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THE DEVELOPMENT AND EVALUATION OF SELF-INSTRUCTIONAL UNITS FOR TEACHING SELECTED MUSICAL CONCEPTS TO FOURTH-GRADE CHILDREN

The University of Oklahoma PH.D. 1979

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE DEVELOPMENT AND EVALUATION OF SELF-INSTRUCTIONAL UNITS FOR TEACHING SELECTED MUSICAL CONCEPTS TO FOURTH-GRADE CHILDREN

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1979

THE DEVELOPMENT AND EVALUATION OF SELF-INSTRUCTIONAL UNITS FOR TEACHING SELECTED MUSICAL CONCEPTS TO FOURTH GRADE CHILDREN

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ACKNOWLEDGMENTS

The author is especially grateful to his advisor, Dr. Harry W. Fierbaugh, whose advice, criticism, and overall concern have been of great help in the preparation and completion of this study. Appreciation also is extended to Dr. Melvin C. Platt and Dr. Ralph E. Verrastro for their advice and counsel and to Dr. Digby B. Bell, Dr. Ernest L. Trumble, and Dr. Gail de Stwolinski, members of the committee.

Thanks are expressed to Ms. Kim Sherman and Ms. Barbara Mitchell for their illustration work, to David Baldwin and Larry Brock for recording the tapes, and to Mrs. Carolyn Brown for her assistance in interpreting the statistical data.

The author also wishes to convey his gratitude to the elementary school principals, classroom teachers, and music teachers who cooperated in this project, and particularly to the boys and girls who participated in the pilot and formal studies.

Finally, the author gratefully acknowledges his wife, Ruth, his children, Julie, Christopher, and Carol, and his parents, Mr. and Mrs. C. J. Wood, for their love and support through the long years of work necessary to complete the study.

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CHAPTER I

INTRODUCTION

The importance of music in the life of man has been evident throughout history. Man has utilized music for expressing feelings in worship, war, love, death, and other significant life events, and has recognized the value of music to satisfy fundamental human needs.[1]

The position that "music is basic in education" was adopted at the November 1976 National Executive Board meeting of the Music Educators National Conference. Included in that position was the belief that

> music is taught and should be taught in the schools primarily because it represents one of the most magnificent manifestations of our cultural heritage, because it brings joy and solace to mankind in the myriad activities of daily life, and because it elevates and exalts the human spirit.[2]

Twentieth century technology, communication, and music education have made great strides to bring music to mankind in unprecedented quantities. Ernst and Gary believe "the children in our schools today will be living their lives in a world in which music is more available to them

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[1]Bjornor Bergethon and Eunice Boardman, Musical Growth in the Elementary School, 4th ed. (New York: Holt, Rinehart, and Winston, Inc., 1979), p. 3.

[2]MENC National Committee on Instruction, "The Role of Music in the Total Development of the Child," Music Educators Journal 63 (April 1977):59.

than has ever been true in times past.[1]

Music plays a particularly vital part in the life of the child. From infancy the youngster is exposed to music through all of the means mentioned above plus the live experiences provided by parents and other individuals in the home, church, and school environment. The child responds to music in various ways, reflecting the complexity of human nature. The spontaneous chants and songs improvised during play are a natural expression about life--joys, sorrows, angers, fears, hopes, and dreams. In addition, the child reacts physically to the sounds of music through the modes of dancing, clapping, and other movements.

As growth and development occur the child's musical interests evolve to levels of greater sophistication than the early chants and songs of the preschool years. Fierbaugh notes that

> the primary level is a season for formulating attitudes, understanding and developing basic musical concepts. It is a period during which almost everything the child learns is learned through imitation. To the child, it is a time to investigate, discover, and enjoy music although he may not completely understand all of his experiences.[2]

Continuing, Fierbaugh indicates that the intermediate years provide

> a period for expanding, unfolding, evolving, reinforcing, nurturing, and developing, in breadth and depth, the knowledges, skills, and experiences that were introduced during the primary years. It is a time to provide for individualized instruction in listening (guided analysis), writing, and performing.[3]

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[1]Karl D. Ernst and Charles L. Gary, eds., Music in General Education (Washington: Music Educators National Conference, 1965), p. 1.

[2]Harry W. Fierbaugh, "Introduction to Elementary Education," course syllabus, The University of Oklahoma, 1972, p. 4. (Mimeographed.)

[3]Ibid., p. 5.

Therefore, music education is charged with the responsibility of providing concept and skill development which will help the child to continue to find meaning in musical experiences. The dual challenge to music educators, then, appears to be that of being able to "nurture in a child the sense of mystery and of wonder" of musical experiences and yet to foster growth that will continue to challenge his mind and spirit.[1] The importance of this is stressed by Mursell:

> . . . musical experiences certainly should and can be a pleasure. But music will not yield its richest pleasures if it is treated merely as happy play and if the fact that it is an organized art is ignored. . . . Musical growth turns upon a progressive and continuously developing realization of what music actually is. Therefore, at least a dawning realization should come from the earliest years.[2]

It can be seen that music plays a significant role in the life of contemporary man. Therefore, it is imperative that music education provide training and experiences upon which the individual may continue to draw throughout life. Music education based on the development of musical behaviors in the areas of knowledge, skills, attitudes, and aesthetic experience can provide the basis for greater understanding and enjoyment of the many sounds of music encountered each day in the life of the human being.

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[1]Charles L. Gary, ed., The Study of Music in the Elementary School: A Conceptual Approach (Washington: Music Educators National Conference, 1967), p. 1.

[2]James L. Mursell, "Growth Processes in Music Education," in Basic Concepts in Music Education, Fifty-Seventh Yearbook of the National Society for the Study of Education (Chicago: University of Chicago Press, 1958), p. 157.

Purpose of the Study

The purpose of this study was to develop and evaluate self-instructional units to teach selected musical concepts to fourth-grade children. Specifically, the study sought to answer the following question: Can fourth-grade students learn selected musical concepts through criterion referenced self-instructional units as ascertained by the procedures employed in the present study?

The effectiveness of the self-instructional units was determined by testing the following null hypothesis:

> As determined by an investigator-designed measure of musical concepts, there will be no significant difference, at the .01 level of confidence, between the mean posttest scores of subjects who study the self-instructional units and subjects who do not study the units.

Need for the Study

Educators have realized that uniform achievement through group instruction is complicated by variables in learning rates, intelligence levels, motor skills, and interests. The problem of individual differences was not so evident prior to the nineteenth-century adoption of grade-level instruction, for "most schools were basically tutorial, and instruction was essentially individual."[1] Since that time, however, class enrollments of twenty or more graded students have made it increasingly difficult for the teacher to spend time with the individual learner.

Faced with the task of teaching twenty or more students of the

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[1]Robert H. Anderson, "Organizing Groups for Instruction," in Individualizing Instruction, Sixty-First Yearbook of the National Society for the Study of Education (Chicago: University of Chicago Press, 1962), p. 240.

same age and grade level, many teachers focused their efforts toward the middle or average group of students. Several writers have noted the problems which result from this approach. For example, Goldiamond and Pliskoff believe

> learning is an individual process. It is a single child who learns, and it is a truism that a classroom consists of individual learners. A child who fails is not consoled by the fact that the teaching method used is efficacious for the average child, or produces better average performance than another method, or teacher. Nor are his parents so consoled, nor is the conscientious teacher.[1]

Commenting on the same problem, Thiebe observes that

> the "bright" or "fast" student becomes bored because he is able to grasp the material or behavior quickly. The "slow" student becomes frustrated because he has never learned the required entry behaviors or material.[2]

Twentieth century recognition that the school curriculum should be tailored to the needs of the individual student began in England. The British open education movement began after the 1944 Education Act abolished grammar school tuition fees and opened the doors to students from working-class families. Pressure from working-class parents to make the schools more relevant led to experimental programs in the late 1940's and into the 1950's.[3] One of the many important results of these experimental programs was the detection of individual differences among students. Following a three-year study of British primary education,

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[1]Israel Goldiamond and Stanley Pliskoff, "Music Education and the Rationale Underlying Programmed Instruction," Music Educators Journal 51 (February-March 1965):44.

[2]Edward H. Thiebe, "Somewhere the Child Has Been Lost," Music Educators Journal 59 (November 1972):22.

[3]"A Time and Thought Line," Music Educators Journal 60 (April 1974):35.

Plowden wrote that

> individual differences between children of the same age are so great that any class, however homogeneous it seems, must always be treated as a body of children needing individual and different attention. . . .[1]

Two years earlier, Jerome Bruner, an American researcher, wrote of similar observations regarding individual differences.

> Quite plainly, they exist in massive degree - in the extent to which children have problem-solving predispositions, in the degree of their interest, in the skills that they bring to any concrete task, in their preferred mode of representing things, in their ability to move through any particular sequence, and the degree to which they are initially dependent upon extrinsic reinforcement from the teacher.[2]

With regard to the response of individuals in musical situations, Redding adds

> it has also been evident to music teachers and musicians that there are definitely individual differences, needs, and enthusiasms to be discovered in each child who is required to or desires to involve himself in music.[3]

In addition to individual differences observed among students in the typical music class, the needs of the exceptional student as well must be recognized. The trend toward mainstreaming the physically, mentally, and emotionally handicapped learner back into the regular classroom has increased the range of individual differences found in the music class. Graham notes that the phrase "exceptional child"

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[1]Bridget Plowden et al., Children and Their Primary Schools, 1 (London: Her Majesty's Stationery Office, 1967):25, quoted in "A Time and Thought Line," Music Educators Journal 60 (April 1974):36.

[2]Jerome S. Bruner, Toward a Theory of Instruction (Cambridge, Massachusetts: The Belknap Press of Harvard University Press, 1966), p. 71.

[3]Frances S. Redding, "Individualization is a State of Mind," Music Educators Journal 59 (November 1972):25.

includes not only the handicapped but the gifted as well.[1] The same writer points out that the students who are "gifted, academically talented, or who have high exploratory drives" may cause as much difficulty in traditionally oriented music education settings as do the handicapped."[2] Nocera writes that "in most schools, the gifted are handicapped by 'the system'" because their individual needs are not met.[3]

Individual differences among those who study music were recognized by music educators who met at the Tanglewood Symposium in 1967. Evidence of this recognition is seen in one of the evaluation documents of that symposium, "The Tanglewood Declaration." Specifically, one point agreed upon by the assembled music educators was that "greater emphasis should be placed on helping the individual student to fulfill his needs, goals, and potentials."[4]

The spread of the open school movement to American education, along with the support of documents such as "The Tanglewood Declaration," led music educators to adopt instructional techniques to fit new learning environments which were appearing in their schools or which they desired to create in their own classrooms. Some of these instructional techniques included division of the class into small groups or individuals, learning centers, programed learning, and other types of

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[1]Richard M. Graham, comp., Music for the Exceptional Child (Reston, VA: Music Educators National Conference, 1975), p. 1.

[2]Ibid., p. 9.

[3]Sona D. Nocera, "Special Education Teachers Need a Special Education," Music Educators Journal 58 (April 1972):75.

[4]Robert A. Choate, ed., Documentary Report of the Tanglewood Symposium (Washington: Music Educators National Conference, 1968), p. 139.

self-instructional lessons.

In modifying programs to include the new instructional techniques, music specialists including Moore realized the importance of preserving total group experiences such as group singing, movement activities, performance preparation, and the viewing of films.[1] Some teachers begin the music class period with a total group activity before dividing the class into small groups. In other situations, days or even weeks of total group activity are interspersed between days spent at the learning centers. Most teachers agree that a balanced music program should include both large groups and individualized instructional activities.

Landon suggests that one effective way to meet the need for helping the individual is through the use of a "modified open classroom." Continuing, Landon states that such an environment involves a partnership of teachers and students in learning activities and that "the primary task of the teacher is to select and provide materials that will allow students to explore, manipulate, experiment, invent, and discover - processes that are essential for the understanding of music."[2]

One of the most important tools for individualizing instruction, then, is the self-teaching material which the students use in the learning experience. Relating to this need, Cornell suggests that

> although teaching materials for open classrooms are plentiful in other subject areas, few are available for use in music education.

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[1]Floy S. Moore, "Today I Go to Studio K," Music Educators Journal 62 (March 1976):59.

[2]Joseph W. Landon, "Strategies for Opening the Traditional Classroom," Music Educators Journal 60 (April 1974):64.

> As an increasing number of elementary schools make the transition to open learning environments, music educators are called on to meet the challenge to find or develop the appropriate resources.[1]

Several writers of the early seventies observed that the amount of materials and the time-consuming preparation process could be a deterrent to widespread adoption of the individualized instruction method for music education. For example, Hagan wrote: "This process entails much more work than conventional lesson planning because the teacher must plan diverse activities and set up many tools for teaching any one fact to any one group."[2]

In a related study, Kahnert concluded that "the vast amount of materials and devices demanded by this type of program could well be a deterring factor to wide acceptance by teachers and administrators."[3]

Cornell enumerated some specific problems teachers might encounter during the process of accumulating materials suitable for the individualized instructional setting in music.

> As they try to develop these music materials, teachers will be faced with many problems - deciding where to look for direction, determining who will accept responsibility for music learning and who will prepare such materials, . . . finding time to develop materials, . . .[4]

Many of the self-instructional materials used in the music class

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[1]Helen Loften Cornell, "Drums and Dumpsters, Puppets and Pods," Music Educators Journal 60 (April 1974):60.

[2]Sister M. Tobias Hagan, "How the Teacher Functions in an Open Classroom," Music Educators Journal 59 (November 1972):45.

[3]Colleen Kahnert, "An Investigation of the Effect of Individualized Instruction and Materials on the Musical Growth of Second Grade Children" (M.M.Ed. thesis, Wichita State University, 1969), p. 107.

[4]Cornell, "Drums and Dumpsters," p. 60.

can be adaptations of lessons previously taught by the teacher to the entire class. According to Cornell, others can be borrowed from other subject areas "if we remember to reinforce the visual with the aural."[1] In addition to sounds performed, created, or discovered through a variety of sound sources, prepared tapes provide another opportunity for experiencing the aural dimension of music.

Rasmussen notes that the complexity of planning and preparing sequential materials for taped listening lessons indicates "that most classroom teachers will not be in a position to provide their own listening sequences." The same writer suggests that such instructional materials should be developed through educational research.[2]

Materials developed through educational research have the advantage of being pupil-tested before they are marketed. Such materials provide lessons to be used in the classroom and may serve as models for the development of similar lessons for use in related instructional settings at various grade levels.

A review of related literature revealed only two studies involving use of the self-instructional format with fourth grade children. Rasmussen designed and evaluated programed tapes for developing listening skills in the perception of rhythm, melody, tone color, and aspects of texture and form. Content of the tapes was based on music literature examples (listening lessons) generally available to classroom

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[1]Ibid., p. 61.

[2]Warren Irvin Rasmussen, "An Experiment in Developing Basic Listening Skills Through Programed Instruction" (D.M.A. dissertation, University of Southern California, 1966), p. 221.

teachers.[1]

Dean used autoinstructional devices as a means of learning music symbols and terms and for strengthening general music achievement. The devices were used during the last ten minutes of the music class period to reinforce instruction initially presented in class by the music specialist.[2]

Another researcher, Romanek, developed self-instructional tapes and lesson booklets for teaching musical concepts about pitch, duration, and loudness to preschool children. One of Romanek's recommendations for further study was "a study which would determine the feasibility and effectiveness of a self-instructional unit in the development of musical concepts in elementary school children."[3]

A survey of the educational market prior to the beginning of the study disclosed that units such as the investigator proposed to develop were not available.

In summary, educators have realized that the effectiveness of large-group instruction is hindered by the individual differences of students. The open school movement brought about curricular and environmental changes designed to meet individual learning needs. An emergent problem was that of accumulating the vast amount of teaching materials

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[1]Ibid., p. 78.

[2]Roger Alan Dean, "The Effect of an Adjunct Autoinstructional Device on the Learning of Music Symbols and Terms and on General Music Achievement of Fourth Grade Music Students" (D.M.A. dissertation, University of Oregon, 1971).

[3]Mary Louise Romanek, "A Self-Instructional Program for the Development of Musical Concepts in Preschool Children" (Ed.D. dissertation, The Pennsylvania State University, 1971).

needed for the new instructional settings. Self-instructional lessons utilizing programed learning and prepared tapes were not available on the education market and required preparation time unavailable to elementary music specialists. Given the interest in individualizing elementary music instruction and the corresponding lack of pilot-tested self-instructional units, there was a critical need for the study.

Definition of Terms

Behavioral objective. A statement which describes what the learner will do to demonstrate understanding of the concept.[1]

Concept. An idea or mental image of something which remains in the mind following a perceptual experience. Following perception, the learner must think about what he has perceived, analyzing and exploring it mentally. A third step in developing a concept is that of application--putting the concept into practice.[2]

Criterion measures. An examination or exercise which indicates the amount of learning that has occurred. Criterion-referenced test items compare the student's performance with a stated behavioral objective.[3]

Development. As used in this study, the evolutionary process through which a teaching unit is written, and then revised and refined

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[1]Robert F. Mager, Preparing Instructional Objectives (Palo Alto, CA: Fearon Publishers, 1962), p. 11.

[2]Asahel D. Woodruff, "Concept Teaching in Music," in Perspectives in Music Education: Source Book III, Bonnie C. Kowall, ed. (Washington: Music Educators National Conference, 1966), pp. 220-21.

[3]"Contemporary Music Project: Putting Ideas Into Practice," Music Educators Journal 59 (May 1973):41.

on the basis of a series of pilot trials in which careful consideration is given to the responses and reactions of the subjects.

Elements of music. Briefly defined, the basic elements of music considered in this study were those of (1) pitch--the "highness" or "lowness" of a sound;[1] (2) duration--the temporal characteristics of sound and silence; (3) intensity--the "loudness" or "softness" of a sound;[2] (4) timbre--the characteristic color or quality of a sound; (5) texture--the "thickness" or "thinness" of a sound which is determined by the number of sound sources occurring at the same time; and (6) structure--the order in which sound events occur.

Evaluation. In this study, the assessment of the effectiveness of the self-instructional units, achieved by accumulating and interpreting data from the criterion measure answer sheets and the posttest.

Experiment. In this study, the formal testing of the units as well as the administration of an investigator-designed posttest to subjects who studied the units and to a control group which did not study the units.

Individualized instruction. A teaching approach which provides for learning differences by guiding the student through experiences that are geared to meet his own level of achievement. The student may work alone, with other students in small groups, or with the entire class. An informal environment often prevails, and a variety of teaching media are employed.

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[1]Paul Harder, Basic Materials in Music Theory: A Programed Course, 4th ed. (Boston: Allyn and Bacon, Inc., 1975), p. 2.

[2]Ibid., p. 4.

Knowledge representation. Based on Bruner's modes of representation and the translation of experiences into models of the world, the levels on which student responses were given in this study are those of the (1) enactive: representation of experience through action, such as by singing or moving; (2) inconic: representation of experience through imagery, such as a series of horizontal lines to represent duration or pitch levels; (3) symbolic: representation of experience through words, language, or the accepted symbols of a discipline, such as staff notation.[1]

Programed instruction. Learning experiences which are divided into small segments for gradual development of a concept or skill. These small segments are usually arranged in frames which may include space for the learner to record his response. Immediate feedback is provided in the form of the correct response. When the linear technique is employed the student proceeds through the frames in consecutive order. In the branching type of programing, however, the student's response determines the order of advancement. An incorrect answer directs the learner to frames which clarify and provide additional drill work while a correct response often allows the student to omit material he already understands. The present study utilized linear programed instruction.

Self-instruction. A learning experience in which the student teaches himself through the use of programed learning or some other form of self-contained learning package.

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[1]Bruner, Toward a Theory of Instruction, pp. 10-11.

Limitations

The content of the units developed and evaluated in this study were limited to concepts pertaining to the musical elements of pitch, duration, intensity, timbre, texture, and structure. The teaching method used for the study was that of self-instruction, utilizing cassette tapes, programed booklets, and criterion measure answer sheets. The study consisted of the organization of the units and criterion measures, a series of pilot trials, a formal study, and evaluation of the criterion measure responses as well as an investigator-designed posttest.. Subjects for the study were selected from extant classes of fourth-grade children in the Norman, Oklahoma, and Portales, New Mexico public schools.

Organization of the Study

This chapter presented the need for the development and evaluation of structured learning units that could be used for teaching musical concepts to children on an individualized basis. Chapter II reviews related literature and research considerations pertinent to the areas of concept teaching, individualized instruction, and programed instruction. Chapter III includes the rationale for the design and descriptions of the processes followed in developing the six units (eighteen lessons) used in the study. Chapter IV presents and analyzes the statistical data accumulated during the formal study and from an investigator-constructed posttest. In Chapter V, results, conclusions, and implications of the study are discussed, and recommendations for further research are made.

CHAPTER II

REVIEW OF RELATED LITERATURE AND RESEARCH

The current chapter reviews literature and research in the areas of concept teaching, individualized instruction, and programed instruction as they pertain to the study. A review of concept teaching is appropriate because the units are based on a conceptual framework. Individualized instruction relates to the study because it was for such a context that the teaching units were designed. Since the instructional units employ a programed instructional format, a review of the literature relating to that area is also included.

Concept Teaching - Related Literature

Reference to the terms "concept," "conceptualization," and "concept teaching" is difficult to escape for the reader of contemporary educational methodology. Familiarity with these terms grew perhaps as a result of the curriculum revision movement which began during the early 1960's in the areas of science and mathematics. Realizing that the amount of time allotted to formal instruction is limited and that learning is an individual and on-going process, the participants at the Woods Hole Conference concluded that

> . . . the curriculum of a subject should be determined by the most fundamental understanding that can be achieved by the underlying

principles that give structure to that subject.[1]

A similar viewpoint is extended to the music curriculum by Nye and Nye.

> The current philosophy of learning emphasizes that beneficial and purposeful learning can be attained and used if it is acquired through a program that is organized around the basic structure of a subject. . . . For students to understand the structure of music they must learn to process information at the data, concept, and generalization levels, since these three levels of information comprise the structure.[2]

The importance of basing the study of a discipline on structure is also affirmed by Bergethon and Boardman.

> The conceptual structure of music is concerned with the elements of music - melody, rhythm, and harmony and their formal, expressive, and stylistic organization. Specific concepts relating to the organization of each of these elements are essential to musical understanding, whether the music to be comprehended is a simple folk tune or an intricate fugue.[3]

Concept is defined differently by many writers. Zimmerman denotes concept as "a clear and complete thought about something that has been acquired through sensory perception."[4] Gary describes this term as "that which remains in the mind following a given learning experience."[5] Leonhard and House state that "concepts are cognitive organizers of

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[1]Jerome S. Bruner, The Process of Education (New York: Vintage Books, 1960), p. 31.

[2]Robert Evans Nye and Vernice Trousdale Nye, Music in the Elementary School, 4th ed. (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1977), pp. 32-33.

[3]Bjornar Bergethon and Eunice Boardman, Musical Growth in the Elementary School, 2d ed. (New York: Holt, Rinehart, and Winston, Inc., 1970), p. 6.

[4]Marilyn P. Zimmerman, Musical Characteristics of Children (Washington: Music Educators National Conference, 1971), p. 12.

[5]Gary, ed. The Study of Music, p. 2.

experience." They point out that concept formation is dependent on the person's ability to organize experience and make discriminations among stimuli perceived by the senses.[1] Carlsen affirms concept formation or conceptual behavior to be "the identification of similar characteristics which classify otherwise dissimilar stimuli."[2]

Piaget believes that conceptual development in the child involves conservation, the ability "to retain the invariant qualities of a particular stimulus when the stimulus field has been changed."[3] Reversibility, an attending mental process, exists if the child can mentally return the stimulus to its original condition. A third factor, decentration, allows the child to focus on more than one facet of a problem (stimulus) at the same time and to relate these facets.[4]

The process of conceptualization is described by Bergethon and Boardman as

> . . . the means by which individuals organize their sensory experiences. Concepts allow a person to generalize, to differentiate and categorize classes of objects, qualities, or relationships. They provide an individual with tools for problem-solving in new situations. The ability to conceptualize empowers the individual to use "progressive learning," that is, the building of new learnings on previously acquired conceptual organizations.[5]

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[1]Charles Leonhard and Robert W. House, Foundations and Principles of Music Education, 2d ed. (New York: McGraw-Hill Book Company, 1972), p. 127.

[2]James C. Carlsen, "Some Problems in Music Learning," Journal of Research in Music Education 17 (Spring 1969):9.

[3]Marilyn Pflederer Zimmerman, "Percept and Concept: Implications of Piaget," Music Educators Journal 56 (February 1970):49.

[4]Herbert Ginsburg and Sylvia Opper, Piaget's Theory of Intellectual Development: An Introduction (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1969), p. 168.

[5]Bergethon and Boardman, Musical Growth, 4th ed., pp. 10-11.

According to Woodruff, there are several stages through which the learner must proceed in developing a concept. The first stage is perception of the actual phenomenon, or personal interaction with something in which the learner forms a mental impression.[1] Zimmerman points out that "it is the percept that germinates the concept."[2]

The perceptual process, suggests Carlsen, is made up of three components: the existence of a perceptual field, selective focus, and the internal operation of labeling and organizing. The perceptual field contains at least one stimulus but more likely is a composite of stimuli. Examples of a perceptual field in music given by Carlsen include the auditory stimulus (musical sound), visual stimulus (musical score or the sight of a performer), and tactile/kinesthetic stimulus (a musical instrument being touched by a performer).[3]

Selective focus, the second component, is an operation during which the mind blocks out information not being used in the immediate perceptual field. During the third component, labeling and organizing, the stimulus is attached to some means for reference and is catalogued into a systematic scheme.[4]

A problem in perceptual research is the collection of accurate evidence. One evidence-gathering method is to ask the subject to respond verbally but Carlsen suggests that words often do not convey the precise meaning, such as the "dark" color of sound or the "moody"

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[1]Asahel D. Woodruff, Basic Concepts of Teaching (San Francisco: Chandler Publishing Company, 1961), p. 72.

[2]Zimmerman, Musical Characteristics, p. 12.

[3]Carlsen, "Some Problems," p. 7.

