, Pitch and Rhythm in Beginning Instrumental Students using Tune-A-Day Method Book, Boston Music Company

Mrs. Evelyn M. Brandes
Swampscott Public Schools, Swampscott, Massachusetts
1. Fundamentals of Elementary Music
   a. An Introduction to Rhythm
   b. An Introduction to Rhythmic Notation
   c. Finding do in Sharps and Flats
   d. Primary Melody - Form - Harmony
   e. An Introduction to Beginning Music Reading

JUNIOR HIGH LEVEL

Coordinator: Mrs. Sheila Reid
Brooks School, Lincoln, Massachusetts
1. Analysis of the form of Bartok's Fourth String Quartet
2. Analysis of Stravinsky's Compositional Techniques in L'Histoire Du Soldat

Mrs. Ruth D. Amelotte
Lancaster Public Schools, Lancaster, Massachusetts
1. Music Skills Related to the Bass Staff
   Set A. Introductory Set

Set B. Treble Melodies
Set C. Bass Melodies
Set D. Bass Rounds
Set E. Harmonizing with Chord Roots
Set F. Two and Three-Part Harmony

Mr. Robert B. Cullen
Murdock Junior-Senior High School
Winchendon, Massachusetts
1. Application of Media to a Listening Lesson
a. Finlandia by Jan Sibelius
b. Hary Janos Suite by Zoltan Kodaly

Mr. Ralph A. Metcalf
Shrewsbury High School, Shrewsbury, Massachusetts
1. Understanding and Reading Rhythm through Response and Performance: A Supplement to General Music Classroom Activities

HIGH SCHOOL LEVEL

Coordinator: Mr. Dwight Killam
Minnechaug Regional High School
Wilbraham, Massachusetts
1. Rhythmic and Melodic Perception for High School Students

Mrs. Virginia C. Coffin
Westfield High School, Westfield, Massachusetts
1. Choral Aids
Set 1. The Printed Page
Set 2. Vocal Technique
Set 3. History and Style

Mr. Harold E. Fiske
Gardner High School, Gardner, Massachusetts
1. Understanding Music through Analytic Listening

Mr. Edward H. Thiebe
John J. Duggan Junior High School
Springfield, Massachusetts
1. Developing Sight-Singing Skills as a Class Activity
Part 1. Rhythm
Part 2. Pitch
Part 3. Intonation

COLLEGE LEVEL

Coordinator: Miss Sandi Lea Kinyon
Lexington High School, Lexington, Massachusetts
1. An Introduction to Score Reading
2. An Introduction to Atonal Music and The Twelve Tone Technique through the works of Arnold Schoenberg, Alban Berg, and Anton Webern

Mr. Donald J. Gillespie, Jr.
Lexington Public Schools, Lexington, Massachusetts
1. Echelon Routine No. 1
2. Approaching the Band Rehearsal Using Overhead Projectuals and Tape Recorder

Mr. David D. Kaplan
Berklee School of Music, Boston, Massachusetts
1. Orchestration
   - Set One - Strings
   - Set Two - Brasses
   - Set Three - Woodwinds
   - Set Four - Percussion

Miss Mary Ann Norton
Worcester State College, Worcester, Massachusetts
1. Materials for Music Literature

Miss Vernice Van Ham
Salem State College, Salem, Massachusetts
1. Development of Tape Recordings and Overhead Transparencies to be used as a Supplement to and in Conjunction with the Text and Recording of The Craft of Music Teaching in The Elementary School by Schubert and Wood, Silver Burdett Company
2. Materials for Music Literature

Mr. James A. Wiltshire
Boston University, Boston, Massachusetts
1. Programed Instruction in Music Listening (programed tape technique)
   1. March from Summer Day Suite, Prokofieff
   2. Prelude to Act III from Lohengrin, Wagner
   3. Minuetto from Divertimento No. 17 in D, Mozart