[4]Ibid.

quality of music.[1] Zimmerman points out that children may not be able to accurately apply terms such as "up-down, high-low, large-small" to musical percepts because they also relate to other concepts they are learning.[2]

A second way to collect perceptual evidence in research is by asking the subject to reproduce the stimulus. This method is particularly effective when the subject can respond with the same sound source used in the stimulus presentation, such as the voice, body instruments, or musical instruments.[3]

Woodruff believes that concepts are acquired through the basic senses rather than verbal activity.[4] A number of writers comment on the pitfalls inherent in verbal teaching. Evanson notes that "telling is not teaching. The learner must form his own concepts out of his own experiences."[5] Woodruff states that verbal activity provides the transmission of symbols, not meanings.[6] Thus the teacher's words are transmitted to the student as symbols and conceptualization occurs only if the student can transfer these symbols into meaning.

Several writers emphasize the need for developing vocabulary

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[1]Carlsen, "Some Problems," p. 8.

[2]Zimmerman, Musical Characteristics, p. 7.

[3]Carlsen, "Some Problems," p. 8.

[4]Woodruff, "Concept Teaching," pp. 219-220.

[5]Flavis Evenson, "How Musical Concepts Are Developed and How They Are Applied," Music Educators Journal 56 (February 1970):55.

[6]Asahel D. Woodruff, "How Music Concepts Are Developed," Music Educators Journal 56 (February 1970):52.

along with conceptual development.[1] Bergethon and Boardman stress, however, that vocabulary will only be meaningful after the concept is learned. The same pattern applies when introducing musical notation.

> To the child who has still not grasped the basic concepts of melodic and rhythmic movement--up-down-same, step-skip, long-short, beat-accent--the symbols of musical notation can have little meaning. Just as the words in a child's first primer stand for ideas already possessed, so must notation picture musical concepts already formed.[2]

Because music is an aural art, perceptions are best achieved through hearing. The presentation of musical concepts without aural stimuli hinders perception and limits the extent to which concepts will develop within the learner.[3]

Internalization, the second stage of concept development, follows perception. During this period the perceptual symbols are changed into meaning. The mind organizes what has been received through the senses and fits the pieces together to make sense.[4] Carlsen describes this stage as the third component of the perceptual process, "the internal operation of labeling and organizing."[5]

The third stage of concept development is application - putting the new concept into practice.[6] Musical application involves listening to music or producing it.[7] At the application stage the child actively

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[1]Zimmerman, Musical Characteristics, p. 15; and Bergethon and Boardman, Musical Growth, 4th ed., p. 12.

[2]Bergethon and Boardman, Ibid.

[3]Woodruff, "Concept Teaching," pp. 219-220.

[4]Carlsen, "Some Problems," p. 9; and Woodruff, Ibid., p. 221.

[5]Carlsen, Ibid., p. 7.

[6]Woodruff, "Concept Teaching," p. 221. [7]Ibid., p. 222.

engages in various forms of performance, reaction, and discussion. Examplar activities are singing or playing tonal patterns of a song, clapping and chanting rhythmic patterns from a musical score, or listening to a recording and describing a particular musical characteristic heard in the music.

The Manhattanville Music Curriculum Project (MMCP) encourages original composition for applying concepts. In studying timbre, teachers might ask students to structure a one-minute sound event for contrasting timbres maintaining a given single expressive character or quality throughout the piece. Similar strategies could be devised for applying concepts pertinent to other musical elements.[1]

For effective conceptual application both the Comprehensive Music Project (CMP) and MMCP stress that the student should be involved as a musician. The roles/functions of the musician include those of creator, performer, and critic.[2] Teaching strategies at the application stage of conceptual development should foster decision making and student responsibility. These responses can be accomplished through the musicianly activities of composing, performing, conducting, listening, and evaluating.

Bruner believes that the structure of a stimulus affects perception and conceptualization.[3] He points out that the structure of any

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[1]Ronald B. Thomas, MMCP Synthesis (Bardonia, New York: Media Materials, Inc.).

[2]"Contemporary Music Project: Comprehensive Musicianship," Music Educators Journal 59 (May 1973):40; and Thomas, Ibid., p. 7.

[3]Bruner, Toward a Theory of Instruction, p. 2.

body of knowledge, ideas, or problem can be recognized by any learner if it is presented to him in a simple enough mode.[1] To illustrate this belief, Bruner suggests that there are three representational modes: enactive representation, iconic representation, and symbolic representation.[2]

Enactive representation involves action.[3] According to Boardman and Landis, children interacting with music through enactive representation

> Perform music by imitating what they hear
> Describe music with gesture or dance movement
> Organize music ideas through instrumental and vocal improvisation[4]

The second representational mode, iconic representation, involves imagery.[5] Boardman and Landis define this mode as "internalizing the concept by associating a mental image of sound with 'ikons' (visual images) that 'look like the music sounds.'" When children interact through iconic representation in music, they

> Perform music from ikons such as diagrams, charts, designs
> Describe music with visual images and word images
> Organize musical ideas; record them with ikons of own devising[6]

The third mode, symbolic representation, involves language, number, and logic.[7] In order to interact with symbolic representation in music, children

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[1]Ibid., p. 44. [2]Ibid., p. 10. [3]Ibid.

[4]Eunice Boardman and Beth Landis, Exploring Music, Grade 4, Teacher's Book, 3d ed. (New York: Holt, Rinehart and Winston, Inc., 1975), p. vii.

[5]Bruner, Ibid., pp. 10-11. [6]Boardman and Landis, Ibid., p. vii.

[7]Bruner, Ibid., pp. 18-19.

Perform music by turning musical symbols into sound
Describe music with musical symbols and conventional terminology
Organize musical ideas; record them in notation[1]

A learner may develop a concept through the stages of perception, internalization, and application.[2] An additional principle is that the development of a concept "is a long, slow process" and that the student must have repeated experiences over a long period of time in order to retain, refine, reuse, and transfer a concept.[3]

Woodruff believes that the first step in planning a concept lesson plan is to express the concept in the form of a clearly-defined statement. The conceptual statement describes in detail what the learner should know at the end of the learning experience.[4] Once the conceptual statement is written, the teacher can design the instruction to teach the concept. Examples of conceptual statements in music education materials are found in the Exploring Music series, the MMCP Synthesis, and Musical Growth in the Elementary School.[5]

According to the MMCP Synthesis, a balanced curriculum should provide for both inherent and idiomatic conceptual learning. Inherent concepts pertain primarily to the basic characteristic of musical materials and response patterns and derive from the inherent character of the art.[6] The following statements are examples of inherent concepts:

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[1]Boardman and Landis, Ibid. [2]Woodruff, Ibid., p. 223.

[3]Bergethon and Boardman, Musical Growth, 4th ed., p. 12.

[4]Woodruff, Basic Concepts in Teaching, p. 120.

[5]Boardman and Landis, Exploring Music; Thomas, MMCP Synthesis; Bergethon and Boardman, Musical Growth in the Elementary School.

[6]Thomas, MMCP Synthesis, p. 17.

"Timbre is a major factor in the expressiveness of music" and "Tempo is that characteristic of music which makes it appear to go fast or slow."[1] Concepts so derived have universal application and are not limited to the music of one culture, period, or style.

Idiomatic concepts relate to stylistic practices and compositional techniques employed by the composers of a given historical era. Examples of this type of concept would be the harmonic progressions expected in the music of the common practice period, form derived from harmonic and melodic analysis, or the use of the tone row as originally suggested by Schoenberg.

Conceptual understanding expands and become more complex as the child matures in age and musical experience. Mursell describes this characteristic below.

> What our understanding of growth and development clearly seems to imply is a cyclical sequence or order of topics. . . . Items that need to be presented do not occur once for all at some predetermined time. They appear again and again, always in new settings, always with added meanings.[2]

And according to Swanson,

> what may be encountered in a musical setting and on a level appropriate for second graders must be dealt with again by older pupils for broader as well as more precise application in different musical contexts.[3]

Bruner suggests the spiral curriculum as a means for revisiting basic ideas until the student has grasped their full formal structure.[4]

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[1]Ibid., p. 40. [2]Mursell, "Growth Processes," p. 157.

[3]Bessie R. Swanson, Music in the Education of Children, 3d ed. (Belmont, CA: Wadsworth Publishing Company, Inc., 1969), p. 24.

[4]Bruner, The Process of Education, p. 13.

The MMCP Synthesis demonstrates an example of the spiral curriculum in music. At the lowest spiral level concepts are stated in broad and simple terms. As the curriculum progresses through sixteen cycles or levels, however, each concept becomes more complex and specific.[1]

Bergethon and Boardman believe that too often musical learning moves in a circle rather than a spiral.

> Such experiences are stunting in their repetitiousness. The same problems may need to be returned to time and again, and the same skills must certainly continue to be practiced; however, like the spiral, the return must be to a position a little higher on the ladder toward musical understanding and achievement.[2]

Musical Concepts - Related Research

A review of research conducted in elementary music education revealed no studies in which conceptual learning was measured for all six of the musical elements identified for the present study. A number of studies have indirect implications for the present study, however, because of their investigation of musical perception and conceptualization among elementary school children. It appears that a majority of the research has been focused on measurement of perception and conceptualization related to the elements of pitch, duration (rhythm), and intensity (loudness). The tendency to study these elements may relate to their identification as three of the four basic characteristics of sound (the fourth being timbre).[3] Investigation of children's percepts and concepts of texture, structure (form), and timbre seems to have been

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[1]Thomas, MMCP Synthesis, p. 32.

[2]Bergethon and Boardman, Musical Growth, p. 12.

[3]"Contemporary Music Project: Comprehensive Musicianship," p. 39.

less frequent. This trend may be due to the fact that centration factors of intensity, duration, and pitch complicate their recognition, particularly for preschool and primary students.

The order in which children develop concepts about the musical elements has been observed by several researchers. Andrews and Diehl, Laverty, and Romanek found that the concept of loudness develops earlier than either pitch or duration.[1] Andrews and Diehl found that loudness concepts developed first, followed by duration and pitch.[2] Evidence concerning the order in which preschool children learn pitch and duration concepts is inconclusive in the Romanek study because the results were reversed in the pilot and formal studies.[3]

Zimmerman suggested that texture (simultaneous sounds or harmony) develops last because of the perceptual phenomenon of centration.[4] Piaget views centration as a perceptual fixation on a dominant or biasing aspect of the stimulus field.[5] In the case of music, the young child centers on one or more of the dominant elements (loudness, duration, or pitch) thereby ignoring texture. Zimmerman reported that studies with American, English, and French children show that harmonic perception

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[1]Frances W. Andrews and Ned C. Diehl, "Development of a Technique for Identifying Elementary School Children's Musical Concepts," Council for Research in Music Education, Bulletin 13 (Spring 1968):6; Grace Elizabeth Laverty, "The Development of Children's Concepts of Pitch, Duration, and Loudness As a Function of Grade Level" (Ed.D dissertation, The Pennsylvania State University, 1969), p. 46; and Romanek, "A Self-Instructional Program," p. 109.

[2]Andrews and Diehl, Ibid., p. 6.

[3]Romanek, Ibid., p. 95.

[4]Zimmerman, Ibid., p. 10.

[5]Zimmerman, "Percept and Concept," p. 49.

begins at about age eight.[1]

A characteristic observed by several researchers was that many children understand and can detect differences in basic musical concepts, but are unable to express their thoughts with verbal accuracy. Confusion is noted particularly between pitch and loudness concepts in using terms such as high, loud, and fast, and low, soft, and slow.[2]

The factor of age in the development of musical percepts was reported by a number of researchers. Petzold investigated auditory perception development of children in the first six grades. He hypothesized that age is a major factor in the development of auditory perception and investigated this in the areas of melodic perception, phrase learning, melodic reproduction with varying harmonies and timbres, and rhythmic ability. In most areas, the children reached an auditory perception plateau by age eight (third grade). The data revealed that the most significant development happens between the ages of six and seven (first and second grades).[3] Petzold noted, also, that auditory perceptual differences are greater between primary and intermediate groups than between any groups one or two years apart.[4] Zimmerman and Sechrest found

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[1]Zimmerman, Musical Characteristics, p. 10.

[2]Andrews and Diehl, "Development of a Technique," p. 7; Laverty, "The Development of Children's Concepts," p. 68; Marilyn Pflederer Zimmerman and Lee Sechrest, How Children Conceptually Organize Musical Sounds (Cooperative Research Project No. 5-0256, Northwestern University, 1968), cited in Zimmerman, Musical Characteristics, p. 19.

[3]Robert G. Petzold, Auditory Perception of Musical Sounds by Children in the First Six Grades (Cooperative Research Project No. 1051, The University of Wisconsin, 1966), p. 257.

[4]Robert G. Petzold, "The Development of Auditory Perception of Musical Sounds by Children in the First Six Grades," Journal of Research in Music Education 11 (Spring 1963):42.

that with increasing age children's performances improved on conservation tasks in four out of the five experiments tested.[1]

Andrews and Diehl studied fourth-grader's concepts of pitch, duration, and loudness through their Battery of Musical Concept Measures. Measurement of the concepts was accomplished through verbal, listening, manipulative, and overt techniques. The study was a pioneer study of children's conceptualization of musical elements and was motivated, in part, by the curricular movement related to the study of the structure of a subject.[2] The investigators believed that the Manipulative Measure and Overt Measure, which are administered on an individual basis, have particular possibilities for use with children having language and/or reading problems or with younger children who have not yet learned to read.[3]

In an extension of the study, Laverty found a significant gain in scoring on pitch and duration for fifth-graders over third-graders and seventh-graders over fifth-grade students.[4] A significant gain was noted in loudness from third to fifth-grade but not from fifth to seventh, indicating that a plateau in loudness is reached around the fifth-grade level.[5] A progressive gain between grade levels was made in the

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[1]Marilyn Pflederer Zimmerman and Lee Sechrest, "Brief Focused Instruction and Musical Concepts," Journal of Research in Music Education 18 (Spring 1970):29.

[2]Andrews and Diehl, "Development of a Technique," p. 1.

[3]Ibid., p. 6.

[4]Laverty, "The Development of Children's Concepts," p. 44.

[5]Ibid.

listening and verbal measures for all three elements.[1]

Melodic, rhythmic, and harmonic capabilities of children in grades one through six were investigated by Dittemore. Results of the study suggested that many capabilities in the three areas are found in average students at different grade levels, that concurrent development of some musical capabilities occur for children at specific grade levels, and that capability levels and developmental sequences are related to musical aptitude. Consistent development sequence in seven of the twelve measured capabilities was found among students in the average and upper musical aptitude levels. The investigator concluded that the average level of musical capability development of students with low musical aptitude does not rise much above that of the average first-grade student.[2]

In a related study, DeYarman observed the rhythmic and tonal capabilities of kindergarten and first-grade children. The investigator utilized some of Dittemore's research techniques, such as teaching the same criterion songs to subjects at both grade levels, using the children's musical performances of the criterion songs to measure their achievement, and objectively evaluating the performances on the basis of well-defined criteria.[3] Results indicated that children who had

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[1]Ibid., pp. 66-67.

[2]Edgar E. Dittemore, "An Investigation of Some Musical Capabilities of Elementary School Children," Experimental Research in the Psychology of Music, Edwin Gordon, ed., 6 (Iowa City, IA: University of Iowa Press, 1970):30-31.

[3]Robert M. DeYarman, "An Experimental Analysis of Rhythmic and Tonal Capabilities of Kindergarten and First Grade Children," Experimental Research in the Psychology of Music, Edwin Gordon, ed., 8 (Iowa City, IA: University of Iowa Press, 1972):6.

comprehensive meter and tonal exposure generally performed better on the tonal and usual meter criterion songs than did those who had been exposed only to usual meter and tonal experiences.[1]

In a study relating the conservation principle of Piaget to cognitive development in music, Pflederer devised a series of musical tasks to determine if five- and eight-year-old children could conserve meter, tone, and rhythm stimuli.[2] Results of the study showed that the eight-year-old children were at an intermediate stage of conservation. The five-year-old subjects, however, gave intuitive-type answers reflecting preoperational thought and the inability to conserve.[3]

Zimmerman and Sechrest investigated the conservation responses to musical stimuli of five, seven, nine, and thirteen-year-old children. Subjects were presented phrases selected from Bartok's piano music For Children which were paired with seven systematic deformations to test the presence of conservation. Conservation was identified as early as age seven and states of non-conservation and intermediate conservation ("the deformation was recognized but with uncertainty as to the 'sameness' of the two phrases") were found still to exist in the thirteen-year-old age bracket.[4]

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[1]DeYarman, Ibid., p. 32.

[2]Marilyn Ruth Pflederer, "The Responses of Children to Musical Tasks Embodying Piaget's Principle of Conservation" (Ed.D. dissertation, University of Illinois, 1963), p. 2.

[3]Ibid., p. 195.

[4]Marilyn Pflederer Zimmerman and Lee Sechrest, "Conservation-Type Responses of Children to Musical Stimuli," Council for Research in Music Education, Bulletin 13 (Spring 1968):20-31.

Jones studied the development of meter conceptualization in children using musical tasks based on Piaget's theory of the child's conception of time. Analysis of the subject's responses gave support to Piaget's theory that the child's concept of time develops through three invariant stages.[1] The meter concept task required the subject to identify the basic meter (either two or three beats per measure) of twelve rhythmic patterns and to explain his responses.[2] Subjects in the first stage (ages up to seven) generally were unable to explain their responses. Most of those in the second stage (seven to nine) gave perceptual-type explanations, indicating confusion between the number of notes in the measure and the meter. During the third stage (beginning at about age nine) most explanations were more logical, even though more than two-thirds of the group were unable to accrue perfect scores for the task.[3] Jones believed that the children's explanations showed that the meter concept develops in children after the age of 9½.[4]

Basic listening skills of eight- and nine-year-old children were investigated by Boekelheide. Results of the study showed that the students with higher achievement levels in reading and other areas of the curriculum, as well as intelligence, have acquired the basic listening skills. The data showed this to be true, particularly for listening skills related to melodic contour, form, and pitch discrimination. The investigator concluded that development of basic listening skills

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[1]Russel L. Jones, "The Development of the Child's Conception of Meter in Music," Journal of Research in Music Education 24 (Fall 1976):142.

[2]Ibid., p. 148. [3]Ibid., p. 152. [4]Ibid., pp. 142, 152.

parallel the child's development in other curricular areas. Results of the study indicate that rhythmic response, phrase discrimination, and pitch discrimination skills were more highly developed than those of melodic contour and form. The highest mean score was demonstrated for the listening skill of rhythmic response, the lowest in the identification of form.[1]

Zemke investigated the effects of a Kodaly-adapted curriculum as compared to a more traditional approach on auditory achievement in fourth-grade students. Thirty-five lessons, planned differently for each approach, were given to experimental (Kodaly) and control (traditional) classes. An additional class which received no special music training was included for comparison purposes. Results showed that some degree of support existed for the hypothesis that the Kodaly-adapted sequence led to greater gains in the development of auditory abilities than those achieved by more typically-oriented approaches.[2]

An investigation of the effectiveness of two approaches for teaching rhythm reading to fourth graders was conducted by Palmer.[3] Two instructional programs were designed by the investigator, one based on

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[1]Viola Ethel Boekelheide, "Some Techniques of Assessing Certain Basic Music Listening Skills of Eight and Nine Year Olds" (Ed.D dissertation, Stanford University, 1960), cited in Dissertation Abstracts, 21/10/3111-A.

[2]Sister Lorna Zemke, "The Kodaly Method and a Comparison of the Effects of a Kodaly-Adapted Music Instruction Sequence and a More Typical Sequence on Auditory Musical Achievement in Fourth Grade Students" (D.M.A. dissertation, University of Southern California, 1973), p. 304.

[3]Mary Palmer, "Relative Effectiveness of Two Approaches to Rhythm Reading for Fourth-Grade Students," Journal of Research in Music Education 24 (Fall 1976):110.

Richards' Threshold to Music and the other derived from Gordon's approach to rhythmic literacy as described in The Psychology of Music Teaching. Each instructional program was taught to two classes by the investigator. In addition to the four experimental classes, two control classes received no special music instruction. Results of the study indicated that while the Gordon approach was statistically more effective, the total data did not clearly show one method to be superior to the other in terms of student achievement.[1]

In an effort to measure musical concept development in fourth and fifth graders according to the CMP philosophy, Pignolet designed tests which were criterion-referenced to stated behavioral objectives. Results of four items reported by the investigator disclosed substantial progress between pre- and posttest administrations for students at both grade levels. The test items included tasks requiring the musicianly functions of listening, score analysis, discussion of musical styles, composing, and performing. Musical elements of rhythm, pitch (melody and tonality), harmony, texture, and style were encountered by the students in the reported sample items.[2]

Individualized Instruction

The terms "open education" and "individualization" are commonly used by the educators of today's children and youth. According to Hillson,

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[1] Ibid., p. 117.

[2] "Contemporary Music Project: Comprehensive Musicianship," p. 41.

> open education is a concept; it has to do with the setting as well as with procedures and processes. Open education means . . . both a philosophy and environment that can elicit each child's potential.[1]

The open education movement brought a variety of changes to the school curriculum. Among those changes was a shift from teaching to learning - learning which takes into account the differences, needs, and interests of individual students.

Individualization is one of the instructional types used in open education. Zahorik offers the following definition of individualization:

> Individualization deals with individuality. Its purpose is to recognize, enhance and develop individuality. It is to help individual children to grow in individual ways, to become what they might become, to extend their vision and promise. The goal of individualization is to make unique persons more unique.[2]

The need for individualization in professional teacher education was recognized by Task Group II in their recommendation for the document entitled Teacher Education in Music: Final Report. The report suggested that needs, competencies, and professional aspirations of the student be considered when planning individual programs. Projected, also, was the thought that both student and faculty time can be saved by waiving required courses in which the student is able to demonstrate competence.[3]

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[1]Maurie Hillson, "Forces for Change," Individualized Instruction in Music, comp. by Eunice Boardman Meske and Carroll Rinehart for the National Commission on Instruction (Reston, VA: Music Educators National Conference, 1975), p. 5.

[2]John A. Zahorik, "Individual Instruction and Group Instruction: A Case Study," The Journal of Educational Research 62 (July-August 1969): 453-455.

[3]"Task Group II: Recommendations for Critically Needed Changes in Teacher Education," Teacher Education in Music: Final Report, by Robert Klotman, Chairman, Commission on Teacher Education (Washington: Music Educators National Conference, 1972), p. 11.

Planning instruction for individual learners requires role changes for the traditionally-oriented teacher. Lathrop sees the music educator "primarily as a facilitator of student learning," one whose responsibility is "to organize effective music learning experiences, to motivate students to want to make music a part of their lives, and to serve as a diagnostician and critic of student musical efforts."[1]

Colwell also offers insight about the teacher's role in the open school. "Here materials do much of the teaching; the teacher is a resource, one who helps students who have problems rather than one who keeps the class together in activities that he hopes will result in learning."[2]

Inherent in the teacher's responsibility is the organization of instruction. Kahnert summarizes the essential components with which the teacher must deal in planning for individualized instruction.

> (a) Content analysis and selection; (b) identification of concepts, skills, and attitudes to be developed in the individual program; (c) a statement of objectives in terms of student performance; (d) the development of a variety of instructional approaches; (e) establishment of criterion levels of performance; (f) and the provisions for feedback, evaluation, and revision.[3]

A more extensive list for the development of an individualized instructional system is submitted by Frantz and McConeghy. Their list includes

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[1]Robert L. Lathrop, "The Psychology of Music and Music Education," Music Educators Journal 56 (February 1970):47.

[2]Richard Colwell, "Industry Goes to School: Performance Contracting," Music Educators Journal 59 (September 1972):58.

[3]Kahnert, "An Investigation of the Effect of Individualized Instruction and Materials," pp. 26-27.

> 1. Selecting the instructional content for adoption to an individualized instructional system. 2. Specifying course objectives in behavioral terms that describe what the learner must be able to do, the conditions under which the student operates, and the minimum standard of achievement. 3. Developing learning sequences that describe the learning paths students can travel in order to obtain each course objective. 4. Identify and selecting a variety of instructional media (programed instruction, videotape recordings, closed-loop films, etc.) suitable for individualized instructional approach. 5. Developing instructional materials as required to supplement those materials readily available. 6. Preparing evaluative instruments and procedures that diagnose and monitor individual progress through the learning sequences.[1]

Andress and Rinehart developed a design-for-learning model to be considered when planning individualized instruction for the music class. The design includes a study of the common elements perceived in terms of musical structure and context, and realized through study of musical styles by becoming involved in the process of creating, performing, and describing music. The design also includes concern for how the learner learns, his level of learning, his commitment to music, and the opportunities provided for his involvement in the process of learning about music.[2] An accompanying flow chart and sample contracts illustrate the implementation of the design within a music program.[3]

Most self-instructional materials, sometimes called learning packages, are teacher-constructed models. Ubben lists the characteristic components of learning packages with which he is familiar:

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[1]Nevin R. Frantz, Jr. and Gary L. McConeghy, "Individualized Instructional Systems for Industrial Education," Audiovisual Instruction 17 (February 1972):20.

[2]Barbara Andress and Carrol Rinehart, "A Design for Learning," in Individualized Instruction in Music," comp. by Meske and Rinehart, pp. 38-39.

[3]Ibid., pp. 40-43.

> Each is a set of teaching-learning materials. Each package focuses on a major learnable idea, skill, or attitude. Objectives are clearly stated in behavioral terms, shifting the emphasis for performance from the instructor to the learner. Each package relies heavily on the use of learning resources which can be student operated, allowing the student to obtain information and direction without the constant attention of the teacher. Each package attempts to use a variety of media components to provide variation in instructional modes. Each package has student evaluative devices including pretests, student selftests and posttests.[1]

A description of the Learning Activity Package (LAP) is provided by Howard.[2] Each LAP has a number of options from which the learner may choose, such as learning lists, audio-visual approaches, or experimentary-manipulative activities. Included in the components are clearly-formulated statements that convey to the learner what is to be accomplished and why it may be valuable to learn the material. At the conclusion of the LAP the student's learning may be evaluated by an assigned paper, project, or a test. A conference with the teacher is usually designed so that the student, in view of the achievement results, decides on one of the following options: "(1) to cycle himself back through some of the learning activities to improve his achievement level, (2) accept a depth option, (3) accept a quest option, or (4) proceed to another unit in the sequence."[3]

Musical subject matter which can be included in LAPs is virtually limitless, according to Landon. He suggests subjects such as

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[1]Gerald C. Ubben, "A Look at Nongradedness and Self-Paced Learning," Audiovisual Instruction 15 (February 1970):31-32.

[2]Eugene R. Howard, "Developing Sequential Learning Materials," The Bulletin of the National Association of Secondary School Principals 54 (May 1970):165-166.

[3]Ibid., p. 167.

> introducing a new instrument, learning to construct or work with melody or rhythm patterns; decoding music symbols (music reading); composing music by various techniques; performing experiments with music sounds; learning a new technique for playing an instrument; listening analytically and critically to unfamiliar music; introducing alternative methods of achieving the same result; and researching a given topic in music.[1]

A self-instructional teaching model similar to the LAP is called UNIPAC. Johnson reported the use of UNIPACS with students in middle school music classes. The UNIPAC format is sequentially developed and activity oriented. According to Johnson, the first in a series of UNIPACS is worked through large-group instruction to demonstrate the instructional mechanics. Following this, students proceed at their own pace, individually or in small groups. Students who complete the series rapidly may become assistant teachers or develop activities of their own.[2]

In some classes, the instructional assignment is formulated as a contract between the student and teacher. Kopp and Zufelt depict the contract as a written statement about the assignment which may clarify the assigned learning task and serve as a reference should a misunderstanding occur.[3]

Use of the contract system in eighth-grade music classes was reported by Peotter. According to the author, students work on the

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[1]Joseph W. Landon, "Strategies for Opening the Traditional Classroom," pp. 67-68.

[2]Diana M. Johnson, "Individualizing Instruction Through the Use of UNIPACS," in Individualized Instruction in Music, comp. by Meske and Rinehart, p. 145.

[3]O. W. Kopp and David L. Zufelt, Personalized Curriculum: Method and Design (Columbus, OH: Charles E. Merrill Publishing Company, 1971), p. 58.

contract system during one of the two forty-minute music classes each week. The contract states the nature of the work to be done and the amount of time to be allowed for completion, with a maximum of eight weeks. During the contract period, student tasks may include library research, taping, listening to recordings, drawing, or practicing. At the conclusion of each class period the students are asked to record a few brief thoughts about what they have accomplished. From time to time a contract day is designated for the presentation of finished work to the class.[1]

A contract system is used to facilitate practical experiences in the elementary music education methods classes at the University of Oklahoma. Core and optional experiences are designed to help the student develop musicianship and teaching effectiveness. Core experiences are required of all students. Individualization is provided by allowing the student to design the balance of his contract by choosing from the optional experiences.[2]

A rich variety of resources should be available to the learner, according to Eichmann. Among the types of resources suggested are technological, musical, environmental, electronic, and human.[3] Many of the resources mentioned are commonly used by the music educator. Other

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[1]Jean Peotter, "Contracts," Music Educators Journal 61 (February 1975):46-49.

[2]Harry W. Fierbaugh, "An Introduction to Elementary Music Education," course syllabus, The University of Oklahoma, 1979. (Mimeographed.)

[3]Paul Eichmann, "Resources for Learning," in Individualized Instruction in Music, comp. by Meske and Rinehart, pp. 64-81.

sources already available in the school may be adaptable to music instruction, such as the Tutorgram and Language Master (or commercial equivalents).[1] Because a great amount and variety of sounds occur in the open classroom, Cornell believes that equipment with earphones should be given top priority.[2] In an unusual preview of music education in the twenty-first century, Shetler describes music learning utilizing technology already available though not commonly used in the public schools.[3]

The increasing importance of the learning or resource center, also known as the Instructional Media Center (IMC), is reported by several authors. Ragan, Wilson, and Ragan note that the IMC houses various types of hardware (audiovisual equipment) and software (instructional materials), a collection of media which is used to accommodate the students' varying learning styles.[4]

A music education equivalent to the IMC is the music laboratory. The efficacy of providing music instruction in a laboratory situation was discussed during the 1972 Biennial Convention of the Music Educators National Conference. To some participating music educators, the laboratory provided an environment for student exploration using a variety of equipment including musical instruments, resource materials, electronic

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[1]Ibid., pp. 68-69. [2]Cornell, "Drums and Dumpsters," p. 61.

[3]Donald J. Shelter, "This Trip Was Really Necessary," in Music Education for Tomorrow's Society: Selected Topics, ed. Arthur Motycka (Jamestown, RI: GAMT Music Press, 1976), pp. 36-38.

[4]William B. Ragan, John H. Wilson, and Tillman J. Ragan, Teaching in the New Elementary School (New York: Holt, Rinehart and Winston, Inc., 1972), p. 261.

equipment, and sound-producing objects. Others viewed the laboratory as a means for improving and individualizing the teaching of traditional content and as an aid in the development of music skills. A third view was that a combination of the two ideas is appropriate.[1]

Several types of music laboratories being used in elementary schools were reported by the participants. One type is located in a permanent location while another type consists of equipment assembled on a cart which the music instructor moves from classroom to classroom. A third type exists where the music teacher brings the equipment to a classroom and initiates activities which the children continue beyond the limits of the designated music period.[2]

The MMCP philosophy sees the Music Lab as

> an educational environment created to allow and motivate intrinsic involvement, personal growth, and musical insight. It is a learning atmosphere where creativity . . . , judgment making . . . , personal viewpoints . . . ; . . . music and sincerity are respected, and where the logic of discovery is considered far more important than the logic of the discovered.[3]

While in the Music Lab, the students play the musician's role on the level of the student's own capabilities.[4] Types of musical activities suggested for the Music Lab include MMCP strategies, student recitals, listening to recordings, research and oral reports, guest recitals, singing, and skill development.[5]

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[1]Ralph E. Verrastro, "New Learning Environments," descriptive report of the National Commission on Instruction sponsored session on the Music Laboratory during the MENC Biennial Convention, March 10, 1972, Atlanta, Georgia. (Mimeographed.)

[2]Ibid. [3]Thomas, MMCP Synthesis, p. 23. [4]Ibid.

[5]Ibid., pp. 24-25.

A learning laboratory containing thirty individual studio-stations for fourth, fifth, and sixth-grade general music classes was designed and implemented by Moore.[1] Planned for the thirty-minute music period, the class begins and ends with large-group instructional activities. During the interim the students move, according to a thirty-day rotating schedule, to studio-stations within the classroom.[2] There they use job-cards, coded to behavioral goals, to accomplish the self-instructional assignments. The studios contain a variety of manipulative activities, including some which involve sound sources and others with learning tasks of a nonsound nature.[3] Evaluation procedures include teacher-devised criterion-referenced assessments, self-check assessments built into the job-cards, and the constant process of teacher observation and evaluation.[4]

Existing music programs which incorporate principles of individualized instruction at the elementary school level were reported by Ackerman, Myers, Ravine, Reichgut, Rukasin, Scranton, Springer, and Walczak. Roloff and Thiebe described middle school and junior high level programs.[5] In some cases, the programs exist in open schools where

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[1]Floy S. Moore, Individual Studio-Stations in the General Music Class (Portland, OR: Sumar Publications, 1974).

[2]Ibid., pp. 1-2. [3]Moore, "Today I Go to Studio K," pp. 59-60.

[4]Moore, Individual Studio-Stations, p. 16.

[5]Susan A. Ackerman, "Individually Guided Education in Music;" Carol Underkoffler Myers, "The Mix-Match and Unscrambling of Music, Methods, Students, and Classroom;" Frances Redding Ravine, "Flexibility: The Key to Individualizing Music Instruction;" Carol Reichgut, "Children Develop Musical Concepts Through a Music Center;" Kay Rukasin, "Learning Centers: An Approach to Music in the Open Space School;" T. J. Scranton,

individualized instruction in music is an integral part of the educational philosophy while in other situations, the school is conventionally organized with individualization implemented within the music class. Nearly all the writers indicate that instruction is conducted in a music laboratory environment. Most of the settings include learning centers for individual or small-group work and some labs have auxilliary rooms for practice or work requiring sound control. Some schools have flexible schedules with changing numbers of students while others have fairly uniform schedules and class populations. The majority report that music classes meet twice-weekly with extra sessions designated for band, choir, recorder club, guitar classes, and piano lessons. In several situations, music instruction is part of an arts-team approach.

Programed Instruction - Related Literature

Credit for the upsurge of interest in programed instruction is generally given to B. F. Skinner. In 1954 Skinner began investigations with teaching machines in an attempt to generalize to education what he had learned about operant conditioning in the laboratory. Skinner believed that the teaching machine and its materials, called programs, could increase instructional efficiency. Two particular advantages seem to be offered by the teaching machine: (1) an investigator who has determined the lesson content through empirical research may be more

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"An Individualized Music Program in a Developmental Open Space School;" Virginia F. Springer, "A Music Program in a Nontraditional Setting;" Deanna Oilschlager Walczak, "Organizing a Music Program in a Continuous Progress School;" Maureen Boyce Roloff, "Music Where He's At;" and Edward H. Thiebe, "An Environment for Individual Music Learning" in Individualized Instruction in Music, comp. Meske and Rinehart, pp. 112-160.

skilled in planning instructional order and presentation rate than the teacher, and (2) reinforcement is possible with machine (or programed) teaching but not with conventional instruction "because the teacher cannot be with every child in a class at once."[1]

Programed instruction is described by Carlsen as "the learning procedure by which a student may pursue the acquisition of knowledge or skills at his own best learning pace with minimal if any assistance from a teacher."[2]

Fowler defines programed instruction as

> a self-instructional approach that presents an ordered sequence of informational units to the student, requires an overt or covert response to each unit of information, and provides immediate confirmation of the response, whether correct or incorrect.

Should a response be incorrect, Fowler points out, the student is usually asked to repeat the material or proceed to some remedial material until the responses given indicate an understanding of the topic. The pupil is involved in continual response and learning reinforcement is provided by immediate confirmation of answers. All of these factors make the instructional program self-pacing.[3]

Concomitant with recognizing the need for individualizing instruction was recognition of the need for behavioral objectives or goals to

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[1]Ernest R. Hilgard and Gordon H. Bower, "Skinner's Operant Conditioning" in Theories of Learning, 4th ed. (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1975), p. 232.

[2]James C. Carlsen, "The Role of Programmed Instruction in the Development of Musical Skills" in Comprehensive Musicianship: The Foundation for College Education in Music (Washington: Contemporary Music Project/Music Educators National Conference, 1965), p. 29.

[3]Charles B. Fowler, ed., Introductory statement to "A Funny Thing Happened on the Way to Market," by Jerome P. Lysaught, Music Educators Journal 57 (January 1971):55.

meet these individual needs. Carlsen believes that the "demand to identify learning goals in objective terms of behavior" and "the formulation of processes of behavior shaping" have contributed to the evolution of the programed teaching technique.[1]

Support for the importance of behavioral objectives is given by other writers. Popham states that

> without question the most important instructional advance in America during the 1960's was a widespread advocacy and use of measurable instructional objectives.
>
> In spite of certain educator's advocacy of behavioral objectives during earlier eras, it took the enthusiasm of the programmed instruction devotees to really get people talking about measurable goals.[2]

Music educators, too, have pointed out the value of behavioral objectives. For example, Kapfer writes

> unless music teachers understand and appreciate the value of behavioral objectives in music education, the ultimate goal of the behavioral approach - the improvement and individualization of learning opportunities for the student - will not be realized.[3]

Bergethon and Boardman advocate behavioral objectives formulated in statements which "describe the behaviors by which children may demonstrate their understanding of a particular musical concept or their ability to perform a specific musical skill."[4]

Well-written behavioral objectives contain a number of basic elements, according to Regelski. These elements include (1) what materials,

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[1]Carlsen, "The Role of Programmed Instruction," p. 29.

[2]W. James Popham, The Uses of Instructional Objectives: A Personal Perspective (Belmont, CA: Fearon Publishers, 1973), p. 3.

[3]Miriam B. Kapfer, "The Evolution of Musical Objectives," Music Educators Journal 56 (February 1970):63.

[4]Bergethon and Boardman, Musical Growth, p. 211.

media, and other limitations or guidelines will be given, (2) who will be affected by the instruction, (3) covert behavior, (4) content, and (5) overt behavior (the major sources of evaluation). Two optional elements are (6) level of proficiency (if any is to be specified) and (7) time limitation (if any is relevant).[1]

Carlsen describes two basic approaches used by writers to incorporate logical sequence into programed materials. One approach is achieved through experimentation, as was used for the present study. The process includes the establishment of learning objectives, ordering the material to achieve the objectives, observing a subject's behavior while using materials, revision based on the subject's reactions, and sufficient repetitions of this cycle "to produce a program that has a sequence which accommodates students' needs."[2] Thus the sequence estimated to be logical by the programer at the onset is transformed to a sequence based on logic of the students.

The second approach to sequencing presents the end task to the student at the beginning but requires his response to only part of the task, a part "that will be obvious and one that he will be capable of performing."[3] From there a process of backward chaining leads him through progressive tasks to achieve the end objective.

A number of issues are viewed as important in the designing of programed instruction by Skinner. These issues are listed below.

(1) Get a clear, detailed, objective specification of what it means

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[1]Thomas A. Regelski, Principles and Problems of Music Education (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1975), pp. 246-248.

[2]Carlsen, "The Role of Programmed Instruction," p. 30. [3]Ibid.

to "know" the given subject matter;
(2) write a series of "stimulus" (question) - "response" (answer) frames which expose the student to the material in graded steps of increasing difficulty, frequently restating the same fact from many different angles;
(3) require that the learner be active--for example, require that a response be composed for each frame in the program;
(4) provide immediate feedback for each response (answer);
(5) try to so arrange the questions that the correct response is very likely to occur and be reinforced; thus learning is not always accompanied by punishing consequences;
(6) let each student proceed through the teaching program at his own pace; and
(7) provide plenty of backup reinforcers (praise, candy, wages) for diligent and effective work on the program.[1]

Potential contributions of programed instruction to music education were recognized by music educators in the 1960's. One example is found in the report of the Tanglewood Symposium committee on "The Impact and Potentials of Technology."[2] A second example is the "Task Force Group 1 (Instrumental Report)," National Conference on the Uses of Educational Media in the Teaching of Music. In this report, Andrews writes that programed learning "can be used best in terms of transmitting musical knowledge and in developing skills. It must include the audio dimension."[3]

Dallin predicted that programed instruction would play an increasingly important role in musical training. According to Dallin, "the programed instructional materials currently available and those in research and development stages suggest that music education is on the

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[1]Hilgard and Bower, Theories of Learning, pp. 232-233.

[2]Allen P. Britton, chr., "Impact and Potentials of Technology" committee report, Documentary Report of the Tanglewood Symposium, p. 124.

[3]Frances M. Andrews, "Task Force Group 1 (Instrumental) Report," National Conference on the Uses of Educational Media in the Teaching of Music, Edward Maltzman, Project Director (Washington: U.S. Office of Education and Music Educators National Conference, 1965), p. 192.

threshold of a new era.[1]

Programed Instruction - Related Research

A number of examples describing the use of programed instruction in music education are described in the pages which follow. The reader will notice that a variety of adaptations have been made to programing in music. The majority of research seems to have been done in the area of music theory and most of the publications appear to have been in the format of programed instructional books. However, an increasing number of investigators have incorporated aural and dextrous dimensions into the programed format. The first example represents, perhaps, the most sophisticated extension of programed instruction yet to be developed.

The Tanglewood Symposium Technology committee report reflected the view that the computer offered the greatest potential of all tools and technologies reviewed by the group.[2] Included in the description of the computer's potential was that of computer-assisted instruction.[3] This potential has become a reality for music education, as shown in the description which follows.

Computer-assisted instruction is an example of how programed instruction can be combined with technology to deal with the divergent learning needs of children. The adaptation of PLATO, a computer-instructional system developed at the University of Illinois, to the

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[1]Leon Dallin, "Music Educators Should Get With the Program," Music Educators Journal 55 (March 1969):107.

[2]Britton, "Impact and Potentials," p. 124.

[3]Ibid., p. 125.

teaching of music was described by Hair.[1] PLATO consists of a computer (located in a university computer center), a terminal (typewriter and videoscreen located in a school), and a telephone. The user telephones the computer for the terminal and types a request for the desired music lesson. According to the author, PLATO music lessons can be used for instruction "based on drills, a simulated laboratory experience, a tutorial sequence, or a game situation."[2]

Several devices attached to the terminal enhance the effectiveness of PLATO. Audio mechanisms allow the learner to hear the sounds of recorded music or a scale or interval he is investigating. Visual capacities include both moving and stationary pictures, such as staff notation, stringed instrument fingerboards, keyboards, and moving sound waves. A special feature is the touch-sensitive viewing screen which allows the learner to register responses which otherwise would be impossible because of language or physical limitations.[3]

Regelski utilizes a programed text to present music education principles and problems to university students. The text utilizes the branching technique of programed instruction. Topic presentations are followed by frames in which questions and answers about the topic are pursued.[4]

According to Carlsen, research in programed instruction has led to the development of materials for three types of musical skill

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[1]Harriet I. Hair, "PLATO Said My Answer Was Terrific!," Music Educators Journal 63 (January 1977):55.

[2]Ibid. [3]Ibid.

[4]Regelski, Principles and Problems.

development. One type (Symbol-Verbal Facility) requires only visual reference such as provided in a programed book.[1] Examples of this type can be seen in the fundamentals-of-music-type texts written by such authors as Clough,[2] Harder,[3] Martin,[4] Barnes,[5] and Andrews and Wardian,[6] to name a few. Martin's text utilizes the branching technique while the others are based on linear programing. The Barnes text, as well as that by Andrews and Wardian, extends beyond the visual parameter of encouraging the student to use the keyboard as an adjunct to the book.[7]

A second type of musical skill development requires kinesthetic responses, according to Carlsen.[8] Woelflin used visual feedback (pictures) in teaching clarinet fingerings through programed instruction.[9] Kanable utilized aural comparison as a feedback technique for sight singing instruction. This approach requires the learner to compare his own taped

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[1]Carlsen, "The Role of Programmed Instruction," p. 31.

[2]John Clough, Scales, Intervals, Keys and Triads: A Self-Instruction Program (New York: W. W. Norton, 1964).

[3]Paul Harder, Basic Materials in Music Theory: A Programed Course, 3d ed. (Boston: Allyn and Bacon, Inc., 1975).

[4]Gary M. Martin, Basic Concepts in Music (Belmont, CA: Wadsworth Publishing Company, 1966).

[5]Robert A. Barnes, Fundamentals of Music: A Program for Self-Instruction (New York: McGraw-Hill Book Company, 1964).

[6]J. Austin Andrews and Jeanne Foster Wardian, Introduction to Music Fundamentals: A Programmed Textbook for the Elementary Classroom Teacher, rev. ed. (New York: Appleton-Century-Crofts, 1969).

[7]Carlsen, "The Role of Programmed Instruction," p. 32.

[8]Ibid.

[9]Leslie E. Woelflin, "Teaching Clarinet Fingerings with Teaching Machines," Journal of Research in Music Education 12 (Winter 1964):287.

response with that of a model on the programed tape.[1]

Carlsen notes the inherent limitations in teaching the above-described kinesthetic skills via programed instruction. Visual feedback shows the correct clarinet fingerings, but does not insure precise kinesthetic refinement such as completely closing the holes. The aural-comparison approach for sight singing is limited by the assumption that the learner can accurately compare his response with the taped model.[2]

Another example which uses kinesthetic response is a "performance reading device" from which the student receives instant feedback as to the accuracy of his performance. Ihrke developed a rhythm training machine utilizing a keyboard and magnetic tape player. In operation, the student reads and performs a given rhythm pattern. His performance is compared with a pre-recorded tape by a sensing device which activates signal lights whenever the student makes an error.[3] Maltzman's work showed that incorrect responses can also be eliminated with such a device.[4] Equipment such as reported by Ihrke and Maltzman was in research development at the time of Carlsen's report.[5] A similar system, developed by Shrader, exists on the educational market today and is being used by many public

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[1]Betty M. Kanable, "An Experimental Study Comparing Programed Instruction with Classroom Teaching of Sight Singing" (Ph.D. dissertation, Northwestern University, 1964).

[2]Carlsen, "The Role of Programmed Instruction," p. 32.

[3]Walter Ihrke, "Automated Music Training," Council for Research in Music Education, Bulletin 2 (Winter 1964):6.

[4]Edward Maltzman, "An Investigation of Key-Tone Matching with Children and Adults" (Ed.D. dissertation, Boston University, 1964).

[5]Carlsen, Ibid., p. 33.

schools and universities.[1]

The third type of skill development for which programed instruction has been utilized is the cognitive ability to relate sound and symbol.[2] This type, to which the present study relates, incorporates a book and prepared tape. Much of the musical research utilizing this combination of media has related to the study of sight singing and ear training. In some cases, the musical elements are treated in isolation, while in others, the elements are treated within the musical context.[3]

Spohn reported an investigation in which self-study programed materials were used for developing aural skills of freshman students in a fundamental of music course at the Ohio State University. In the study, isolated intervals, tone groups, and rhythmic units were recorded on tape. After listening, the student recorded his response on a worksheet. A delayed correct response was provided on the tape accompanied by a second playing of the stimulus.[4] Results of the study showed that self-presentation methods can be used to improve the ability to identify both melodic and harmonic intervals and that the use of this method for interval reading provides for greater instructional flexibility in utilizing allotted class time.[5]

Research conducted by Carlsen used the musical context approach

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[1]TAP Rhythmic Sightreading System, Bellevue, WN: Temporal Acuity Products, Inc.

[2]Carlsen, Ibid. [3]Ibid.

[4]Charles L. Spohn, "Programming the Basic Materials of Music for Self-Instructional Development of Aural Skills," Journal of Research in Music Education 11 (Fall 1963):93-97.

[5]Ibid., p. 96.

for teaching melodic dictation. Carlsen's program included the use of verbal cues which allow a larger step size from frame to frame. This is possible, he believes, because the verbal cues extend beyond simple stimulus-response presentation and help the student to generalize on the basis of previous knowledge.[1]

A study by Costanza utilized the musical context approach to develop and evaluate programed materials for teaching melodic and harmonic score reading skills to college music and music education majors. Representative musical examples from the baroque through the contemporary periods were performed by brass and woodwind quartets on a tape. The musical score for each example was included in the programed materials and the subjects were asked to detect whether the performance of a musical example conformed to the printed score.[2] Results led the investigator to conclude that score reading skills can be taught effectively by programed instruction using aural and visual materials.[3]

Michalski designed and evaluated a visual-aural program for developing conceptual understanding of the basic elements of music in college elementary education majors. Content of the program and the investigator-designed test consisted of both verbal information and aural items performed on a variety of instruments. Pilot tests were conducted and

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[1]James C. Carlsen, "An Investigation of Programmed Learning in Melodic Dictation by Means of a Teaching Machine Using a Branching Technique of Programming" (Ph.D. dissertation, Northwestern University, 1962).

[2]Anthony Peter Costanza, "The Development and Evaluation of Programed Instruction in Score Reading Skills" (Ed.D. dissertation, The Pennsylvania State University, 1968).

[3]Ibid., pp. 85-87.

several revisions were made prior to the formal study. Michalski concluded that conceptual understanding of the basic elements of music can be effectively taught by programed instruction utilizing both verbal and aural materials.[1]

Taped programed materials for teaching music fundamentals to seventh graders were developed and evaluated by Owen. Content of the programs included pitch and rhythm fundamentals, reading notation, and hearing. The behavioral modes of writing, tapping, singing, and speaking were used in the learning process. Programs for the five-week experiment were based on the concept of foreign language audio-lingual drill. The students worked with the programs in a foreign-language lab in order to utilize lab facilities such as the listen-and-compare feature on the lab tape recorders. Lab facilities dictated the group approach which was paced by the teacher.[2] A general music class served as the experimental group and three control groups consisted of a second general music class taught by conventional instruction, a band, and an art class. Data revealed that the experimental group's scores were significantly better than those of the control groups at the .01 level of confidence.[3]

A self-instructional program for developing musical concepts about pitch, duration, and loudness in preschool children was devised and

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[1]Stanley Franklin Michalski, "The Development and Evaluation of a Visual-Aural Program for Self-Instruction in Conceptual Understanding of the Basic Elements of Music" (Ed.D. dissertation, The Pennsylvania State University, 1966), p. 98.

[2]Norman L. Owen, "Teaching Fundamentals to the Seventh Grade via Programed Materials," Journal of Research in Music Education 21 (Spring 1973):56-58.

[3]Ibid., p. 58.

evaluated by Romanek. Taped materials played on cassette tape recorder were accompanied by illustrated booklets for the program of ten twenty-minute lessons. Individual lesson content was developed in a format employing both story and theoretical-abstract units of instruction. Response modes by the children included singing, moving, pointing, drawing circles and lines, and playing various musical instruments.[1]

As a result of the study Romanek concluded that the children who used the self-instructional program were able to learn the concepts of pitch, duration, and loudness as determined by the criterion measures employed. She also concluded that concepts of loudness were more easily acquired by the children than those of pitch and duration. Furthermore, the students' interest and positive reaction substantiated the investigator's conclusion that self-instructional materials can be developed which have the potential for holding the attention of preschool children.[2]

Programed music reading games utilizing the principles of musical development suggested by Dalcroze, Kodaly, and Orff were developed and evaluated by Woskowiak with first-grade children. The one-group, posttest-only research design was used for the study. Conducted over a six-week period, the study included nineteen twenty-five minute games. Each game was recorded on cassette tape and was accompanied by a booklet of reading materials. These materials consisted of two- and four-measure melodies and rhythmic patterns played on bells, drum, sticks, and tambourine.[3]

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[1]Romanek, "A Self-Instructional Program," p. 46. [2]Ibid., p. 109.

[3]Leona Frances Woskowiak, "Programed Music Reading Games for First Grade Utilizing Certain Principles of Dalcroze, Kodaly, and Orff" (Ed.D.

In order to evaluate the effectiveness of the programed games, an investigator-designed, criterion-referenced test was administered to the subjects. The test evaluated basic melodic and rhythmic music reading skills presented in the program. During the test, the subject was asked to perform ten four-measure examples, five rhythmic patterns on the drum and five melodies on resonator bells. Results of the test indicated that the programed games were effective for teaching music reading.[1]

Programed instruction utilizing a visual text and aural stimuli (piano) recorded on tape was used in a study by Roach to facilitate upper elementary school children's aural-visual perception of music notation. The program content was based on the rhythmic and melodic expectations suggested by upper elementary music series books. Results of the study led the investigator to conclude that the program was successful in developing aural-visual perception of music notation. Roach concluded that programed instruction utilizing a visual text and taped aural stimuli can provide a supplementary tool for individualization of aural-visual notation instruction and may help to fill a void of materials and approaches by actively engaging the student in the learning task.[2]

Taped programed lessons for developing listening skills, such as teaching aural perception of rhythm, melody, tone color, and aspects of texture and form, were demonstrated with fourth-grade students by

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dissertation, The Pennsylvania State University, 1973), pp. 192-200.

[1]Ibid., p. 171.

[2]Donald Wycoff Roach, "The Development and Evaluation of Programed Instruction to Facilitate Upper Elementary School Children's Aural-Visual Perception of Music Notation" (Ed.D. dissertation, The Pennsylvania State University, 1970), pp. 111-112.

Rasmussen. Perception of the musical elements was emphasized in the lessons. Objective questions concerning the musical elements were used to motivate careful listening and to evaluate the students' progress.[1]

Experimental data supported the idea that sequential lessons taught through the use of programed tape recordings are an effective means of teaching. The investigator reported that a high degree of student interest was maintained throughout the experiment. Results of the achievement tests and written descriptions of music heard during the last lesson indicated that the students were perceiving music in terms of its constituent elements. Rasmussen concluded that there is considerable potential for programed instruction in music listening at the elementary school level and recommended further research and experimentation in this area.[2]

Dean conducted a study of fourth-grade students using auto-instructional devices (AIDS) as a means of learning music symbols and terms and for strengthening general music achievement. Control and experimental classes met twice a week for thirty minutes of identical instruction from the same music specialist. Students in the experimental class operated the devices during the last ten minutes of the class period. On the basis of posttests given to both groups, the investigator concluded that the autoinstructional devices had a positive influence on the learning of the experimental group.[3] The data revealed that students

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[1]Rasmussen, "An Experiment in Developing Basic Listening Skills," Dissertation Abstracts, 26/12/7359-A.

[2]Ibid.

[3]Dean, "The Effect of an Adjunct Autoinstructional Device," p. 109.

in the upper one-third musical achievement level performed best on the posttest, followed by girls and then boys of the experimental group.[1] Subjects in the lower one-third of the experimental group benefitted very little from using the AIDS.[2]

Summary

A review of related literature and research disclosed that no other studies had been developed exactly like the one proposed by the writer. The present study appears to be the first to investigate concept development in all six musical elements with the same group of children. However, the discoveries of many researchers contributed to the overall development and evaluation of the self-instructional units in the present study. Research conducted in the areas of concept teaching, individualized instruction, and programed learning was particularly significant.

Educators of the past two decades have emphasized the need to teach a subject in terms of its structure. Inherent in this philosophy is the realization that students will benefit most from learning concepts that will remain functional despite the changes and new discoveries that occur in a subject. Structural study of music is based on the musical elements and the concepts which describe these elements.

An understanding of the process through which students learn concepts is important to the educator. This process, called conceptualization, includes the stages of perception, internalization, and application. Conceptualization occurs over a period of time as a result of repeated experiences. Learning occurs in cycles of increasing complexity,

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[1]Ibid., pp. 109-11. [2]Ibid., p. 111.

suggesting the use of the spiral curriculum in order to provide periodic review and expansion of concepts at higher levels. Conceptualization is affected by cognitive developmental factors such as conservation, reversability, decentration, and the enactive, iconic, and symbolic modes of representation.

A review of research in the area of individualized instruction revealed information helpful for the construction of self-instructional materials. For example, self-instructional materials typically include several component parts and a variety of resources. Also discovered was the use of a variety of settings for individualized instruction in elementary music education. Most situations appear to utilize some elements of the music lab approach wherein learning centers contain a variety of resources systematized according to levels of difficulty.

Three types of musical skill development have been taught through programed instruction. One type teaches verbal-symbol facility and is characterized by a programed book which teaches basic music symbols and terms. A second type concentrates on kinesthetic skill development, such as sightsinging, instrument fingering, or performance of a rhythmic pattern on a device coordinated with a correct taped version. The third type is related to the cognitive ability to relate sound and symbol. This method typically incorporates aural and visual dimensions such as a tape and program book. Computer-assisted instruction combines the best attributes of programed instruction with the capability of the computer.

A number of research studies in music have developed and evaluated programed instruction in formats related to the present study. These studies have been conducted with subjects from preschool age

through the college-level student. Content of the various programed instructional studies have included both skill and concept development. The studies conducted by Costanza, Romanek, and Woskowiak were particularly helpful to the writer of the present study.

CHAPTER III

DEVELOPMENT OF MATERIALS AND PROCEDURES

An Overview

The study was concerned with the development and evaluation of self-instructional units for teaching selected musical concepts to fourth-grade children. This chapter includes the rationale for the design and descriptions of the processes followed in developing the units used in the study.

Design of the Study

Costanza reported that the research design of studies concerned with programed instruction has been dominated by the approach that compares programed instruction to conventional or traditional teaching.[1] An examination of the studies discussed in Chapter II, however, reveals a trend away from the comparative style of research.[2] Support for the design that utilizes only one approach and uses "engineering or cut-and-fit techniques"[3] is given by Coulson and Cogswell.

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[1]Costanza, "The Development and Evaluation of Programed Instruction in Score Reading Skills," p. 48.

[2]Ibid., pp. 48-50.

[3]Ibid., p. 50.

> In this approach, small numbers of students are introduced in tutorial fashion to small lesson segments. An experimenter attempts to diagnose and remedy learning problems as the student proceeds through the material. Records are kept of all diagnostic and remedial techniques used by the experimenter, and the success or failure of these techniques. Procedures that prove consistently effective for several students are incorporated as an integral part of the lesson. As subsequent students work with the materials, new learning problems are uncovered, and new solutions attempted. Through a series of such empirical revisions, evaluations, and further revisions, a lesson is finally evolved.[1]

An experimental dimension was included in order to more objectively measure the results. To do this, a statistical design of posttest-only control group design was utilized.[2] Campbell and Stanley state that this design controls for the following sources of internal invalidity: history, maturation, testing, instrumentation, regression, selection, mortality, and interaction of selection and maturation. In addition, Campbell and Stanley note that this design controls for interaction of testing and treatment as a source of external validity.[3]

In accord with the above descriptions, the design of the study was both developmental and experimental. It was developmental in that the investigator-designed units and criterion measures were revised through a series of pilot trials until judged ready for testing in the formal study. Student responses, reaction of the students to the units, and student conversations with the investigator were closely observed

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[1]John E. Coulson and John F. Cogswell, "Effects of Individualized Instruction on Testing," Journal of Educational Measurement 2 (1969):63.

[2]Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research (Chicago: Rand McNally and Company, 1963), p. 25.

[3]Ibid., pp. 5-13.

and noted during the pilot trials and received careful consideration when subsequent revisions to the units were made.

The design was experimental in that an investigator-designed posttest, the Musical Concepts Measure, was administered to the subjects who studied the self-instructional units and to a randomly-assigned control group.

The research design of the study was as follows:

1. Phase I. In Phase I (development) the musical concepts were selected, behavioral objectives were formulated, criterion measures were designed and validated, the self-instructional units were written, and the units and criterion measures were pilot tested with subjects. Problems encountered in the units and criterion measures were analyzed and revisions were made until the units and criterion measures were judged ready for Phase II of the study. In addition, data collected in this phase resulted in some revision of the behavioral objectives.

2. Phase II. In Phase II (evaluation) the six units and their criterion measures were submitted to a formal study with students in a classroom situation. No revisions of the units or criterion measures were made during this phase of the study. Following the formal study, an investigator-designed posttest, the Musical Concepts Measure, was given to students in both the experimental and control groups to test the following null hypothesis:

> As determined by an investigator-designed measure of musical concepts, there will be no significant difference, at the .01 level of confidence, between the mean posttest scores of subjects who study the self-instructional units and subjects who do not study the units.

Subjects

Subjects in the preliminary study consisted of 188 students selected from extant fourth-grade classes at the John F. Kennedy and James Madison Elementary Schools in Norman, Oklahoma and the John P. Steiner and R. M. James Elementary Schools in Portales, New Mexico, and selected university students majoring in elementary education at the University of Oklahoma and Eastern New Mexico University. The number of students who served as subjects in the pilot studies for each unit varied according to the number of trials deemed necessary to prepare the units for Phase II. Some subjects studied only one while others responded to as many as four different units.

During the pilot trials for the pitch unit, the lessons were studied by one subject at a time. This number was doubled during the texture unit pilot trials and was determined to be effective. In the formal study, each of the six units was simultaneously studied by two or three students. At the end of three class periods, the students began a different unit. This procedure continued for eighteen class periods until the entire group had studied all six units.

The formal study involved 104 students from James Elementary School in Portales. At the beginning of the school year every Portales fourth-grade student was assigned to one of the eight classrooms at James. Extreme care was taken to insure that all classes met federal guidelines for a balanced distribution of ethnic backgrounds, sexes, and academic abilities. On this basis, the school principal assured the investigator that composition of each class represented a normal distribution.

The subjects were selected through the method known as incidental sampling or samples of convenience.[1] Subjects for the experimental group were chosen from the four classrooms which had their music classes on days of the week which matched free periods in the investigator's university teaching schedule. Classroom teachers of these four classes were asked to recommend sixteen students each: twelve to serve as subjects and four to serve as alternates in case some subjects were unable to complete the study. Five alternates were selected by the investigator to study the units along with the forty-eight subjects. One of the five alternates moved before the study was completed.

Four criteria were used as a basis for nominating subjects. Each student was to (1) have a good attendance record, (2) have good work habits, (3) grasp instructions without an extensive amount of individual explanation from the teacher, and (4) read on the fourth-grade level. The pilot efforts substantiated that the vocabulary could be grasped by the average fourth-grade student. Although a narrator read the complete text on the tapes, reading skill was advantageous if a child wanted to stop the tape and reread for better understanding.

No effort was made to select students with a high grade-point average or a strong musical background. The intended purpose was to test the effectiveness of the units with students from various backgrounds. To avoid possible contamination of the study, the subjects did not attend regular music classes in the school during the time of the

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[1] J. P. Guilford and Benjamin Fruchter, Fundamental Statistics in Psychology and Education, 6th ed. (New York: McGraw-Hill Book Company, 1978), p. 513.

study; their music instruction was limited to the self-instructional units developed for the study.

Following the completion of Phase II, the formal study, an investigator-designed posttest, the Musical Concepts Measure, was administered to the fifty-two subjects and to a control group of the same number. Subjects for the control group were selected from the remaining four sections of fourth-grade at James Elementary School. These students were recommended by their classroom teachers in the same manner and based on the same criteria used for choosing the experimental group subjects.

Subjects in the control group attended the music classes taught by the regular music teacher during the six-week period and were administered the posttest during the same week that it was given to the experimental group. The regular music teacher knew that the units studied by the experimental group taught musical concepts found in fourth-grade curricular materials, but was not asked specifically to teach the same concepts to the control group students. The posttest was administered to all students in the control group classes to avoid the Hawthorne effect which might have occurred if only subjects selected for the study were given the test.

Phase I (Development)

Organization of the Units and Criterion Measures

The study began with the selection of concepts pertaining to the musical elements of pitch, rhythm, timbre, texture, intensity, and structure. The selected concepts were derived from the investigator's

personal experience and professional literature including selected elementary music series texts and elementary music education methods books. The musicianly functions of listening, creating, and performing as well as several musical response modes served as the criterion references for the behavioral objectives. The objectives were employed as the basis for the construction of appropriate evaluative (criterion) measures for each concept. Behavioral objectives for the criterion measures are listed in Appendix A.

Evaluative criterion measures (posttests) were developed for each lesson in the six instructional units. Face validity was established by deriving each measure with the unit objectives in mind. A further check for validity was accomplished by submitting the measure to three elementary music education specialists.[1] These music educators were asked, on the basis of experience and judgment, to examine each measure for its appropriateness in measuring the desired conceptual learning and for the suitability of the material for testing fourth-grade children's knowledge of the concepts. There was unanimous, positive agreement by the specialists and the criterion measures were judged to have content validity.

The criterion measures were used to determine whether the student had learned the concepts taught in the units. Response modes which were alternative-equivalent to those used in the lessons were incorporated in the criterion measures. For example, in Lesson 1, pitch unit, the

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[1]Helen Edwards, Clovis Public Schools, Clovis, New Mexico; Rossanna Hays, Albuquerque Public Schools, Albuquerque, New Mexico; and Mary Ann Vaughan, Texas Tech University, Lubbock, Texas.

student used a rubber band and box to learn the concept "The length of a vibrating body determines the pitch of its sound." On the criterion measures which followed, the student was asked to apply his knowledge of the concept to illustrations of the rubber band and box as well as to string instruments, autoharp, and song bells.

One type of response mode utilized paper and pencil responses including listing, identification, matching, classification, and answering multiple choice questions. Another mode was based on the student's musical performance, such as singing, playing a sound source, or rhythmic movement. A third type was a creative response such as a short composition, verbal description, or iconic illustration.

When the concepts, behavioral objectives, and criterion measures had been stated, units were written for each of the six elements of music, and each unit consisted of three concept lessons. Some concepts required more than one lesson for student accomplishment of the learning tasks. Thus, a particular lesson may have contained the initial presentation of a concept or it may have been on a more advanced level. Each lesson was based on a particular concept, but concepts previously presented in the unit were repeated to reinforce and amplify the new concept. As a general rule, reference to other musical elements was avoided. This practice was followed to help the student center on the element being studied. A second reason was to minimize the confusion between the elements of pitch and intensity (high and loud, low and soft) or timbre and structure (tone color changes rather than thematic changes).

The units were recorded on cassette tapes and used in a

self-instructional format. The tapes included instructions and musical examples used to teach the concepts. Visual stimuli such as pictures, diagrams, and some written material were provided in the frames of accompanying lesson booklets to supplement the aural stimuli presented on the tapes. During the pilot studies, the lesson booklet pages were four by six-inch cards placed in loose-leaf notebooks. For the formal study, the booklets were reprinted on five by eight-inch cards, laminated, and fastened together with plastic binders.

Worksheets were coordinated with the lesson booklets and tapes in the first unit (pitch). The worksheets eventually were discontinued to economize time. For some students, the worksheet compounded the physical problem of managing the tape, lesson booklet, and additional equipment or material required for the lesson. At that point, an answer sheet (4¼ by 5½ inches) was designed for recording the student's written responses to the criterion measures. The combined learning package of cassette tape and lesson booklet incorporated linear-type programing.

Consistent with programed instruction philosophy, the learning content was arranged and presented in sequential segments. In each segment (frame), the learner was required to make a response after which immediate correct reinforcement was supplied before the student moved to the next frame. The basic format used in many frames consisted of instruction (percept), question (stimulus), multiple-choice answers (response), and disclosure of the correct answer (reinforcement). The instruction segment included tasks or informative statements. The question related to information learned from completing the task or to

the statements made by the narrator. The question was to be answered by choosing one of several answers.

A "no response" answer was included as a third reply to questions in Lessons 1 and 2 of the pitch unit. This choice was used only a few times by subjects in the pilot trials. A number of subjects disclosed that they did not understand the meaning of the term "no response." Others understood the term but preferred to guess because a guess might reveal the correct answer. The "no response" option was discontinued after Lesson 2 and later was deleted from the first two lessons in the pitch unit.

Following a timed interval, a signal on the tape directed the student to turn to the back of the lesson booklet frame. The correct answer was revealed there and on the tape.

Each unit was developed as an independent entity. Although completion of all the lessons in a unit was required before the student was allowed to study another unit, the student was permitted to study the units in random order. Success in completing any one unit was not dependent on prerequisite learning gained from any of the others.

The concluding part of each lesson contained the criterion measures. Each measure was printed on a separate page in the booklet. Instructions for responding to the measure were also read on the tape by the narrator. The student wrote his responses on the answer sheet and then checked his own paper following the final criterion measure. Correct answers to the criterion measures were shown on the reverse side of the final page in the lesson booklet and were recorded on the tape.

Pilot Trials

A series of pilot trials was conducted to determine the effectiveness of the programed instruction, the adequacy of the tape recordings, and the reactions of subjects to the self-instructional experience.

In each pilot trial session, the investigator instructed the subject about the cassette tape, lesson booklet, answer sheet for the criterion measures, and worksheet. As the subject studied the lesson, the investigator listened, observed, and recorded the student's verbal and musical responses. In the first few pilot trials, a second cassette recorder was used to record these responses. The playback time for this process proved to be more time consuming than practical, and the investigator resorted to taking notes which were later transcribed and used as a basis for revising the lesson.

In the event a subject had difficulty with a frame the investigator stopped the tape and explained the problem. Frequently the investigator spent a few minutes after the criterion measures were completed discussing the student's reaction to the lesson or to the type of instruction. In some cases the investigator asked additional questions about the concept. On a number of occasions, the tape was stopped between the lesson and criterion measures to clarify points for the student.

Following a pilot trial session the investigator examined the difficulties encountered by the subject. If the difficulty was within the lesson, a revision was made to eliminate the problem. The lesson was submitted to additional subjects and the process repeated until the majority of students were able to successfully complete the lesson.

The time interval varied between the pilot trials for subsequent lessons of a unit. In some cases a subject studied the lessons of a particular unit during three consecutive music class periods. At other times a longer time span elapsed because the investigator needed to repeat a particular lesson with different students before offering the next lesson to any of the subjects.

Development of the Self-Instructional Unit on Pitch

The development phase of the pitch unit began with the selection of the following concepts:

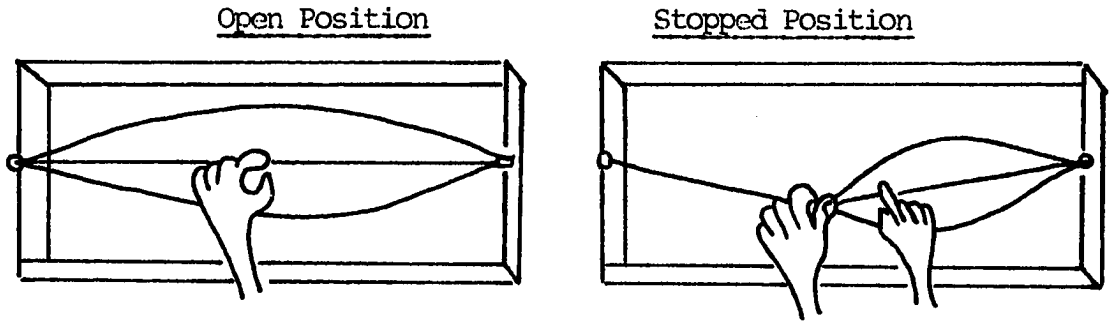
> The length of a vibrating body determines the pitch of its sound.
> A melodic sequence is a pattern which is repeated immediately at a different pitch level.

Based on these concepts three lessons were developed from August 1973 to March 1974 in Norman. Additional revisions to the format were made as a result of procedures developed in the pilot trials of other units.

In Lesson 1 the concept is applied to elastic bodies. The student works with a rubber band and a shoe box lid to accomplish the learning tasks. As the lesson progresses the student learns to use the open and stopped positions of the rubber band, as illustrated in Frame 9 (see illustration, next page). Further activities lead him to discover that he can raise and lower the pitch by adjusting the vibrating part of the rubber band to different lengths. Finally the student is told that the pitch on string instruments is adjusted in a similar manner to the procedure used with the vibrating rubber band.

The lesson was pilot tested with fourteen subjects in Norman. During this period the tape, booklet, and worksheet were revised a

Frame 9



In which position is the vibrating part of the rubber band shorter? Open position or stopped position?

number of times. For example, the time allowed for performing the learning task or answering the question was reduced from ten to five seconds in each frame because some subjects were able to complete their responses in less than ten seconds and grew restless waiting for the answer signal. The instruction STOP THE TAPE was added to frames when it was observed that a number of subjects needed additional time to perform the learning task.

Reactions of the subjects to the lesson and the self-instructional format were positive because "here you get to answer all of them (frame questions)" and "I like to do it myself."

Observation revealed three subjects for whom the lesson seemed inappropriate. Subject 6 was hyperactive, restless, and easily distracted. He spent a lot of time operating the START and STOP buttons on the tape recorder and guessed the answers to many frames. The classroom teacher disclosed that the child had scored in the twenty-first percentile in reading/verbal areas on the third-grade achievement test and in the

sixtieth percentile in mechanical areas. The investigator believed the child was capable of learning the concept but probably would work better through a free, manipulative, and self-exploratory process.

Subject 8 worked diligently but added that she had learned the concept practicing her harp and grand piano at home and wished the program were "a little harder." The student said she would rather learn about music by herself at school. Obviously, this child was musically ahead of her peers and could benefit from more challenging self-instructional lessons.

Subject 9 had aural difficulty with a number of frames and criterion measures because he could not distinguish between high and low pitches. The investigator noted the subject's need for basic pitch skills before he could successfully complete the program.

During May of 1976, the lesson was administered to twenty additional subjects in Portales in a setting similar to that used later for the formal study. Several groups of students studied different lessons in the room at the same time. The investigator was present and moved among the groups rather than monitoring students studying any particular lesson.

Criterion Measures 6-10 require abstract thinking but none of these measures had an error rate higher than twenty-five percent. Although many nine-year-old children are unable to solve abstract problems, it seems equally inappropriate to deny the bright and gifted child the challenge offered by more difficult measures. To solve the dilema, the narration was revised.

> Questions 6-10 are BRAIN BUSTERS. The BRAIN BUSTERS are for extra credit because they are harder and you may bust your brain trying to

> solve them. You may stop now or you may try to solve these questions. If you want to stop now, turn to the back of the last page and check your answers. If you want to try the BRAIN BUSTERS, wait until the end to check your answers.

The lesson was retaped and corresponding revisions were made to the lesson booklet for the formal study.

Lesson 2 applies the same concept ("The length of a vibrating body determines the pitch of its sound") to sound produced by a vibrating air column. In the original version of the lesson, the student was to compare pitch differences produced on a soft drink bottle. The task was to be accomplished by (1) blowing across the top of the empty bottle, (2) adding water, and (3) blowing again. The tape and booklet frames emphasize that the vibrating air column produces sound. Finally it is explained that pitch is changed on wind instruments, just as on the bottle, by altering the length of the vibrating body.

The lesson was pilot tested and revised a number of times during the spring semester of 1974. Nineteen fourth-graders in Norman and several university students served as subjects.

The instructions for several frames were rewritten to insure that the student would have to repeat the learning task. The revision was made because a number of subjects responded correctly when asked to repeat the task. Subsequently the error rate was decreased in a number of frames.

Another revision was recommended by a university student. She noted that it is difficult to remember pitches when changing the water level in the bottle and suggested that two bottles be provided for the lesson. An extra bottle was added and pilot tested with elementary students in Portales in 1976. The two bottles increased the efficacy of

the lesson.

Additional changes to the lesson included deleting unessential material, combining several frames, and adding several frames to utilize the second bottle. Several criterion measures were revised to conform in format and content to similar criterion items in Lesson 1 because both lessons are based on the same concept.

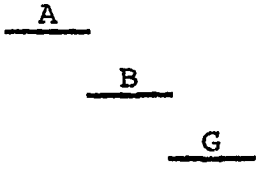
Following the major revisions described above, the lesson was administered to sixteen fourth-graders in Portales during May 1976. The students studied the lesson without assistance from the investigator. Following these trials, several additional revisions were made to the criterion measures. For example, pictures were added to make some items more concrete. The criterion measures were rearranged in order, from concrete to abstract, as had been done for Lesson 1. Three measures which required abstract or transfer thinking were retained and labeled BRAIN BUSTERS. The lesson was retaped and appropriate revisions were made in the lesson booklet. Several behavioral objectives were revised to agree with changes made in the criterion measures.

Lesson 3 was designed to teach the following pitch concept: A melodic sequence is a pattern which is repeated immediately at a different pitch level. The goal for this lesson is to develop both aural and visual perception of a short melodic sequence. The student uses a set of five resonator bells (g^1 a^1 b^1 c^1 d^1) to accomplish the learning tasks. These tasks include hearing, playing, and reading two- to four-note melodic patterns and sequences. In the original version the patterns and sequences were shown in both iconic (diagram shape) and symbolic (staff notation) representation. Later the symbolic type

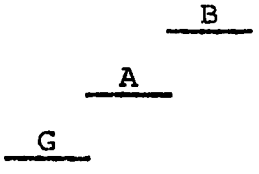
examples were deleted to shorten and simplify the lesson. Inclusion of the symbolic examples made the lesson too comprehensive, particularly for students who lacked staff notational skills.

The lesson was submitted to pilot trials involving eleven students in Norman during the spring of 1974. During this period the lesson was revised a number of times.

Four students demonstrated difficulty in diagraming melodic patterns. Often there was no consistency between the direction of the diagram (low-to-high or high-to-low) and the letter names placed upon it by the child. For example, after listening to the melodic pattern G A B, one subject indicated that it moved up by steps but drew the following pattern:

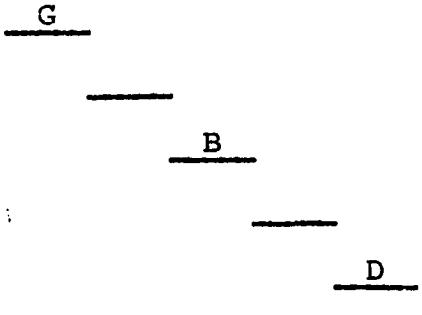


Student's diagram.

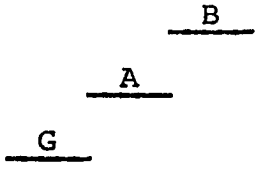


Correct diagram.

Another subject said the G A B pattern moved up by skips, but drew a descending skip pattern:



Student's diagram.



Correct diagram.

A related problem was that some children seemed unsure whether the melodic pattern moved from left to right or from right to left, particularly if the lower pitch was located on the left side of the diagram. They seemed to center on the highest pitch if it were placed on the right.

Two types of revisions were made to alleviate the problems. One type was to rearrange a number of frames to give the student experience with patterns which moved in the same direction before introducing those which moved in the opposite direction. Before the revision, the patterns had been mixed.

A second change was to eliminate the tasks of drawing and labeling the melodic pattern or sequence. As revised, the shape of the diagram is given and the child is asked only to add letter names. In several frames the first letter name is given to help the student get started.

The elimination or abbreviation of several repetitious frames allowed the student to procede to the sequence concept more quickly. Practicing additional frames of melodic patterns lengthened the lesson and some subjects showed signs of fatigue before completing the lesson.

Selected frames and criterion measures which involved staff notation were deleted in order to reduce the length and comprehensive scope of the lesson. Most of the subjects lacked the notational expertise needed to make accurate responses.

The lesson was retested with ten subjects in Portales during May and June of 1976. The students worked in groups of two and three at a learning center without interference from the investigator.

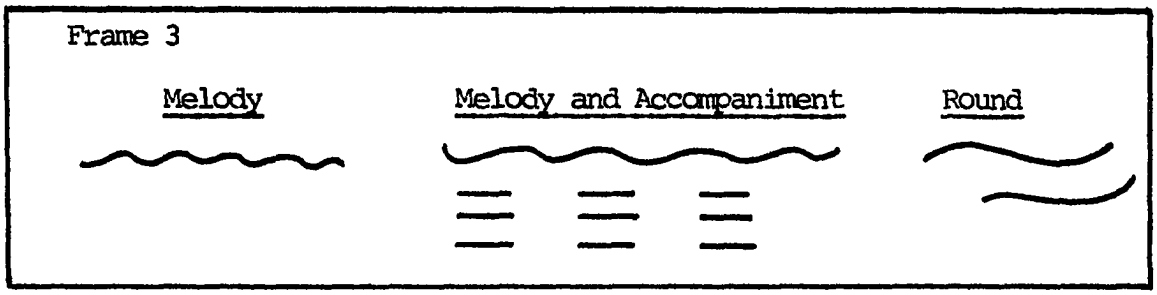
Development of the Self-Instructional Unit on Texture

The development phase of the texture unit began with the selection of the following concepts:

> In music, one layer of sound is monophonic texture.
> When a melody is accompanied by chords, the texture is homophonic.
> When two or more melodies are heard at the same time, the texture is called polyphonic.

Based on these concepts, three lessons were developed in Norman during the spring and summer of 1974. Additional revisions were made in 1977 prior to the formal study.

Lesson 1 introduces the student to the musical element of texture. Concrete examples of texture (water, ice, walls and ceilings of the classroom, clothing, and food) are noted first. Following this, it is explained that in music texture is heard as layers of sounds. Iconic diagrams, shown in Frame 3, illustrate the textures of a melody, a melody and accompaniment, and a round which are demonstrated on the tape. The



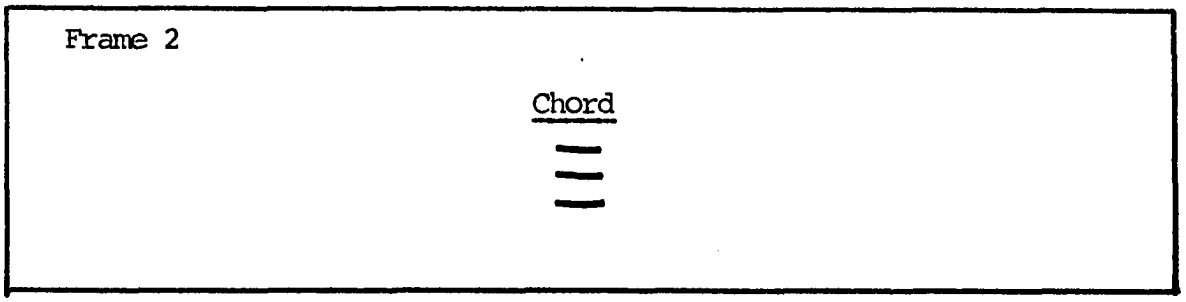
remainder of the lesson emphasizes monophonic texture. During this time the student hears examples of one-layer music performed on flute, piano, vocal, and violin timbres. Situations are mentioned in which the student is likely to perform or hear music with monophonic texture.

Following pilot trials with twenty-three subjects, a number of revisions were made in Lesson 1 including rewriting much of the

narration to improve the clarity and to create interest. Pages in the booklet were brightened with colorful iconic diagrams and cartoon-type illustrations.

Lesson 2 reviews the element of texture and the concept of monophonic texture, one layer of sound. The concept of homophonic texture, a melody accompanied by chords, is to be learned during this lesson. The term "chord" is defined and illustrated with an iconic picture, as shown in Frame 2. Also, it is demonstrated on the tape in broken and block form played on the piano. Following this the song is played, first sounding chords alone, and then sounding both chords and melody.

Frame 2



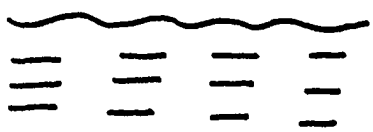
During the lesson a number of different examples of homophonic texture are heard on the tape. Selected examples include piano, piano and voice, choir and guitar, three-part vocal, choir and organ, autharp and voice, and trombone quintet. In several frames, the student hears a musical example and is asked to match it with an iconic representation of monophonic or homophonic texture, such as in Frame 5 (see next page).

A number of revisions were made in the lesson following pilot trials involving ten subjects. The changes were made to improve clarity and interest, and to provide a greater variety of response types on the criterion measures. In one frame the musical example was changed because five subjects had identified a homophonic orchestral excerpt as monophonic. It appears to be difficult for children to accurately perceive

Frame 5

Picture A

Picture B



Listen to a piece of music.

Choose the picture which has the same kind of texture as the music you hear.

the texture of orchestral music, particularly when several timbres are involved. Aural perception of homophonic texture seems easier for the children when the performance medium is piano, guitar, small vocal ensemble, or a combination thereof.

Lesson 3 begins with a review of the concepts about monophonic and homophonic texture. The concept of polyphonic texture, two or more simultaneous melodies, is emphasized during this lesson. Two types of polyphonic texture are demonstrated during the instructional phase, the round/canon and the type which is like partner songs (quodlibet). The musical examples recorded on the tape are vocal performances and instrumental duets.

The aural presentations are accompanied by visual representations of the two types of polyphonic texture, such as illustrated in Frame 2.

Frame 2

Round or Canon

Partner Songs

In several frames, the student is asked to listen to a musical example and match it with an iconic representation.

Following pilot trials with fourteen subjects, several revisions were made to the lesson. Two frames were added to the lesson and colorful iconic illustrations were added to the booklet. Several musical examples were changed to familiar songs and additional listening examples were added. The criterion responses were expanded by several items to give a broader picture of student conceptualization.

Development of the Self-Instructional Unit on Structure

The development phase of the pitch unit began with the selection of the following concept:

The phrases in a song may be the same, almost the same, or different. Based on this concept, three lessons were developed in Norman and Portales during 1974 and 1976. Further revisions were made to the unit in 1977.

Lesson 1 introduces the musical element of structure. In Frame 1 the narrator compares the musical score of a song to a house plan. It is noted that just as rooms in a house may have the same or different uses, so the phrases in a song may be the same or different. A number of frames are designed to give the student practice in hearing phrases which are the same or different. In Frame 8 the student is introduced to the technique of coding phrases with alphabetical letter names. In the remaining frames the student codes two three-phrase songs presented on the tape.

The opening frames of Lesson 2 review same and different musical

phrases and the technique of coding. Beginning with Frame 3, the musical score is shown for each example. This contrasts to Lesson 1 in which student responses to the musical examples are based entirely on aural presentation. Frame 9 introduces the concept that some musical phrases are almost the same, rather than exactly the same or different. The student listens to several musical examples with almost-the-same phrases both with and without benefit of the musical score. In addition, the lesson teaches the student to apply the coding system to the new type of phrase.

In Lesson 3, the concept of similar phrases is reviewed. Beginning with Frame 5, the student learns about songs which have a third contrasting phrase, commonly coded with the letter C. Examples are presented both with and without the musical score.

Two musical examples are used for the criterion measures. The first example, "Walk Along, John," shown in musical score, tests whether the student can detect the C-type phrase. The second example, "Go Tell It on the Mountain," is presented aurally but not visually. This example was chosen to illustrate similar phrases.

Observations from the pilot studies prompted a number of revisions to the lessons and criterion measures. One observation was that most students were unable to detect the structure of musical examples which contained more than one phrase per section. Songs with two to four phrases seemed to be more effective than excerpts from longer instrumental works such as "March" from 'Comedians' by Kabalevsky. After several pilot trials it was apparent that for most students it was necessary to announce the phrase numbers on the tape. Without this help,

many students were unable to complete the tasks. The investigator noted the need in the general music class for more activities which would help the child to hear and sense phrase endings. An additional need is for activities designed to lengthen the musical memory span.

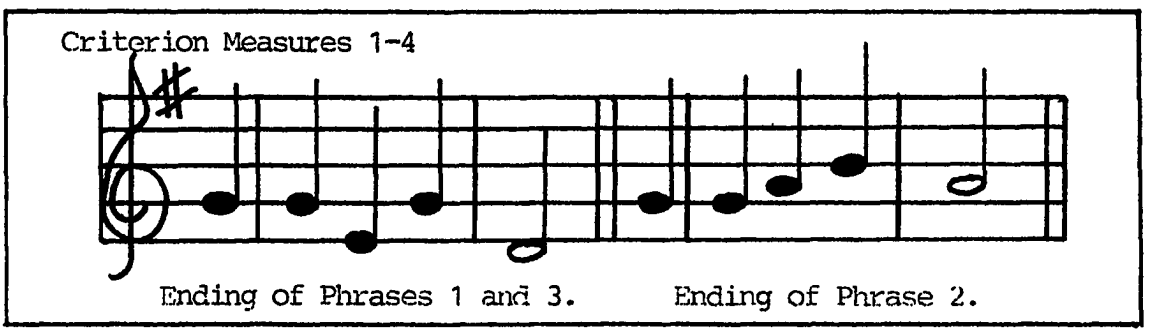
A second observation was that timbre is a stronger influence than thematic change. Evidence of this was noted in student reactions to the structure of a fifteenth-century composition written in AABB form. Several timbral changes occurred during the piece. In each section, the theme was played by a soprano recorder, accompanied by woodblock, and finally repeated by a recorder consort with cymbal accompaniment. Most of the subjects did not recognize the A theme when it was repeated by the consort and cymbals, indicating that they were unable to conserve the theme when the timbre changed. With this example and several others, most students assigned a different letter name whenever they heard a change of timbre. In the revised version of the lesson, the musical examples were all played on the piano to avoid this problem.

A third observation was that most students could not create a short original sound piece in AB or ABA form without a great deal of help from the investigator. At first it seemed that the children did not understand what to do. The frames were revised several times to include precise instructions and a demonstration model. It seemed the subjects understood, then, but were too inhibited to begin. Many seemed afraid even to try for fear of being wrong. It appeared that the children who participated in the pilot trials did not have basic experience in the playing and improvising of rhythms. Since the lesson was to be self-instructional, the frames which included this type of activity were

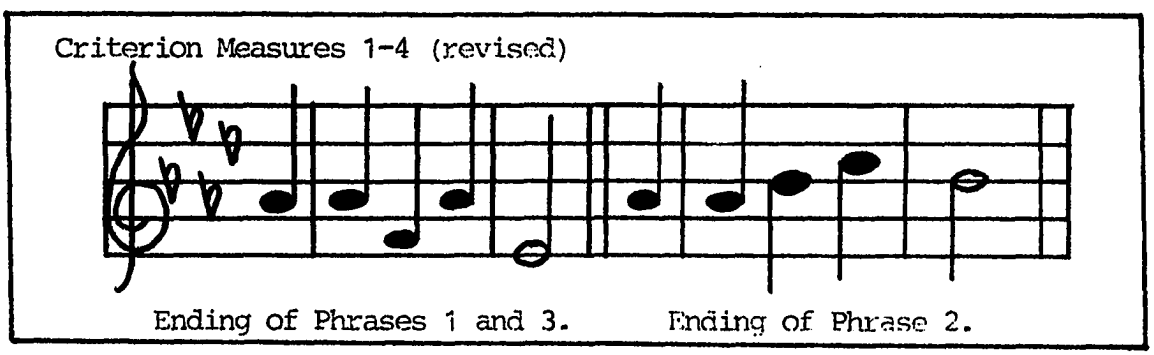
removed.

A fourth observation was that the subjects tended to be very particular when examining scores for notational indication of structure. They observed and mentioned the slightest difference, such as a minute change in rhythmic pattern or pitch and the presence in one phrase but not the other of an expression mark or meter signature. This behavior indicates the tendency to center on a particular aspect of the musical score. In several cases, the score was edited, such as by adding a slur mark or removing a tie or meter signature, in order to avoid a "different" identification response when two phrases were essentially "the same."

In a related case, the opposite reaction occurred. Twenty-six subjects failed to detect the difference in the two phrase endings shown in Criterion Measures 1-4. Following the pilot study, the key was changed from G major to A-flat major because this provided for the stems



of the last three tones in Phrase 2 to be turned down.



A fifth observation was that in early experiences with structure some children heard sequential phrases as the same while others heard them as different from the preceding phrase. Therefore it seemed logical, particularly in a self-instructional lesson, to avoid musical examples in which sequentially repeated phrases were found. Songs including "Lovely Evening" and "Music Alone Shall Live" were deleted.

A sixth observation was that for identifying structure from an aural approach, the musical segments had to be limited to two phrases at a time. After some experimentation an effective model was evolved for this type of learning task. For example, in the song "Silent Night," the student listened to Phrases 1 and 2. The letter name A was given for Phrase 1 and the student was asked to choose a letter name for Phrase 2. After a pause on the tape, the narrator stated that Phrase 2 was contrasting and should be called B. At that point Phrases 1 and 2 were replayed and Phrase 3 was added. The pupil was asked to identify Phrase 3 as A, B, or C. The process was continued for longer songs.

A concomitant observation was almost a paradox. Most of the children needed to hear the musical examples several times. However, many of the subjects wrote their first decision and seemed to pay little attention during the second hearing. It seemed that there was a closure point at which time the student made a decision and then did not question it during a second exposure.

If such a factor exists in children, and if it is predictable, a number of conclusions can be drawn. For example, if children "close" after one or two hearings, there may be no point in providing additional listening opportunities. If the classroom teacher is aware of this

factor, he may be able to compensate with alternate lines of questioning. The problem may be insurmountable in self-instructional situations where the teacher does not interact and adjust to the responses of the student.

Development of the Self-Instructional Unit on Rhythm

The development of the rhythm unit began with the selection of the following concepts:

> In a musical composition, the rhythm of the beat and the rhythm of the melody may be felt and heard.
> A melody may move with tones that sound with the beat, are longer than the beat, or shorter than the beat.

Based on the selected concepts, three lessons were developed in Norman during the spring of 1974. Additional revisions were made to the unit in 1976 and 1977 prior to the formal study.

Lesson 1 includes activities and learning tasks to help the student hear and feel the difference between the two kinds of rhythm, beat rhythm and melodic rhythmic pattern, and to recognize either type when it is demonstrated on the tape. In a number of frames, familiar songs are sung while first the rhythm of the beat is tapped in the background and then the rhythmic pattern of the melody is clapped. The rhythmic pattern of the melody, it is emphasized, is like the rhythmic pattern of the words. The student is asked to listen to the two types of rhythm and then to tap or clap along with the narrator. Following this, one of the rhythmic types is presented on the tape and the learner is asked to identify the type he hears.

On two occasions, the student is asked to stop the tape, sing, and clap the rhythmic pattern of the melody for a familiar song ("Happy Birthday" and "London Bridge"). After this, the narrator claps the

rhythmic pattern of the melody for one and asks the pupil to name the song.

The rhythmic pattern of a melody without words is also demonstrated with a simple instrumental composition. After hearing the rhythm of the beat tapped, the student listens again and claps the rhythmic pattern of the melody. During a third hearing, the narrator claps the rhythmic pattern of the melody for the learner to compare with his own response.

Informal checks, beyond the lessons, were conducted from time to time to determine if the subjects understood the difference between the two types of rhythm. One kind of check was to ask the child to clap either one or both of the rhythmic types as a song of his own choice was sung. Another check was simply to ask the subject to explain each type of rhythm. Two subjects' responses to the latter type of check are quoted below.

1. "It (rhythm of the beat) kept going even when the words didn't keep going."
2. "It (rhythmic pattern of the melody) stops at the end of the words. The beat goes on."

Following pilot trials with twenty-four subjects in Norman and Portales, the lesson was judged ready for the formal study.

Lesson 2 was developed to teach the concept "the tones of a melody may have the same rhythm as the beat, they may be longer than one beat, or they may be shorter than one beat." The three ratios of melody-tones-to-the-beat are introduced but only the first two, same as the beat and longer than one beat, are emphasized.

Aural, visual, and motor responses are required to complete the learning tasks. In some cases, the student is to aurally perceive

whether the tones of the melody have the same rhythm or are longer. The rhythm of the beat is usually tapped in the background on the tape.

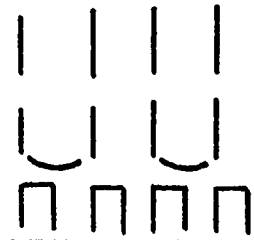
Rhythmic symbols (visual) are used to illustrate the three types of melodic pattern, such as in Frame 3. In some frames, both rhythms of

Frame 3

Same rhythm as the beat:

Longer than one beat:

Shorter than one beat:



the beat and melody are shown so the learner can see the difference as he listens and moves (motor) to the music.

Another type of visual response requires the learner to decide whether certain words in song texts sound for one beat or longer than one beat. In such examples, a number of words are circled and the student selects those which are appropriate. One such example occurs in Frame 11.

Frame 11

DOWN IN THE VALLEY

(Down) in the val - ley, the val - ley so (low,)

(Hang) your head o - ver, hear the wind (blow.)

Find the (circled) words which sound LONGER than one beat.

Motor responses include tapping the rhythm of the beat and clapping the rhythmic pattern of the melody.

The lesson was submitted to pilot trials with twelve subjects in Norman and later to a few subjects in Portales. Based on the responses of the subjects, revisions were made to clarify instructions in

several frames and criterion measures.

Lesson 3 contains a continuation of the concept begun in Lesson 2: "The tones of a melody may have the same rhythm as the beat, they may be longer than one beat, or shorter than one beat." In this lesson, the first two ratios are reviewed and then the third, shorter than the beat, is emphasized. The learning tasks and response modes are similar to those used in the previous two lessons.

The lesson was administered to twelve subjects who had studied Lessons 1 and 2 in Norman. Several additional subjects later worked with the lesson in Portales. Revisions to the lesson were made to clarify and improve the format of the tape and lesson booklet.

A technique devised by one subject to solve a problem led to its being incorporated into the lesson as a suggestion for other students. In Frame 7, the student is to determine whether the melody tones to the song "Kookaburra" are longer or shorter than one beat. Several repetitions of the song are provided on the tape. During the first hearing, the student taps the beat. As the tune is sung again, the student is asked to clap the rhythmic pattern of the melody. Instead, Subject 7 clapped the beat. When questioned, she replied "I decided to do the beat so I could tell the difference between what we were doing." Subject 8 observed that "it was easier when _____ was doing the beat because I could hear what she was doing and what I was doing." This motivated the investigator to add the following instruction to the end of the answer segment:

> If you're doing this lesson with another person, and both of you know the song, do this: one person clap the beat; the other person clap the rhythm of the words; both persons sing.

Development of the Self-Instructional Unit on Timbre

The development phase of the timbre unit began with the selection of the following concepts:

The timbre of a sound is affected by the material used in the sound source.
A sound source may produce more than one timbre.
The same musical idea will have a different timbre when it is produced on another sound source.

Based on the selected concepts, three lessons were developed in Portales during 1975 and 1976. Additional revisions were made to the lesson in 1977.

In Lesson 1, the objective is to get the student to recognize that a wide variety of sounds exist and that the quality of each is affected by the material in the sound source. The learning activities consist of a series of frames in which the student locates and experiments with sound sources in his immediate environment. After producing sounds on each object, the learner is urged to describe the quality of the sound. In some frames, alternative descriptors are suggested, such as hollow/solid, bright/dull, or clink/clank. After the sounds of several materials have been explored, the pupil is asked to compare their qualities.

A number of revisions were made to the lesson during the pilot trials. For example, a specific effort was made to clarify instructions and simplify language and terminology. Other changes included making the booklet more attractive, deleting unessential material, and condensing content with undue replications.

An instructional revision alleviated two problems related to the completion of a frame in which the student was asked to locate a sound

source. Originally the narrator told the student to locate a sound source made of metal. Questions about the sound source followed on the tape and in the booklet, but sometimes a pupil was so eager to find a sound source that he forgot about answering the questions. A related problem was that some students continued to look for as many objects as possible which were made of the same material. Although the response was creative, the additional time consumed prevented some subjects from completing the lesson during the prescribed time limit.

To alleviate these problems the frame in the lesson booklet was changed. The questions were stated first and the narrator asked the student to read them. Following the questions, the instructions stated: "Find one or two metal objects. Tap each one. Answer these questions about the metal objects." The remaining subjects followed the directions, proving that the order in which instructions are placed may be as important as the content of the instructions.

Several criterion measures were revised because it was difficult to distinguish between certain timbres on the tape. For example, the sounds of metal and glass, as well as wood and hard plastic, were sometimes confusing for the student. In one kind of measure, a sound was played and the student was asked to choose the material upon which it had been produced. The multiple choice answers were rewritten so that only one of the similar sounding materials was included in the alternatives.

Finally, five criterion measures were deleted to shorten the lesson and to eliminate items deemed unessential or inappropriate. Several items were abstract and measured terms or cognitive ideas rather than conceptual understanding based on the experiences provided in the

lesson. Another item was a duplication of two other measures using different timbre.

Spot checks were made at the end of some pilot sessions to determine if the students understood the meaning of the word "timbre." Characteristic responses are shown below.

1. "It helps you to know the difference between sounds."
2. "It makes you know that you can tell different sounds."
3. "Like you can tell a guitar from a violin."
4. "It can tell you what the thing (sound source) is."

Subject reactions to the lesson were positive. The children seemed particularly to enjoy looking for sound sources and producing sounds on them. Typical comments about the lesson were "it was fun" and "it got more interesting every time (frame)."

The central concept of Lesson 2 is "a sound source may produce more than one timbre." To illustrate the concept, the student is asked, early in the lesson, to clap, rub palms together, and snap fingers, thereby producing three different timbres on one sound source, the hands. As the lesson progresses, the learner discovers that timbre can be changed by (1) starting the sound source at a different place on the sound source, (2) starting the sound with a different action or movement, or (3) by using a mute.

Opportunities are provided during the lesson for the student to try the above activities on sound sources such as a coffee can with plastic lid and a few paper clips, a piece of paper, and an additional sound source located by the student in the learning environment.

In addition to the object sound sources, the concept is applied to musical instruments. On the piano, for example, a pencil is drawn across the strings, the strings are tapped, and an arpeggio is played on

the keys. Several timbres are demonstrated on the violin, such as bowing, pizzicato playing, and muted strings.

Pilot trials with forty-two subjects disclosed the need for several revisions and deletions. Some of the criterion measures required abstract thinking beyond the fourth grader's capacity. One example, Criterion Measure 3, was missed by forty-eight percent of the pilot subjects. The format was changed from verbal descriptions to pictures as

Criterion Measure 3

One way to change timbre is to start the sound at a different place on the sound source. Three activities are described here. Which activity tells how to start the sound at a different place on the sound source?

(A) Strum the strings of a guitar. Put a piece of paper between the strings and strum it again.

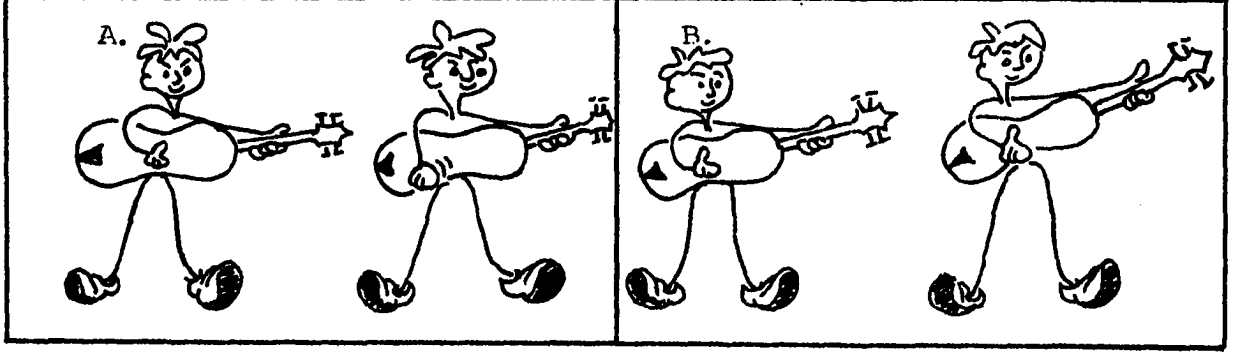
(B) Strum the guitar with a pick, then tap your knuckles on the body of the guitar.

(C) Strum the guitar with a plastic pick, then strum with a pick made of metal.

shown in the revised Criterion Measure 3.

Criterion Measure 3 (revised)

One way to change timbre is to start the sound at a different place on the sound source. In which picture is the timbre changed by STARTING THE SOUND AT A DIFFERENT PLACE ON THE SOUND SOURCE?



Another criterion measure was also missed by forty-eight percent of the pilot subjects. The measure read

> You will hear a short sound piece. As you listen to the sound piece, you will hear three different timbres. You are to decide if the sound piece is being played on one, two, or three sound sources.

The sound piece was performed on a tambourine by shaking, tapping, and rubbing the head of the instrument. Further investigation revealed that the rubbing sound was unfamiliar to many students and caused eleven subjects to believe there were two different sound sources being used. The measure was revised by deleting the rubbing sound.

In the summer of 1977, criterion measures for the six units were shown to a number of music education graduate students at the University of Oklahoma. The students, all experienced music teachers, were asked to comment on the appropriateness of the measures for fourth-grade students. A number of the graduate students noted that some measures seemed to be testing for identification of cognitive knowledge rather than application of conceptual understanding. In an effort to improve the criterion measures for Lesson 2 of the timbre unit, three items were deleted because they appeared to be examining specific knowledge rather than general conceptual understanding.

Lesson 3 reviews the timbre concepts taught in the first two lessons and introduces a new concept: "The same musical idea will have a different timbre when it is produced on another sound source." To introduce the concept, the first phrase of "The Pledge of Allegiance to the Flag" is spoken in turn by a man, woman, and child. It is noted that the words remain the same each time but that the timbre of the three speaking voices changes with each person. Further illustrations include musical

excerpts performed by different musical instruments or singing voices. One example, "The Trout" by Schubert, is sung by a tenor and then played by a quintet.

In one frame the student is asked to play the rhythmic pattern for "Jingle Bells" on a sound source and to compare this timbre with that which results when he hears the same pattern played on a woodblock and on a tambourine. Other learning tasks include pointing to illustrated groups of instruments or the names of orchestral instruments while listening to musical examples played with various tone color combinations.

The pilot trials with thirty-one subjects revealed several problems. One was that the concerto seemed to be ineffective for demonstrating timbral changes for the same musical idea. The children appeared unable to distinguish the timbre change which occurs when the theme of the Schumann A-minor Piano Concerto was played on piano and by orchestra. After trials with nine subjects, the example was dropped. It was evident that the students did not conserve the theme when the timbre was changed.

A second problem involved the confusion of pitch with timbre. For Criterion Measure 5 the same tone was sounded by four different sources. The G tone was sung by bass, soprano, and unchanged child voices, and played on piano. The instructions noted that three of the four sound sources had almost the same timbre. The learner was to choose the sound source with timbre quite different from the other three. The soprano, child voice, and piano tone were sounded on G above middle C, while the bass voice sang the tone an octave lower. A number of subjects said the bass tone was different, which indicated the pitch

differences were stronger to them than the timbre change. As revised, the bass voice was eliminated. Due to a technical problem a resonator bell replaced the piano tone.

Another problem observed was the difficulty children have in expressing themselves through writing. For Criterion Measure 6, the student was asked to list ways to use the same musical idea many times and still keep it interesting. Some of the student responses were

1. "Add other instruments."
2. "Use a different instrument."
3. "You can use diferent [sic] sound sources [sic]."
4. "Play it with other insenment [sic], difint [sic] voces [sic]."

One subject wrote "Play it differ [sic] ways." Later, when asked to amplify the response, the subject explained that she meant "to play it on bells, sing it, or play it on other instruments." In spite of the difficulties posed by this measure, the investigator felt it was worth retaining.

Several frames were rewritten to simplify vocabulary and to improve clarity of thought. Three criterion measures were deleted because they were unessential to measurement of student conceptual learning. One measure asked the student to identify the term "sound source." Another was to select the musical element which helps one to recognize the sounds made by different voices and instruments. A third measure was deleted because it asked the number of instruments in a quintet. A fourth criterion measure was dropped because it seemed to be too abstract for the fourth-grader. This measure was a true or false statement about the concept. An additional reason for deleting the four criterion measures was to shorten the length of the lesson.

Development of the Self-Instructional Unit on Intensity

The development phase of the intensity unit began with the selection of the following concepts:

> The intensity of musical sounds may stay about the same or change.
> Intensity may change suddenly or gradually in music.
> Musical sounds may change gradually from soft to loud or from loud to soft.

Based on the selected concepts, three lessons were developed in Portales from 1976 to 1978.

Lesson 1 begins with general instruction about sound and intensity. Sound, the narrator explains, is created by vibration and travels in sound waves from the sound source to the ears of the listener. Intensity is shown to depend on the amount of energy in the sound wave and the distance the sound wave must travel. Each of these points is related to an experience familiar to the child. Different levels of musical intensity are demonstrated by repeating a chord at different levels of loudness.

The response mode for several frames is to listen to a musical example and decide if the intensity changes or stays the same. In two frames, iconic illustrations give visual reinforcement to the aural impression received from the tape. Later the idea is introduced that intensity may change once, a few times, or many times during a musical composition. Following this, the pupil is asked to detect the frequency of intensity changes in several recorded musical examples.

Another response mode is to ask the child to perform different intensities on a sound source. First he is asked to vary the intensity only a few times during a ten-second period. Next he is instructed to

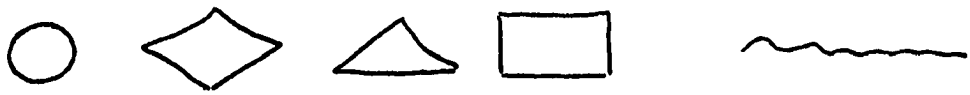
play for another ten seconds, changing the intensity many times.

Pilot trials conducted with the first sixteen subjects revealed the need for several revisions. In some cases, vocabulary terms were simplified. For example, "amount" and "distance" were changed to "how much" and "how far." Two criterion measures were deleted because the responses sought were more factual than conceptual.

Two changes were made to Criterion Measure 5. This measure concerned an original sound piece to be planned by the student and depicted in picture format on the answer sheet. The directions stated "Your picture must show whether the intensity stays the same or changes." Because some subjects were unsure about how to picture intensity, the booklet page was ammended with the following model.

Criterion Measure 5

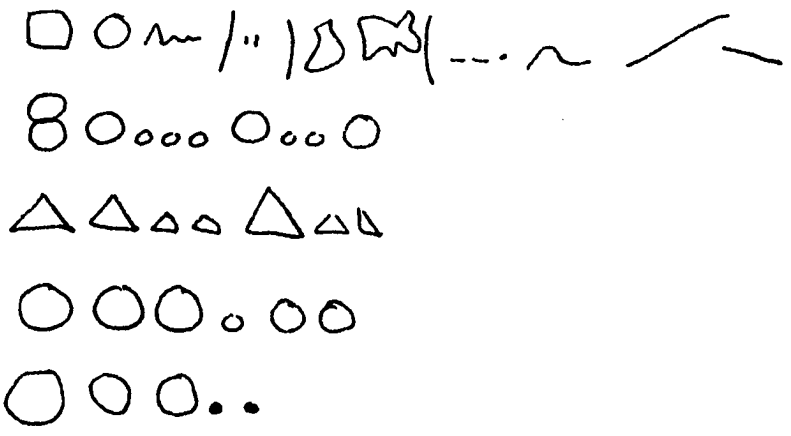
Use shapes or a wavy line to show loudness or softness.



The revision helped as little assistance was required by the remaining pilot study subjects. The responses given by seven subjects are shown below. Subject 3 used such a variety of shapes and sizes that the investigator felt the picture would need further explanation by the composer before the sound piece could be accurately played. The remaining six pictures clearly indicate the intent of the composers.

Subject 1 

2 

Subject 3 

4

5

6

7

At the conclusion of Criterion Measure 5, the student originally was instructed "show your picture to someone else. The two of you decide if your picture shows whether the intensity stays the same or changes." After a number of pilot trials, the investigator felt the evaluation could be enriched by requiring the sound piece to be played. The directions were revised to read "ask another person to play your sound piece. Count the question right if the other person thinks the picture shows when to play softly."

The lesson was administered to nine additional subjects in 1978. The students responded correctly to most of the lesson frames and criterion measures.

In Lesson 2, the difference between sudden and gradual changes in musical intensity is emphasized. Here the student is given opportunities to detect the type of changes heard in a number of musical examples played on the tape. Frame 4 illustrates the type of visual reinforcement which is supplied through iconic drawings in the lesson booklet (see next page).

In Frame 10 the musical example is "Pop, Goes the Weasel." The song lyrics are shown in the booklet and the melody is played on the

Frame 4

Intensity may change suddenly or gradually.

Sudden: intensity changes quickly from

soft to LOUD or from LOUD to soft.

Gradual: intensity changes more slowly, a little at a time.

Listen to the intensity of this music.

Does it change suddenly or gradually?

piano without changes of intensity. The narrator asks

> when you sing this song, do you use sudden or gradual changes of intensity? Would you start softly and suddenly change to loud, or would you start loudly and suddenly change to soft? Sing the song to yourself and answer these questions. Stop the tape.

A performance response mode is used again in Frame 12. Here the student is instructed to use his sound source to make gradual and sudden changes of intensity. The instructions include three steps.

1. Begin soft or loud. Change the intensity SUDDENLY.
2. Begin softly and GRADUALLY change to loud.
3. Begin loudly and GRADUALLY change to soft.

Pilot trials with fourteen subjects in 1976 helped the investigator to locate problem areas and refine the lesson for additional testing. At the conclusion of one pilot session, a subject said "that Beethoven music . . . was hard to tell." The example, "Fur Elise," was used in a frame in which the student was asked to decide whether the intensity stayed the same or changed. The investigator decided that the changes in the example were too subtle for the children to perceive. An excerpt from "Desert Water Hole" from Death Valley Suite by Grofe was

substituted. Subsequent subjects encountered no difficulty with the selection.

A direction was added to alleviate a problem with the sound source used by the student in Frame 12. Because some subjects continued to play with the sound sources after the frame was completed, the following statement was added: "Put your sound source down, out of the way. You will not need it for the rest of the lesson."

Several criterion measures were deleted in order to shorten the lesson and because they seemed unessential for testing the child's understanding of the concept. One criterion measure was dropped because a clear-cut answer was hard to establish. For this item, the student was asked to tell what kind of intensity changes he would use in music about the changing of the seasons. While the investigator believes the logical answer to be "gradual changes," two students chose "sudden" and the correctness of this response is defendable.

Instructions for grading Criterion Measures 8 and 9 were modified in order to require the student to seek reaction from the teacher. The original grading instructions were:

> Your pictures or designs may look something like the ones you see here. If you are working with someone else, ask the other person if the pictures show sudden and gradual changes.

The investigator believed it would be appropriate for the child to show his responses to the teacher since none of the lessons in the entire study require reaction or help from the teacher. The revised directions state: "Your pictures or designs may look something like the ones you see here. Show your pictures to the teacher."

The revised lesson was administered to nine additional fourth-

grade subjects in May 1978. No problems with the lesson were apparent, except that more time was needed at some points on the tape for student responses before the answer signal was sounded. Additional time was added to the tape at those locations before the onset of the formal study.

The central concept of Lesson 3 is "musical sounds may change gradually from soft to loud or from loud to soft." Specifically, the lesson seeks to teach the crescendo and decrescendo concepts and symbols. During the lesson the student listens to recorded musical examples in which one or both of these effects are demonstrated. A second type of instructional mode requires the student to make gradual changes of intensity with a sound source.

Pilot trials with eighteen subjects in 1977 helped the investigator to locate problems in the lesson. One problem involved finding and preparing taped musical examples which would accurately depict the desired intensity effect. Locating musical examples with obvious changes of intensity presented a challenge. In a great deal of music, including popular music, intensity changes are few, too subtle, or actually changes of timbre rather than intensity. The investigator believes it is important to prevent confusion between these two musical elements by providing only musical examples which clearly demonstrate the element being studied.

More specifically, the tape recorders available for the project were equipped with devices which automatically balanced loud and soft sounds in order to prevent noise distortion. While desirable for domestic, business, recreational, and other uses, this feature makes it

difficult to record music for the expressed purpose of illustrating changes in musical intensity. In addition, the investigator found that even some examples which were recorded on equipment without automatic volume control tended to be affected during playback on recorders with the automatic balancing device.

At one point it occurred to the investigator that the crescendo and decrescendo symbols could be compared to the "lesser than" and "greater than" symbols used in mathematics. These similarities were pointed out to six subjects as they studied Frame 4. Though it may have been coincidental, three of these subjects had the highest criterion measure scores in the 1977 pilot studies. The script for Frame 4 was amended to include the analogy between the mathematics and music symbols.

A number of changes were made to the criterion measures. Several measures which required cognitive type answers about the crescendo and decrescendo symbols were changed to listening questions. The total number of measures was reduced from ten to six in order to shorten the program and to avoid duplicity.

During May 1978 the lesson was administered to seven students, revealing the need for several additional revisions. For example, some reinforcement tasks were repeated more times than necessary and became boring to the students. Some of the repetitions were eliminated. In several cases booklet wording was revised to match the narration on the tape.

The investigator concluded that fourth-grade students are able to learn the concepts presented in the unit. Most children are able to identify different levels of intensity at an earlier age. Romanek found

that preschool children can learn concepts about loudness, softness, and gradual changes of intensity.[1] In accord with the spiral curriculum type of learning, however, these concepts are appropriate for fourth-grade children if presented at a more sophisticated level.

It was evident that most of the subjects had not previously thought, to any great extent, in terms of sudden or gradual changes of musical intensity. Particularly, it seemed that most of the subjects were not accustomed to making decisions about when to use sudden and gradual changes of intensity in musical performance. For example, many of the subjects in the pilot studies needed guidance from the investigator to think through their decisions for performing "Pop, Goes the Weasel." Some subjects made their decisions unconsciously as they performed, but were not sufficiently aware of what they had done to translate them into verbal descriptions.

Finally, the crescendo and decrescendo terms and signs were challenging to many students. The investigator believed that most of the subjects had not dealt with these terms and symbols prior to the study. The analogy to the equivalent mathematical symbols seemed to aid the students in conceptualizing the two signs for music.

Phase II (Formal Study)

Administration of the Units and Criterion Measures

The evaluation phase of the study was conducted in Portales during January and February 1979. The self-instructional units used in

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[1] Romanek, A Self-Instructional Program, p. 62.

this phase consisted of the final form of the printed and tape-recorded lessons and criterion measures which were developed in Phase I.

Subjects were administered the self-instructional lessons during the regular thirty-minute music class three times a week for six weeks, a total of eighteen sessions. An orientation session preceded the first instructional session for the purpose of training the children to use the tape recorders, headsets, lesson bookets, and answer sheets for the criterion measures.

Facilities and Equipment

The evaluation phase was conducted at James Elementary School in Portales. At the beginning of the 1978-79 term the Portales elementary schools were reorganized and all fourth-grade students were assigned to the James building. Because of crowded conditions the subjects studied the lessons in a corridor area in the fourth-grade wing of the building.

The master tapes were recorded on Teac 3340S and 2340S tape recorders using a low impedence Shure Dynamic microphone, Model 5855B. Maxell UD 3590 and Scotch Classic one mil tape in 1800 foot reels was used for recording the master tapes. The narration and musical examples were recorded on separate tracks at 7½ inches per second. An electronic sound was used as a signal for turning the lesson booklet pages. The signal consisted of a tone produced on a Media Master 400 Programer which was added to the master tapes.

The reel-to-reel tapes were dubbed on Scotch Low Noise-High Density Posi-Trak backed tapes using an Hitachi AVA 1000 cassette tape recorder. Two additional copies of each cassette tape were made on a Wollensak High-Speed Duplicator, Model 2772A. The students listened to

one set of the duplicated copies; the master and second cassette copy were reserved in case something would happen to the copy being used.

During the instructional sessions the tapes were played on Sharp Cassette Tape Players, Model RD 650 AVI. The subjects listened through Realistic Nova 10 Stereo Headphone sets which were altered to monaural tracking to match the mode of the tape players being used. All of the hardware (tape players and headphone sets) and software (tapes and booklets) items performed without malfunction during the formal study.

Posttest

An investigator-designed posttest, the Musical Concepts Measure, was used to measure the subjects' retention of the concepts and to compare their responses with a control group which had not studied the self-instructional units. The Musical Concepts Measure includes at least one representative item from each of the eighteen self-instructional lessons. Each question or task is alternative-equivalent to an item in the original lesson. In addition six items require the student to match names of the six musical elements with short descriptive statements which are used in the units to define the elements. Response modes include labeling, matching, multiple choice, and writing short answers of one or a few words. (The Musical Concepts Measure appears in Appendix B.)

Following the completion of Phase II (formal study), the Musical Concepts Measure was administered to the fifty-two subjects and to a control group of the same size. The Musical Concepts Measure was administered to the experimental group ten days after the last subjects had completed the series of eighteen lessons. This time lapse was necessary in order to allow several subjects to complete units who had been absent

because of illness. A period of ten days to seven weeks elapsed between the time the subjects studied the concepts and the posttest was administered. The subjects studied the units at different times in the six-week cycle thus the explanation for the time factor.

Summary

The study incorporated developmental as well as experimental research characteristics. It was developmental in that a series of pilot-testing/revision procedures was used to prepare the six self-instructional units (eighteen lessons) for the formal study. The study was experimental in that following the formal study an investigator-designed posttest, the Musical Concepts Measure, was administered to experimental and control groups to ascertain the effectiveness of the self-instructional units.

Fourth-grade students from extant classrooms as well as selected university students participated in the pilot studies. The formal study was conducted with 104 fourth graders, fifty-two each in experimental and control groups, during January and February 1979 in Portales, New Mexico.

The self-instructional units consisted of lessons based on concepts pertaining to the musical elements of pitch, rhythm, timbre, texture, intensity, and structure. Each lesson was presented through a cassette tape and lesson booklet utilizing linear-type programed instruction. At the conclusion of each lesson a series of criterion measures examined the student's learning of the concept. Each criterion measure was referenced to one of the lesson's stated behavioral objectives.

Observation during the pilot tests provided information on the

appropriateness of the concepts, self-instructional learning procedures which were effective with fourth-graders, and the efficacy of lesson format, timing, and clarity. Pilot testing revealed that a number of criterion measures in Lessons 1 and 2 of the pitch unit were too abstract for the cognitive development of some fourth graders. These measures were relabled BRAIN BUSTERS and offered on an extra-credit basis. Concepts taught in the pitch unit include the effect of a vibrating body's length on its pitch and melodic sequence.

The texture unit instructs the student about monophonic, homophonic, and polyphonic textures. Musical examples in the unit typify those encountered in fourth-grade music education materials. Iconic illustrations provide concrete representations of the aural musical examples.

Musical concepts about structure teach that phrases in a song may be the same, almost the same, or different. Simple songs containing two to four phrases proved to be the most effective musical examples for the structure unit.

In the rhythm unit, Lesson 1 emphasizes that beat rhythm and melodic rhythm can be felt and heard. Lessons 2 and 3 illustrate that melodic tones may sound with the beat, longer than the beat, or shorter than the beat.

Concepts about timbre instruct that the material in a sound source affects timbre, that a sound source may produce more than one timbre, and that the same musical idea has a different timbre when it is produced on another sound source. A variety of timbres are heard on the tapes and the student produces others from sound sources found in

the learning environment.

The intensity concept lessons provide experiences for learning that intensity may stay about the same or change and that intensity may change gradually from soft to loud or from loud to soft. Learning modes include performance with percussion instruments and the composition of simple sound pieces to demonstrate intensity changes.

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

This chapter presents and analyzes statistical data from Phase II and from an investigator-designed posttest, the Musical Concepts Measure. Included are results of the posttest administered to the experimental and control groups. Also included are analyses of the incorrect criterion measure responses incurred by the subjects in the experimental group as they studied the self-instructional units.

Results of the Posttest

Following the completion of Phase II the Musical Concepts Measure was administered to fifty-two subjects in the experimental group and to fifty-two students in the control group. Statistical procedures employed for analyzing the posttest data included (1) computation of means and standard deviations, (2) computation of unpaired t-tests between the experimental and control group means in order to determine the effectiveness of the self-instructional units in developing the behavioral objectives, (3) computation of the Mann-Whitney U test to determine whether the two groups were taken from the same population, (4) an estimate of the reliability of the test by both the split-half and internal consistency methods, (5) an analysis of individual subject's incorrect responses to

the Musical Concepts Measure, (6) item analysis of incorrect responses to the Musical Concepts Measure, and (7) an analysis of incorrect responses to the Musical Concepts Measure by musical elements.

Means and Standard Deviations

Means and standard deviations of the Musical Concepts Measure appear in Table 1. Twenty-nine responses were required to complete the test.

For the experimental group the range of scores in the posttest was from six to twenty-seven. Converted to percentages, the range was from 20.689 percent to 93.103 percent. The range of scores for the control group was from three to twenty-two. Converted to percentages, this range is from 10.344 percent to 75.872 percent. (The raw data for the Musical Concepts Measure are shown in Appendix C.)

Table 1

Mean and Standard Deviations of the Musical Concepts Measure

Group	Mean	%	Standard Deviation
Experimental	15.154	52.255	4.7748
Control	11.827	40.783	4.1808

Tests for Significance of Differences Between Means

The experimental group's mean score was higher than the control group's mean score. To determine whether this mean score difference was statistically significant, a t test was employed. Campbell and Stanley suggest that the posttest-only control group design is perhaps the only

setting for which the t test is optimal.[1] Madsen and Madsen state also that the t test is appropriate for the two-sample design.[2] The results of the t-test for determining the significance level between posttest means are shown in Table 2.

Table 2

Comparison of Posttest Scores

Group	n	Mean Post-test Score	$\bar{D}$ (=$\bar{E}$-$\bar{C}$)	t	P
Experimental	52	15.154	3.327	2.85	$<.005$
Control	52	11.827			

The null hypothesis stated that there would be no significant difference, at the .01 level of confidence, between the mean posttest scores of subjects who study the self-instructional units and subjects who do not study the units. Consultation with a table of t values reveals that a t value with 102 degrees of freedom must be 2.33 or higher in order to be significant at the .01 level. Since the obtained t value (2.85) was actually significant beyond the .005 level, the null hypothesis was rejected. The level of significance attained indicates that the self-instructional units were effective in developing the stated behavioral objectives as measured by the Musical Concepts Measure.

As a further measure of determining whether the mean score

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[1]Campbell and Stanley, Experimental and Quasi-Experimental Designs for Research, p. 26.

[2]Clifford K. Madsen and Charles H. Madsen, Jr., Experimental Research in Music (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1970), p. 81.

differences were significant, the data were submitted to the Mann-Whitney U test. Siegel observes that this test may be used to ascertain whether two independent groups (experimental and control) have been drawn from the same population. Siegel writes that "this is one of the most powerful of the nonparametric tests, and it is a most useful alternative to the parametric t test when the researcher wishes to avoid the t test's assumptions." The Mann-Whitney U large-sample formula was used, including the correction for ties. A z score of 2.3263 or higher is necessary for significance at the .01 level. The obtained z score of 3.296 is significant beyond the .0005 level of confidence, thereby strongly supporting the rejection of the null hypothesis.[2]

Because the levels of significance indicated by the t test and the Mann-Whitney U test were so close, the investigator believes the difference in the results can be attributed to the strengths of the post-test rather than to the data.

Reliability

The reliability of the Musical Concepts Measure was estimated by submitting the data to both the Spearman-Brown and Kuder-Richardson 20 formulas. The Spearman-Brown formula is a split-half method in which test items are divided into odd and even item numbers and scores on the two half tests are correlated.[3] The Kuder-Richardson 20 formula, which

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[1]Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Company, 1956), p. 116.

[2]Guilford and Fruchter, Fundamental Statistics, p. 513.

[3]Jum C. Nunally, Psychometric Theory (New York: McGraw-Hill Book Company, 1967), p. 213.

according to Guilford and Fruchter is the "most accurate of the practical K-R formulas,"[1] estimates reliability based on the internal consistency or the average correlation among the items within a test.[2] Guilford and Fruchter state that both methods make the same assumptions.[3] Cronbach suggests that both types of reliability are important and presents an example in which the results from the Spearman-Brown and Kuder-Richardson 20 formulas are nearly identical.[4] The reliability of the test is established when these two measures are nearly equal and when each is high.

A reliability coefficient of.84 was obtained for the Musical Concepts Measure through computation of the Spearman-Brown formula. Nunally suggests that the split-half method may be employed "when the items are scored not dichotomously but on three or more points."[5] Twenty-six of the twenty-nine test items were multiple choice with three or more choices.

When the Kuder-Richardson 20 formula was applied to the data a reliability coefficient of .77 was obtained. Guilford and Fruchter note that the Kuder-Richardson 20 formula is appropriately applied only when test items are scored dichotomously.[6] In the present case dichotomous

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[1]Guildord and Fruchter, Fundamental Statistics, p. 427.

[2]Nunally, Psychometric Theory, p. 211.

[3]Guilford and Fruchter, Fundamental Statistics, p. 427.

[4]Lee J. Cronbach, Essentials of Psychological Testing, 3d ed. (New York: Harper and Row Publishers, 1970), p. 161.

[5]Nunally, Psychometric Theory, p. 214.

[6]Guilford and Fruchter, Fundamental Statistics, p. 428.

scoring was interpreted to mean that the test item was answered correctly or incorrectly.

Individual Subject's Incorrect Responses

The analysis of individual subject's incorrect responses to the Musical Concepts Measure is shown in Table 3 (see page 118). Twenty-nine responses are required to complete the test. Table 3, based on fifty-two subjects each in the experimental and control groups, shows the range of incorrect responses for the experimental group to be from two to twenty-three. Converted to percentages, this is an error rate of 6.897 to 79.310 percent. The mean error rate for the experimental group was 13.846 incorrect responses or 47.738 percent. Table 3 shows the error rate for the control group to be from seven to twenty-six. When converted to percentages, the error rate ranges from 24.138 to 89.655 percent. Mean error rate for the control group was 17.173 incorrect responses or 59.218 percent.

Item Analysis of Incorrect Responses

An item analysis of incorrect responses to the Musical Concepts Measure is shown in Table 4 (see page 120). The test contains twenty-nine items. Table 4 reveals the number of incorrect responses and the mean error rate of each item for the experimental and control groups. For the experimental group, the error rate ranges from one (Item 4) to forty-three (Item 13) errors. Converted to percentages, the error rate is from 1.923 to 82.692 percent. Errors in the control group range from two (Item 2) to forty-eight (Item 27). When converted to percentages,

Table 3

Analysis of Individual Subject's Incorrect Responses to the Musical Concepts Measure

Subject	Experimental Group		Control Group	
	Number of Incorrect Responses	Error Rate (%)	Number of Incorrect Responses	Error Rate (%)
1	19	65.517	15	51.724
2	19	65.517	15	51.724
3	15	51.724	15	51.724
4	16	55.172	17	58.621
5	17	58.621	16	55.172
6	17	58.621	23	79.310
7	14	48.276	7	24.138
8	7	24.138	9	31.035
9	4	13.793	14	48.276
10	14	48.276	13	44.828
11	2	6.897	26	89.655
12	10	34.483	19	65.517
13	19	65.517	20	68.966
14	5	17.241	19	65.517
15	10	34.483	14	48.276
16	19	65.517	21	72.414
17	17	58.621	22	75.862
18	17	58.621	20	68.966
19	19	65.517	19	65.517
20	16	55.172	19	65.517
21	16	55.172	17	58.621
22	12	41.379	20	68.966
23	15	51.724	17	58.621
24	11	37.931	18	62.069
25	15	51.724	7	24.138
26	8	27.586	17	58.621
27	15	51.724	16	55.172
28	11	37.931	20	68.966

Table 3 (continued)

Subject	Experimental Group		Control Group	
	Number of Incorrect Responses	Error Rate (%)	Number of Incorrect Responses	Error Rate (%)
29	21	72.414	10	34.483
30	13	44.828	18	62.069
31	14	48.276	19	65.517
32	16	55.172	13	44.828
33	23	79.310	16	55.172
34	18	62.069	22	75.862
35	17	58.621	20	68.966
36	10	34.483	20	68.966
37	18	62.069	22	75.862
38	15	51.724	15	51.724
39	7	24.138	12	41.379
40	13	44.828	15	51.724
41	22	75.862	17	58.621
42	3	10.345	19	65.517
43	10	34.483	21	72.414
44	17	58.621	23	79.310
45	16	55.172	17	58.621
46	16	55.172	10	34.483
47	16	55.172	15	51.724
48	13	44.828	19	65.517
49	13	44.828	25	86.207
50	10	34.483	19	65.517
51	12	41.379	13	44.828
52	8	27.586	18	62.069
	M = 13.846	M = 47.738	M = 17.173	M = 59.218

Table 4

Item Analysis of Incorrect Responses to the Musical Concepts Measure

Item	Experimental Group		Control Group	
	Number of Incorrect Responses	Error Rate (%)	Number of Incorrect Responses	Error Rate (%)
1	20	38.462	33	63.462
2	4	7.692	2	3.846
3	20	38.462	33	63.462
4	1	1.923	4	7.692
5	26	50.000	32	61.539
6	27	51.923	32	61.539
7	18	34.615	24	46.154
8	6	11.539	10	19.231
9	31	59.615	43	82.692
10	33	63.462	43	82.692
11	42	80.769	43	82.692
12	3	5.769	9	17.308
13	43	82.692	47	90.385
14	24	46.154	25	48.077
15	25	48.077	19	36.539
16	25	48.077	30	57.692
17	21	40.385	27	51.923
18	22	42.308	32	61.539
19	20	38.462	28	53.846
20	23	44.231	28	53.846
21	33	63.462	44	84.615

Table 4 (continued)

Item	Experimental Group		Control Group	
	Number of Incorrect Responses	Error Rate (%)	Number of Incorrect Responses	Error Rate (%)
22	20	38.462	41	78.846
23	29	55.769	37	71.154
24	34	65.385	29	55.769
25	30	57.692	29	55.769
26	33	63.462	43	82.692
27	40	76.923	48	92.308
28	35	67.308	39	75.000
29	32	61.539	38	73.077
	M = 24.828	M = 47.745	M = 30.759	M = 59.151

the error rate is from 3.846 to 92.308 percent. Mean error rates for the posttest items are 24.828 incorrect responses and 47.745 percent for the experimental group, and 30.759 incorrect responses and 59.151 percent for the control group.

Incorrect responses approximated the same level for the experimental and control groups on three posttest items: 11, 14, and 25. Item 11 asks "Why do sounds made with glass and with paper sound different? Write your answer in a few words." The high error rate of 80.769 percent by the experimental group and 82.692 percent by the control group indicates the ineffectiveness of this test item. The investigator believes the error rate would have been lower if Item 11 had been stated as a multiple choice question. It appears to be difficult for many fourth

grade students to formulate answers and express them in written form.

For Item 14, the student was asked to match the term "monophonic texture" with the correct answer, a definition of the term along with an iconic representation (a single line). This item received incorrect responses from 46.154 percent of the experimental group and 48.007 percent of the control group. The majority of subjects who missed the item matched the term "monophonic texture" to the definition/iconic diagram for polyphonic texture. The rationale for such a choice is unclear.

Item 25 drew incorrect responses from 57.692 percent of the experimental group and 55.769 percent of the control group. For this item, the term "rhythm" was to be matched with its definition, "beat and movement of the music." Item analysis showed that, of the subjects in both groups who missed the item, most matched rhythm with the definition for intensity (loud and soft). The next most frequently chosen response was the definition for texture (the number of layers of sound we hear at the same time). Because the incorrect responses are distributed fairly evenly among the alternative choices, it appears that the errors resulted from guessing rather than because of confusion between terms.

Items 24-29 required the subject to match the names of the musical elements with the correct definitions. The error rate for the six items ranged from 57.692 to 76.923 percent for the experimental group and from 55.769 to 92.308 percent for the control group. The high error rate for both groups reflects, the investigator believes, the fact that the items are of an abstract-verbal nature, definitions of the elements themselves, rather than concepts about the musical elements illustrated with audio and/or visual examples.

Analysis of Incorrect Responses by Musical Elements

An analysis of incorrect responses to the Musical Concepts Measure by musical elements appears in Table 5 (see page 124). The error rate for the experimental group ranges from 36.058 percent on pitch-related items to 58.173 percent for timbre items. Control group errors range from 45.433 percent on the pitch items to 76.923 percent for those pertaining to structure.

The order of difficulty among the musical elements for the two groups is of some interest. For the experimental group, the easy-to-hard order is pitch, intensity, rhythm, texture and structure tying for fourth and fifth places, and timbre. Order of difficulty for the control group is pitch, texture, intensity, rhythm, timbre, and structure. Both groups scored highest on the pitch-related items. The elements of structure and timbre were among the most difficult for both groups. Texture items tied with structure for fifth and sixth place in difficulty for the experimental group, but was second easiest for the control group. Intensity items were slightly easier than rhythmic problems for both groups.

Comparison of Incorrect Responses

To gain further information about the effectiveness of the self-instructional units, a comparison was made between incorrect responses to the unit criterion measures and the corresponding musical element items on the Musical Concepts Measures as answered by the experimental group subjects. Table 6 (see page 125) shows the difficulty order of the criterion measures and Musical Concepts Measure items as related to

Table 5

Analysis of Incorrect Responses to the Musical Concepts Measure by Musical Elements

				Experimental Group		Control Group	
Related Musical Element	MCM Item Numbers	Number of Related MCM Responses	Total Responses Possible[a]	Number or Incorrect MCM Responses	Error Rate (%)	Number of Incorrect MCM Responses	Error Rate (%)
Pitch	1-7, 24	8	416	150	36.058	189	45.433
Rhythm	8-10, 25	4	208	100	48.077	125	60.096
Timbre	11-13, 26	4	208	121	58.173	142	68.269
Texture	14-16, 27	4	208	114	54.808	122	58.654
Intensity	17-20, 28	5	260	121	46.538	154	59.231
Structure	21-23, 29	4	208	114	54.808	160	76.923
	Totals	29	1508	720	298.462	892	368.606
					M = 49.744		M = 61.434

[a]Number of Musical Concepts Measure responses times fifty-two subjects.

Table 6

Difficulty Order of Musical Elements

Level of Difficulty	Self-Instructional Unit Criterion Measures	Musical Concepts Measure
Least Difficult	1. Intensity	1. Pitch
↓	2. Timbre	2. Intensity
	3. Structure	3. Rhythm
	4. Rhythm	4-5. Structure/Texture (tie)
	5. Pitch	
Most Difficult	6. Texture	6. Timbre

the musical elements.

Examination of Table 6 reveals that although the order of difficulty changed for all elements, only those of pitch and timbre changed to any great extent. For the criterion measures, the element of timbre was second easiest while pitch was next to the most difficult. On the Musical Concepts Measure, the element of pitch appears to have been the easiest element for the students and timbre, the most difficult element. While the remaining four elements changed in the order of difficulty, none changed more than one level in either direction on the Musical Concepts Measure as compared to the criterion measures.

Analysis of the Self-Instructional Lesson Criterion Measures

Each of the eighteen self-instructional lessons concludes with a series of criterion measures designed to provide an immediate assessment of the student's learning. Following the completion of the study, incorrect responses given by subjects to the criterion measures were analyzed for the purpose of locating strengths and weaknesses in the

units and to aid in subsequent revisions of the self-instructional units. The following data are presented in this section: analysis of individual subject's incorrect responses and analysis of incorrect responses by units and lessons including item analysis of incorrect responses to individual criterion measure items.

Individual Subject's Incorrect Responses

The analysis of individual subject's incorrect responses for the six units appears in Table 7 (see page 127). Completion of the six units required 103 criterion measure responses from the subject. An additional nine responses were possible for subjects who elected to answer the Brain Busters in Lessons 1 and 2 of the pitch unit. Table 7, based on the minimal 103 responses, shows the range of incorrect responses to be from zero to fifty-nine. Converted to percentages, this is an error rate of 0 to 57.282 percent. The mean error rate for the six units was twenty-one incorrect responses or 20.370 percent.

Table 8 (see page 129) contains the error rate based on the total number of criterion measure responses made by each subject. Five of the fifty-two subjects made the basic 103 responses, electing not to try any of the nine extra-credit Brain Busters for Lessons 1 and 2 of the pitch unit. Fourteen subjects made 108 responses, the basic 103 plus the five Brain Busters for Lesson 1. Four subjects responded to 107 items which included the initial 103 measures plus the four Brain Busters for Lesson 2. Twenty-nine subjects responded to the entire 112 criteria, the basic 103 items plus the nine extra-credit measures. Examination of Table 8 reveals that the error rates range from 0 percent

Table 7

Analysis of Individual Subject's Incorrect Responses for the Six Units Based on 103 Responses

Subject	Number of Incorrect Responses	Error Rate (%)
1	34	33.010
2	29	28.155
3	29	28.155
4	29	28.155
5	36	34.951
6	46	44.660
7	16	15.534
8	6	5.825
9	6	5.825
10	35	33.981
11	8	7.767
12	32	31.068
13	37	35.922
14	8	7.767
15	16	15.534
16	31	30.097
17	24	23.301
18	41	39.806
19	33	32.039
20	31	30.097
21	18	17.478
22	8	7.767
23	20	19.417
24	6	5.825
25	4	3.883
26	12	11.650
27	6	5.825
28	23	22.330
29	59	57.282

Table 7 (continued)

Subject	Number of Incorrect Responses	Error Rate (%)
30	33	32.039
31	23	22.330
32	9	8.738
33	26	25.243
34	13	12.621
35	15	14.563
36	0	0.000
37	2	1.942
38	23	22.330
39	30	29.126
40	19	18.447
41	44	42.718
42	5	4.854
43	11	10.680
44	35	33.981
45	28	27.184
46	22	21.359
47	17	16.505
48	13	12.621
49	12	11.650
50	6	5.825
51	13	12.621
52	9	8.738
	M = 21	M = 20.370

Table 8

Analysis of Individual Subject's Incorrect Responses for the Six Units Based on Number of Responses Attempted

Subject	Number of Responses Attempted	Number of Incorrect Responses	Error Rate (%)
1	108	38	35.185
2	108	30	27.778
3	108	29	26.852
4	112	29	25.893
5	108	36	33.333
6	112	52	46.429
7	112	18	16.071
8	112	7	6.250
9	112	6	5.357
10	112	42	37.500
11	112	8	7.143
12	108	32	29.630
13	112	41	36.607
14	112	7	6.250
15	112	19	16.964
16	103	31	30.097
17	107	26	24.299
18	103	41	39.806
19	103	36	33.333
20	112	37	33.036
21	112	26	23.214
22	112	8	7.143
23	112	22	19.643
24	107	6	5.607
25	112	4	3.571
26	108	12	11.111
27	108	6	6.556
28	108	23	21.296
29	107	60	56.075

Table 8 (continued)

Subject	Number of Responses Attempted	Number of Incorrect Responses	Error Rate (%)
30	107	36	34.951
31	112	31	27.679
32	112	10	8.929
33	112	32	28.571
34	112	15	13.393
35	112	15	13.393
36	103	0	0.000
37	103	2	1.942
38	108	27	25.000
39	103	30	29.126
40	108	23	21.296
41	108	46	42.593
42	112	5	4.464
43	112	11	9.821
44	108	37	34.259
45	112	32	28.571
46	108	25	23.148
47	112	18	16.071
48	112	15	13.393
49	112	15	13.393
50	112	6	5.357
51	112	13	11.607
52	112	11	9.821
		M = 22.827	M =20.939

to 56.075 percent. The mean error rate for these scores is 22.827 errors or 20.939 percent.

An analysis of the individual subject's incorrect responses to the criteria measures for the eighteen lessons is shown in Appendix D. The Brain Buster criteria errors are listed separately for Lessons 1 and 2 of the pitch unit.

Incorrect Responses by Units and Lessons; Item Analysis of Individual Measures

Incorrect responses for the six units are analyzed in Table 9 (see page 132). Table 9 shows the total number of incorrect responses for the six units to be 1083 or 20.042 percent, based on 103 responses, and 1174 or 20.244 percent, when responses to the pitch unit Brain Busters are included. The mean error rates range from 16.290 percent for the intensity unit to 24.301 percent for the texture unit. The error rate for the pitch unit was 22.115 percent without the Brain Busters, 26.225 percent on the Brain Buster criterion measures alone, and 23.325 percent if the Brain Busters are included.

The variation in the error rates for the units is of interest. It appears that the subjects had less difficulty with the criterion measures for the timbre, intensity, and structure units than for those of pitch, rhythm, and texture.

An analysis of incorrect responses by lessons in the six units appears in Table 10 (see page 133). The mean error rates of individual lessons provide the basis for a number of conclusions.

In the pitch unit the criterion responses for Lesson 2 had a lower mean error rate (16.026 percent) than those for Lesson 1 (20.385

Table 9

Analysis of Incorrect Responses to Criterion Measures by Units

Unit	Number of Responses in Each Unit	Number of Responses[a]	Number of Incorrect Responses	Error Rate (%)
Pitch	16	832	184	22.115
(Brain Busters)	9	347	91	26.225
	25	1179	275	23.325
Rhythm	15	780	167	21.410
Timbre	17	884	159	17.986
Texture	22	1144	278	24.301
Intensity	17	884	144	16.290
Structure	16	832	151	18.149
Totals	103	5356	1083	20.042
(With Brain Busters)	112	5703	1174	20.244

[a]Total number of responses in each unit multiplied by fifty-two subjects.

Table 10

Analysis of Incorrect Responses to Criterion Measures by Lessons

Lesson	Musical Element	Number of Responses in Each Lesson		Number of Responses a	b	Number of Incorrect Responses b		Mean Error Rate (%)	
1	Pitch	5	(5)[c]	260	215	53	50	20.385	23.256
2	Pitch	6	(4)[c]	312	132	50	41	16.026	31.061
3	Pitch	5		260		81		31.154	
1	Rhythm	5		260		44		16.923	
2	Rhythm	5		260		39		15.000	
3	Rhythm	5		260		84		32.308	
1	Timbre	5		260		20		7.692	
2	Timbre	4		312		70		22.436	
3	Timbre	6		312		69		22.115	
1	Texture	8		416		110		26.442	
2	Texture	6		312		60		19.231	
3	Texture	8		416		108		25.962	
1	Intensity	5		260		35		13.462	
2	Intensity	6		312		63		20.192	
3	Intensity	6		312		46		14.744	
1	Structure	6		312		43		13.782	
2	Structure	5		260		47		18.077	
3	Structure	5		260		61		23.462	

[a]Total number of responses in each lesson multiplied by fifty-two subjects.

[b]Brain Buster responses.

[c]Number of Brain Buster responses in each lesson.

percent). The error rate for Lesson 2 may have been lower because instruction was centered on the same concept taught in Lesson 1. The high error rate for Lesson 3 (31.154 percent) suggests that the subjects had more difficulty conceptualizing melodic sequence than the length of a vibrating body as a pitch causal factor, taught in Lessons 1 and 2. The high number of mistakes for the Lesson 3 criterion measures may be explained in light of the fact that many subjects were preoccupied playing the resonator bells during the lesson. As a result, these subjects probably did not give close attention to recorded instructions.

For the rhythm unit, the error rate was twice as high for Lesson 3 (32.308 percent) as for Lessons 1 (16.923 percent) and 2 (15.000 percent). Thus it appeared to be harder for the subjects to conceptualize melody tones shorter than the beat (such as eighth notes) than melody tones having the same length as the beat (quarter notes) or longer than the beat (half notes).

Data for the timbre unit suggests that the subjects had little difficulty with their responses to criterion measures relating to the Lesson 1 concept ("The timbre of a sound depends on the material in the sound source"). The concepts for Lessons 2 and 3 seemed to be more difficult ("A sound source may produce more than one timbre" and "The same musical idea will have a different timbre when it is produced on another sound source").

Criterion Measure 6 in Lesson 3 of the timbre unit received the highest error rate (55.769 percent) in the unit and for the entire six units (see Table 11, page 136). This measure asked the subject to explain in his own words how one could use the same musical idea many

Table 11

Item Analysis of Incorrect Responses by Criterion Measure Items

C.M. Item	Number of Errors	Mean Error Rate (%)	C.M. Item	Number of Errors	Mean Error Rate (%)
Pitch 1			Rhythm 1		
1	10	19.231	1	8	15.385
2	12	23.077	2	9	17.308
3	13	25.000	3	11	21.154
4	7	13.462	4	8	15.385
5	11	21.154	5	8	15.385
	(Brain Busters)				
6	11	25.581			
7	11	25.581			
8	8	18.605			
9	12	27.907			
10	8	18.605			
Pitch 2			Rhythm 2		
1	8	15.385	1	7	13.462
2	4	7.692	2	11	21.154
3	2	3.846	3	5	9.615
4	11	21.154	4	8	15.385
5	4	7.692	5	8	15.385
6	21	40.385			
	(Brain Busters)				
7	9	27.273			
8	11	33.333			
9	12	36.364			
10	9	27.273			
Pitch 3			Rhythm 3		
1	20	38.462	1	20	38.462
2	13	25.000	2	24	46.154
3	10	19.231	3	17	32.692
4	17	32.692	4	14	26.923
5	21	40.385	5	9	17.308

Table 11 (continued)

C.M. Item	Number of Errors	Mean Error Rate (%)	C.M. Item	Number of Errors	Mean Error Rate (%)
Timbre 1			Texture 1		
1	1	1.923	1	12	23.077
2	1	1.923	2	15	29.846
3	2	3.846	3	10	19.231
4	4	7.692	4	19	36.538
5	12	23.077	5	15	28.846
			6	11	21.154
			7	17	32.692
			8	11	21.154
Timbre 2			Texture 2		
1	7	13.462	1	9	17.308
	8	15.385	2	9	17.308
	10	19.231	3	12	23.077
2	19	36.538	4	13	25.000
3	15	28.846	5	12	23.077
4	11	21.154	6	5	9.615
Timbre 3			Texture 3		
1	13	25.000	1	10	19.231
2	1	1.923	2	5	9.615
3	16	30.769	3	23	44.231
4	4	7.692	4	15	28.846
5	6	11.538	5	17	32.692
6	29	55.769	6	13	25.000
			7	15	28.846
			8	10	19.231
Intensity 1			Structure 1		
1	4	7.692	1	2	3.846
2	7	13.462	2	1	1.923
3	9	17.308	3	7	13.462
4	7	13.462	4	6	11.538
5	8	15.385	5	13	25.000
			6	14	26.923

Table 11 (continued)

C.M. Item	Number of Errors	Mean Error Rate (%)	C.M. Item	Number of Errors	Mean Error Rate (%)
Intensity 2			Structure 2		
1	6	11.538	1	1	1.923
2	9	17.308	2	14	26.923
3	9	17.308	3	10	19.231
4	11	21.154	4	17	32.692
5	19	36.538	5	5	9.615
6	20	38.462			
Intensity 3			Structure 3		
1	5	9.615	1	2	3.846
2	6	11.538	2	12	23.077
3	3	5.769	3	19	36.538
4	9	17.308	4	17	32.692
5	12	23.077	5	11	21.154
6	11	21.154			

times in a musical piece without boring the listener. The correct response was, in effect, "to have different sound sources play it, or use different voices, instruments or objects, or change the timbre." Many subjects did not even attempt to respond and others were unable to write a logical answer. The investigator believes the error rate would have been lower had the response been put into the form of multiple choice answers.

The highest mean error rate (24.301 percent) occurred in the texture unit (see Table 9, page 132). This fact lends support to the belief of music educators such as Nye and Nye that texture and the harmonic sense are more difficult for children to comprehend than rhythm and pitch. Nye and Nye suggest that "the ability to hear and sing

harmonically develops between the ages of nine and thirteen."[1] Most of the subjects were nine or ten years old, at the bottom of the age range suggested by Nye and Nye.

Table 10 (see page 133) shows that the highest mean error rate (26.442 percent) of the texture unit occurred in Lesson 1 which dealt with monophonic texture. Four criteria in Lesson 1 received mean error rates of twenty-nine to thirty-seven percent (see Table 11, page 136). Three of these measures required the subject to listen to a musical example and indicate if the texture was monophonic or to tell if the music had one or more-than-one layer of sound. The other measure asked if the student's classmates would produce monophonic texture by singing a melody with guitar accompaniment or without accompaniment.

Lesson 2, which taught about homophonic texture, seemed easier than Lessons 1 and 3. It had the lowest mean error rate, 19.231 percent (see Table 10, page 133).

Lesson 3, about polyphonic texture, had a mean error rate of 25.962 percent. Criterion Measure 3, alone, had an error rate of 44.231 percent (see Table 11, page 136). For this measure, the subject is asked to write, in a few words, what he would ask his classmates to do in order to sing with polyphonic texture. It seemed difficult, if not impossible, for many children to express an answer. Four other measures (4, 5, 6, and 7) received error rates of twenty-five to thirty-three percent. One of these requires the student to listen to a polyphonic musical example (partner songs) and then match it with one of three iconic

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[1]Nye and Nye, Music in the Elementary School, pp. 404-405.

designs shown in the booklet. The remaining three high-error criteria require the student to match illustrated iconic designs with the terms "monophonic," "homophonic," or "polyphonic" texture.

For the intensity unit, Table 10 (see page 133) reveals that Lesson 2 had a higher mean error rate (20.192 percent) than either Lesson 1 (13.462 percent) or Lesson 3 (14.744 percent). It appears that the subjects found it difficult in Lesson 2 to distinguish between sudden and gradual changes of intensity. In Lesson 1, the subject listens to whether the intensity changes or stays the same, while in Lesson 3, the learning task is to detect whether the intensity changes gradually from soft to loud or from loud to soft.

Table 10 (see page 133) shows that the mean error rates for the structure unit lessons (13.782 percent, 18.077 percent, and 23.462 percent) suggest that the lesson material became progressively difficult for the subjects. The high error rates for the Lesson 3 criterion measures probably can be attributed to the identification of the C-type phrases in a song with ABCC form. Although five lesson frames concentrate on the C-type phrase, thirty-five percent of the subjects responded incorrectly to the two measures which deal with this phrase type. In contrast, error rates for the A and B phrases of the same song were 3.846 and 23.077 percent.

Table 11 (see page 135) reflects the item analysis of incorrect responses by individual criterion measure items. Shown in the table are the number of errors and the mean error rate for each measure. The range of these data is from one to twenty-nine incorrect responses and the corresponding error rates of 1.923 percent to 55.769 percent.

Summary

Analysis of the data provided by the subjects' responses to the Musical Concepts Measure indicated that the posttest was reliable and that the experimental subjects' scores were significantly higher than those of the control group. Reliability coefficients of .84 and .77 were computed for the Spearman-Brown and Kuder-Richardson 20 formulas, respectively. The significant difference between scores of the two groups was determined through both the t test and the Mann-Whitney U test, showing that the self-instructional units studied by the experimental group were effective in developing the stated behavioral objectives.

Analysis of individual subjects' incorrect responses to the Musical Concepts Measure disclosed an error rate for the experimental group ranging from 7 to 79 percent with a mean error rate of 47.738 percent. For the control group, the error rate ranged from 24 to 90 percent, with a mean error rate of 59.218 percent.

Item analysis of incorrect responses to the Musical Concepts Measure showed the error rates for individual test items incurred by both experimental and control groups. Three items received the same number of incorrect responses from both groups.

An analysis of incorrect responses to the Musical Concepts Measure by musical elements showed the order of difficulty (from least difficult to most difficult) for the experimental group to be pitch, intensity, rhythm, texture/structure, and timbre. For the control group, the order was pitch (least difficult), texture, intensity, rhythm, timbre, and structure.

Examination of the experimental group data revealed that timbre

items were among the least difficult on the unit criterion measures but were the most difficult on the Musical Concepts Measure. Pitch scores changed from next to most difficult on the criterion measures to least difficult on the Musical Concepts Measure. The other four elements changed slightly in the order of difficulty but not more than one level in either direction.

The experimental subjects' responses to the criterion measures for the self-instructional units yielded data about the effectiveness of the lessons. Individual scores ranged from 44 to 100 percent with a mean score of 80 percent.

Analysis of incorrect responses by units indicated that the intensity unit was least difficult followed in order by timbre, structure, rhythm, pitch, and texture, the most difficult. Perusal of the mean scores for individual lessons revealed different results in several cases. For example, Lesson 3 of the pitch unit seemed to be particularly hard for the subjects (error rate: 31.154 percent), compared to Lesson 1 (error rate: 20.385 percent) and Lesson 2 (error rate: 16.026), and affected the difficulty ranking of the pitch unit.

Lessons 1 and 2 of the rhythm unit had error rates of 15 to 17 percent. The 32.308 percent error rate for Lesson 3 made rhythm appear to be one of the more difficult musical elements when the difficulty actually was with Lesson 3.

The investigator believes the overall mean score of 80 percent shows the effectiveness of the self-instructional units. Further revisions to several criterion measure items would likely improve the efficacy of the materials to a considerable extent.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter summarizes the purpose, design, and development of the study and the procedures which were used to analyze the results. In addition, the results, conclusions, and implications of the study are discussed and some recommendations for further research are given.

Summary

Purpose of the Study

The purpose of the study was to develop and evaluate self-instructional units to teach selected musical concepts to fourth-grade children. Specifically the study sought to answer the following question: Can fourth-grade students learn selected musical concepts through criterion referenced self-instructional units as ascertained by the procedures employed in the present study? In addition to investigating the effectiveness of the experimental units, the reliability of the Musical Concepts Measure, designed for the study, was evaluated.

Design of the Study

The study was experimental as well as developmental. A posttest-only control group design was utilized to evaluate the effectiveness of

the self-instructional units.

The research design included two phases. In Phase I (development) the musical concepts were selected, behavioral objectives were formulated, criterion measures were designed and validated and the self-instructional units were written. The units and criterion measures were revised through a series of pilot trials until judged ready for testing in a formal study. Student responses and reactions were closely observed during the pilot trials and were carefully considered when the units were revised for the formal study.

In Phase II (evaluation) the six units and related criterion measures were tested with an experimental group of students in a formal study. No revisions were made to the units or criterion measures during this phase of the study. As the conclusion of Phase II, an investigator-designed posttest, the Musical Concepts Measure, was administered to the fifty-two subjects in the experimental group and to a control group of the same number.

Subjects

Subjects in the study were selected from the Norman, Oklahoma and Portales, New Mexico public schools. One hundred eighty-eight fourth-grade students participated in the pilot trials plus selected students majoring in elementary education at the University of Oklahoma and Eastern New Mexico University. One hundred four students from James Elementary School in Portales served as subjects for the formal study. These students were divided into experimental and control groups of fifty-two students each.

Phase I: Development of the Units and Criterion Measures

The self-instructional units were designed to teach the students concepts about pitch, rhythm, timbre, texture, intensity, and structure. A three-lesson unit was written for each of the six musical elements. Criterion measures requiring from five to ten responses were written for each lesson to measure the conceptual learning achieved by the student. A total of 103 responses were required for the eighteen lessons. Nine extra-credit measures, called Brain Busters, were used with Lessons 1 and 2 of the pitch unit. The criterion measure response modes utilized paper and pencil responses based on the musicianly functions of listening, creating, and performing. Content of the criterion measures required responses which were alternative-equivalent to those used in the lessons.

Face validity for the criterion measures was established by deriving each measure with the unit objectives in mind. Content validity was established by consensus of specialists in the field of elementary music education.

The units and criterion measures were recorded on cassette tapes. Illustrated lesson booklets were designed to provide visual reinforcement of the tapes. The combined learning package of tape and lesson booklet incorporated linear-type programing.

Phase II: Evaluation of the Units and Criterion Measures

The evaluation phase of the study was conducted at James Elementary School in Portales during January and February 1979. Subjects in the experimental group were given an orientation session after which the self-instructional lessons were administered for three sessions per week

for six weeks, a total of eighteen sessions. Several make-up sessions were scheduled for students who had been absent and an additional session was held to administer the posttest. Subjects in the control group attended their regular music class during the six-week period and were administered the posttest during the same week in which it was given to the experimental group. The teaching content of the control group classes was not specifically coordinated with that studied by the experimental group.

Musical Concepts Measure

A posttest, the Musical Concepts Measure, was designed by the investigator for the purpose of measuring the experimental group subjects' retention of the concepts taught in the self-instructional units. An additional purpose was to compare their performance with that of a control group which had not received the instruction. The Musical Concepts Measure includes at least one representative item from each of the eighteen self-instructional lessons. Each question or task is alternative-equivalent to an item in the corresponding lesson. Six additional items relate to the six musical elements upon which the units are based. Response modes for the Musical Concepts Measure include labeling, matching, multiple choice, and writing short answers.

A reliability coefficient of .84 was obtained for the Musical Concepts Measure through computation of the Spearman-Brown formula. When the Kuder-Richardson 20 formula was applied, a reliability coefficient of .77 was found. The two methods of estimation established the reliability of the test.

Analysis of Data

The Musical Concepts Measure was administered to all subjects in both the experimental and control groups as a posttest. Data obtained from the posttest were analyzed statistically by (1) computing means and standard deviations of the Musical Concepts Measure and (2) computing unpaired t-tests and the Mann-Whitney U test to compare the significance between posttest scores of the experimental and control groups. Incorrect responses to the Musical Concept Measure and the self-instructional lesson criterion measures also were analyzed for the purpose of locating possible strengths and weaknesses and to aid in future revisions.

Results

To evaluate the effectiveness of the self-instructional units, the following null hypothesis was tested:

> As determined by an investigator-designed measure of musical concepts, there will be no significant difference, at the .01 level of confidence, between the mean posttest scores of subjects who study the self-instructional units and subjects who do not study the units.

The obtained t value of 2.85 demonstrated a statistically significant difference beyond the .005 level. Computation of the Mann-Whitney U test revealed significance beyond the .0005 level of probability. The null hypothesis was therefore rejected.

Analysis of the Musical Concepts Measure (posttest) scores revealed an error rate for the experimental group of six to twenty-seven errors (20-93 percent) resulting in a mean score of 52 percent. For the control group, the error rate was three to twenty-two errors (10-76 percent) with a mean score of 41 percent.

An examination of the incorrect responses of the experimental group subjects to the lesson criterion measures disclosed an error rate of 21 percent. Mean incorrect responses were analyzed both on the basis of the 103 required responses and the total number of responses attempted (103 plus nine-extra credit points). Thirty-eight subjects (73 percent) scored 70 percent or better on the basis of 103 responses. Using the total number of responses attempted as a basis, forty-one subjects (79 percent) scored 70 percent or better on the criterion measures.

Examination of the data reveals that the mean error rate for the self-instructional units ranged from 16.290 percent (intensity unit) to 24.320 percent (texture unit). In terms of correct responses, the texture unit was most difficult with a mean score of 75.699 percent and intensity was least difficult with a mean score of 83.710 percent.

Individual lesson analysis revealed an error rate ranging from 7.692 percent on Lesson 1 of the timbre unit to 31.154 percent on Lesson 3 of the pitch unit. Shown in terms of correct responses, Lesson 3 (pitch) was most difficult with a mean score of 68.846 percent and Lesson 1 (timbre) was least difficult with a mean score of 92.308 percent.

Conclusions

It can be concluded from the results of this study that the taped self-instructional units for teaching selected musical concepts to fourth-grade children were successful. The formal study revealed that a substantial majority of the experimental group subjects were able to learn concepts about pitch, rhythm, timbre, texture, structure, and intensity as assessed by the criterion measures.

Another conclusion is that taped self-instructional units can be developed to teach concepts about the six major musical elements to fourth-grade students. No previous study has tested such units with the same group of children.

Results of the study show that concepts about intensity are the easiest for children to learn. This conclusion supports previous research including that done by Andrews and Diehl, Laverty, and Romanek.

A further conclusion is that concepts about texture are the most difficult for fourth-grade children to learn. Zimmerman as well as Nye and Nye report that other investigators have reached similar conclusions.

While concepts of loudness have been shown to develop earlier than other musical elements, it can be concluded that children need continuing experiences in the identification of gradual and sudden changes of intensity. Also, children need experiences in which they are required to identify the unconscious decisions they make about intensity during performance.

It can be concluded that study of the self-instructional units provided aesthetic and personal values in addition to cognitive and skill learning. The positive attitude of the children to the experience and the willingness of the experimental-group subjects to return for eighteen sessions shows the high level of interest maintained throughout the seven-week period. Many subjects expressed disappointment when the project ended and asked if the investigator would return the following year with another set of lessons.

The inherent vulnerability of the criterion measure data is an acknowledged limitation. The subjects knew the answers were shown at the

back of the lesson booklets for the purpose of checking their own work. Cheating did occur on several occasions although the incidence decreased after several subjects were asked to repeat the criterion measures for a lesson. For reporting statistical data of the study it may have been better for the investigator to grade the answer sheets. He did check them to insure grading accuracy, but believed it contrary to the philosophy of programed learning feedback to deny the subjects this responsibility. The investigator recognized that learning can occur even in acts of cheating because the student obtains immediate confirmation of his response to a question, an acknowledged factor in programed-instruction philosophy.

Self-instructional lessons are particularly appropriate for the child who has an interest in music, the gifted child, and children who have had extra-curricular musical training.

Self-instructional units should be tested through pilot studies. Understanding of child development and the learning process are important factors to consider in the design of such units.

Although fourth-graders generally are considered to be in the middle stage of concrete operations, some are able to solve problems which require abstract thought or the transfer of a concept from one situation to another. The use of concrete illustrations such as pictures to illustrate an abstract thought increases the probability that the child will be able to solve the problem.

Schools should place more emphasis on the learner than on the teacher. Most children enjoy self-instructional lessons because this method is learner-centered and provides more interaction with concepts

and skills than does large-group instruction.

Fourth-grade children's perception of musical stimuli is affected by the factor of centration. The musical elements of timbre and intensity as well as melodic line affect the child's aural perception of musical structure and texture. Pitch was detected as a centration factor in the timbre unit. Students chose a tone sung by a bass voice as being different from the same tone sung by a child, a woman, and played on the piano (different timbre). Minute differences in a musical score and the highest pitch level in an iconic diagram of a melody affected the child's visual perception of musical notation.

Children need repeated encounters in order to understand and retain a concept. The experimental group's performance on the posttest shows the decay of conceptualization which occurred because the students did not continue to interact with the concepts. Another illustration is the decrease in error rate which occurred between the criterion measures of Lessons 1 and 2 of the pitch unit because the same concept was applied in Lesson 2. This conclusion supports findings reported by Bergethon and Boardman.

Children often understand concepts but lack the vocabulary to explain them. The importance of vocabulary training associated with concept learning has been stressed by Andrews and Diehl as well as Laverty.

The use of vocabulary terms which children understand is a critical factor in preparing self-instructional lessons. The author of such materials should check questionable words with students in the age group for which the materials are being planned. Consistent use of terms throughout a lesson should be observed.

Musical examples must clearly demonstrate the concept being taught. Simple arrangements which focus on the desired element are recommended in order to avoid the effects of centration. Changes in timbre or intensity detract from concentration on structure. Texture perception is more clear when small ensembles of familiar timbres are used, such as piano, guitar, small vocal ensemble, or a combination of these sources.

Primary children should have a firm foundation in iconic notation before staff notation is emphasized. This conclusion supports the research of Zimmerman and Sechrest.

Results of the pilot studies for Lesson 3 of the pitch unit indicate that the symbolic mode of representing melodic and sequential patterns is inappropriate for many fourth-grade students. This conclusion supports the findings of Boekelheide and Zimmerman.

Observations during the pilot and formal studies suggest that children need writing experiences in the music class to aid in conceptual, notational, and vocabulary development. Writing is an integral process-part of learning to read any language.

Creative compositional activities reinforce concepts that the child is asked to learn. Following perception and understanding, utilizing a concept in his own composition provides both application and reinforcement. The child should be encouraged to record the composition on paper using icons or symbols which are meaningful to him. The piece should be performed by the child and/or other students to demonstrate the meaningfulness of the symbols.

Frequent opportunities should be provided for primary children

to work alone with bell-type instruments. This experience is needed for the child to develop basic pitch concepts of high and low as well as melodic patterns using step- and skip-wise notation. Behavior of the experimental subjects during Lesson 3 of the pitch unit revealed that many children had insufficient experiences to work out basic pitch concepts and to satisfy their inner drives to express themselves through playing an instrument. Both factors affected the children's performance on the lesson and criterion measures.

It can be concluded on the basis of this study that active learning experiences should be provided to help children discern structural concepts. Emphasis should be placed on hearing and feeling the phrase and comparing it to previous and succeeding phrases to identify whether it sounds the same, almost the same, or different.

The extensive time period involved in the present study confirms that the largest task in preparing self-instructional materials is the planning. Effective lessons evolve over a period of time during which the designer pilot-tests the lesson, revises it, and periodically reviews it to see if another approach would be more appropriate.

The fixed time schedule utilized for expediting the formal study is recognized as a limitation on the effectiveness of the units. Ideally the self-instructional lessons would be available for the child to study throughout the year. The rate and frequency for working with them would depend on readiness, need, and interest as assessed mutually by teacher and student.

A potential source of invalidity for the study exists in the fact that the control group did not receive specific instruction about the

concepts studied by the experimental group. Acknowledging this possibility, it must be noted that a substantial number of research studies utilize a design in which the control group does not receive an alternative treatment to that given the experimental group. Although an experimental dimension was incorporated in the research design, the primary purpose of the study was to develop and evaluate the units rather than to compare teaching methods.

A strength of the present study is the fact that many findings by the investigator confirm and support the conclusions of previous researchers. Included are data related to concept teaching, musical concepts, individualized instruction, and programed instruction.

A final conclusion is that the self-instructional units developed through this study are appropriate for use with fourth-grade children in other localities. This conclusion is supported by the fact that students from various backgrounds (ethnic groups, social and economic classes, intellectual levels, and previous musical experiences) were chosen to serve as subjects during the study. The fact that the units are based on widely-used music curricular materials contributes to their potential use throughout the nation. Finally, the extensive amount of pilot testing and revising confirms the effort to construct effective learning materials.

Implications

Based on the findings of the study, the following suggestions are given for constructing self-instructional concept lessons.

1. When selecting a concept, determine that it is important to the child's understanding of music and that the student will be likely to

repeat or associate it in future music encounters.

2. Select a concept and formulate it in a complete descriptive statement so that it will be clear what the learner will know at the conclusion of the lesson. When the statement has been completed, the step-by-step provisions for perception, internalization, and application can be planned.

3. Use the simplest vocabulary terms whenever possible. Be consistent in the use of a term in order to avoid confusing the learner. If unsure about certain terms, ask children in the appropriate age group if they understand the words in question.

4. Illustrate terms and concepts whenever possible with musical examples, pictures, icons, symbols, or additional verbal explanation.

5. Allow the child to be an active learner from the onset of the lesson. Include concrete and physical activities whenever possible. The child learns more effectively by doing and through self-discovery than through listening.

6. Short recorded musical examples are better than longer ones. An example should be two minutes or less in length; twenty to thirty seconds is preferable.

7. Avoid over-powering the learner with too much material in one frame--aural, visual, or verbal.

8. Illustrate a new idea with a model before asking questions or instructing the child to act. For example, if he is to draw an arrow beside a bottle, show a picture containing an arrow drawn beside a bottle.

9. Emphasize same-different relationships and then work on degrees

of difference such as are found in all musical elements.

10. Provide experiences which require the child to verbalize his findings aloud. For new terms show a phonetic pronunciation and ask the student to say the word.

11. Provide some open-ended experiences for which an immediate response is not required, such as suggesting that the child try something at home or asking him to imagine the sound of something.

12. Provide creative tasks to help determine the student's mastery of a concept, such as a picture or a short composition which he can discuss with another student or the teacher.

13. If the lesson is taped, try to anticipate the amount of time needed to complete a task. If the time varies for several students, include the instruction "stop the tape." If the time can be estimated and is not an excessive amount, allow the time on the tape.

14. For taped lessons, instruct during the instructional segment and reinforce during the answer segment. Avoid the temptation to provide further instruction during the answer segment; the child's interest fades rapidly and he is anxious to move to the next frame. Reinforce with one- or two-word answers rather than complete sentences if possible.

15. Write out the narration before reading it onto the tape. Think about the rhythm of the narration. For example, when reading multiple choice answers, if the wording of the first two or three choices falls into a rhythm, try to maintain the rhythm as you conclude the sentence. This involves passive teaching and wise use of it may add to the clarity and over-all effect of the passage.

16. Routine reminders such as "turn to the answer" or "write A, B,

or C" can be deleted after a few frames.

17. The "no response" option, if understood by children, is unlikely to be chosen because they would rather guess and take a chance at being wrong than to "admit they don't know."

18. Information printed in the frame should correspond to the narration on the tape. It is unnecessary to print the entire narration, but avoid saying something one way on the tape and printing it another way on the page. Some children read every word and are distracted by even slight differences.

19. Written responses are difficult for children who lack vocabulary skills. Short answers are helpful; avoid sentence-length response requirements.

20. For comparison-type learning with sound sources such as water bottles, it is better to provide two or more bottles than just one. The learner may forget the first pitch by the time he is able to produce the second one.

21. When utilizing object sound sources in taped lessons, listen to the taped sounds before finalizing the lesson. Some sounds are easily distorted on tape and the difference between some timbres is difficult to distinguish, such as hard plastic versus wood or glass versus metal.

22. Most tape recorders contain devices which automatically balance loud sounds to prevent distortion. This feature makes it difficult to record or replay music specifically intended to illustrate intensity changes.

23. If the self-instructional lesson is based on a frame format, continue the same format for criterion measures (tests, assessments),

using one question per page. Answers may be shown on the back of the last frame if the child is to correct his own work.

24. When assembling the criterion measures, put concrete-type tasks or questions at the beginning and abstract-type near the end. Provide an optional stopping point for the student who chooses to omit the abstract-type questions.

25. Scrutinize closely the criterion-measure items to insure that they are testing the concept rather than terminology or symbology about the concept.

Recommendations for Further Research

The following recommendations for further research are based on the findings of the present study.

1. A study to determine the effectiveness of the self-instructional units developed for this study with third, fifth, and sixth grade students.

2. A study to determine the effectiveness of units selected from those developed for the present study with first, second, and third grade students who are gifted or have had extensive extracurricular musical training.

3. A study in which lessons would be developed to provide additional experience with the concepts taught in the units developed for the present study.

4. A study in which units would be developed to reteach the same concepts developed in this study at a higher level of the spiral curriculum, such as fifth or sixth grade.

5. An extension of the present study in which new concept lessons

are developed for each of the units.

6. A study which would investigate factors which promote or inhibit the understanding of structural (formal) concepts. Aural perception and centration factors appear to be critical factors for investigation.

7. A study which would investigate the order in which timbre, texture, and structural concepts develop compared to those of intensity, rhythm, and pitch.

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APPENDIX A

Behavioral Objectives for the Self-Instructional Units

Behavioral Objectives for the Self-Instructional Units

Pitch-Lesson 1

1. Given a picture of four vibrating strings, the student will identify the strings which would sound the lowest and highest pitches.

2. Given three lines of equal length, the student will listen to three pitches and draw vibration curves on the lines to represent the pitches.

3. Given a picture of an autoharp on which three strings are numbered, the student will select the strings which would produce the highest and lowest pitches.

4. Given two examples, the student will select the picture of an autoharp which has an arrow drawn above it to indicate the directions for strumming from the highest to the lowest pitches.

5. Given the picture of a set of bells, the student will indicate which bell would produce the highest pitch.

6. Given a statement about the concept, the student will choose one or two given words to correctly complete the statement.

Pitch - Lesson 2

1. Given an illustration of two bottles, one empty, the other partly-filled with water, the student will draw an arrow inside each bottle to show the length of the vibrating air column.

2. Given the illustration of an empty bottle and the sound of two pitches played on bottles, the student will indicate that the low-pitched sound is more like the sound which would be made by the empty bottle.

3. Given two choices, the student will choose the answer which indicates that when one blows across the top of a bottle a vibrating air column makes the sound.

4. Given two choices, the student will indicate that a shorter vibrating air column will produce a higher pitch.

5. Given illustrations of three empty bottles, each a different size, the student will indicate which bottle would sound the lowest pitch.

6. Given illustrations of three recorder players, each playing with a different number of closed holes, the student will indicate which recorder player is making the shortest air column and which recorder player is sounding the lowest pitch.

7. Given illustrations of a double bass, cello, and violin, the student will indicate which instrument would produce the lowest pitch.

Pitch - Lesson 3

1. Upon hearing a short melody (1-4 measures), the student will indicate whether the melody contains a melodic sequence.

2. Given two melodic patterns in the format of iconic diagrams, the student will indicate whether the second diagram is a melodic sequence to the first diagram.

3. Given the iconic shape and letter names for a melodic pattern, and the iconic shape for a melodic sequence, the student will write the letter names for the melodic sequence.

Texture - Lesson 1

1. Given three choices, the student will indicate that the term "monophonic" means one sound.

2. Upon hearing a musical example, the student will indicate whether the example has monophonic texture.

3. The student will write the number of sound layers one hears in monophonic texture.

4. Upon hearing a musical example with monophonic texture, the student will indicate that the texture has one layer of sound.

5. Given two choices, the student will select a performance activity with which his class can demonstrate monophonic texture.

6. The student will draw a picture or design to show the number of sound layers for music with monophonic texture.

7. Given two pictures of people performing music, the student will choose the picture (solo flute) which shows monophonic texture being performed.

Texture - Lesson 2

1. Given two choices, the student will select the answer which defines "homophonic texture."

2. Upon hearing a musical example, the student will indicate whether the example is homophonic texture.

3. Upon hearing a musical example, the student will indicate whether he hears one or more-than-one layer of sound.

4. Given two choices, the student will select a performance activity with which his class can demonstrate homophonic texture.

5. The student will draw a picture or design to show

homophonic texture.

6. Given two pictures of people performing music, the student will choose the picture (barbershop quartet) which shows homophonic texture being performed.

Texture - Lesson 3

1. Given three choices, the student will select the answer which describes polyphonic texture.

2. Upon hearing a musical example, the student will write YES or NO to the question "Does the music have polyphonic texture?".

3. The student will write, in a few words, a description of how his class can perform vocal polyphonic texture.

4. Given iconic pictures of musical texture, the student will listen to a piece of music and match the kind of texture he hears to one of the pictures.

5. Given an iconic picture of one kind of musical texture, the student will match it with the term monophonic, homophonic, or polyphonic texture.

Structure - Lesson 1

1. After hearing two musical phrases, the student will indicate whether they are the same or different.

2. After hearing two phrases, the student will write code letters to show whether the two phrases are the same or different.

3. Given the letter A for Phrase 1 of "Twinkle, Twinkle, Little Star," and after singing the song with the narrator, the student will write the letters B A to complete the code of the song.

Structure - Lesson 2

1. After hearing and studying the musical score for the song "Green Grow the Lilacs," the student will write a code letter name for each phrase to show whether the phrases are the same, almost the same, or different.

2. After hearing the first two phrases of the song "America, the Beautiful," the student will indicate that Phrase 2 is almost the same.

Structure - Lesson 3

1. Given the musical score to the song "Walk Along, John," the student will listen to the song on the tape, study the score, and write the code letters for the four phrases.

2. Given three choices, the student will listen to the refrain of "Go Tell It on the Mountain" and then select the answer which correctly designates the structure of the song.

Rhythm - Lesson 1

1. Upon hearing a short musical example, the student will decide whether the rhythm of the beat or the rhythm of the melody is being tapped in the background.

2. Given two choices, the student will choose the answer which correctly defines the terms "rhythm of the beat" or "rhythm of the melody."

Rhythm - Lesson 2

1. Upon hearing a musical example in which the rhythm of the beat is tapped in the background, the student will decide whether the melody tones have the same rhythm as the beat or are longer than the beat.

2. Given visual examples of two melodic rhythm patterns, the student will listen to the music heard in the previous question and choose the example which matches the music he hears.

3. After looking at two rhythmic examples, each of which contains the rhythm of a melody and the rhythm of the beat, the student will choose the example which shows tones in the rhythm of the melody which are longer than one beat.

Rhythm - Lesson 3

1. Given a copy of the song words, the student will listen as a song is sung and the rhythm of the beat is tapped in the background, and then decide if the melody tones have the same rhythm as the beat, sound longer than one beat, or shorter than one beat.

2. Given two visual examples of rhythmic notation, the student will listen again to the same song and choose the visual example which is like the aural example.

3. Given a copy of the words to "This Is My Country," on which certain words are underlined, the student will listen to the song, tap the beat along with the narrator, and then decide if the underlined words have the same rhythm as the beat or if they sound longer than the beat.

4. The student will listen again to the same song and decide if the narrator is clapping the rhythm of the melody or the rhythm of the beat.

Timbre - Lesson 1

1. Given the names of four sound-producing materials, the student will listen to a sound and choose the name of the material used to produce the sound.

2. Given a list of four words, the student will listen to a sound and choose the word which describes the timbre of the sound.

3. After listening to a short sound piece played on two different sound sources, the student will select the sentence which tells why the sound piece sounds different the second time.

Timbre - Lesson 2

1. The student will write three different ways he can use his voice to make sounds.

2. Upon hearing a short monophonic sound piece containing two different timbres, the student will indicate that the timbres are played on one sound source.

3. Given illustrated descriptions of two sound experiments, the student will choose the experiment which illustrates a particular way to change the timbre on a sound source.

Timbre - Lesson 3

1. Given three choices, the student will listen to a musical idea performed three times and then indicate that the timbre is changed in each performance.

2. Given four choices, the student will listen to a musical example performed twice and then select the sound source used in each performance.

3. Given three choices, the student will listen to a song sung two times and then indicate that the timbre is changed in the second performance because a different kind of voice is used.

4. Upon hearing the same musical tone sounded by two different voices and a resonator bell, the student will indicate that the timbre of the resonator bell is different from that of the other two sound sources.

5. Asked to indicate how he, as a composer, would use the same musical idea many times and keep it interesting, the student will write a short answer, saying in effect, that he would have the musical idea played on different sound sources, use different voices, or objects, or change the timbre.

Intensity - Lesson 1

1. Upon hearing a musical example played two times, the student will indicate whether the intensity is the same or different the second time.

2. Upon hearing a musical example, the student will indicate whether the intensity level remains the same or changes.

3. Upon hearing a musical example, the student will select from three choices the answer which indicates the order of the intensity changes.

4. Upon hearing a musical example, the student will indicate whether the intensity changes many times or hardly at all.

5. The student will compose a sound piece using geometric shapes or a wavy line to indicate whether the intensity stays the same or changes.

Intensity - Lesson 2

1. Upon hearing a musical example, the student will indicate whether it contains changes in intensity which are sudden or gradual.

2. Given the description of a desired compositional effect, the student will indicate whether sudden or gradual changes of intensity are appropriate.

3. Given two choices, the student will indicate whether gradual changes of intensity happen all at once or a little at a time.

4. The student will draw a picture or design using geometric shapes or a wavy line to show sudden and gradual changes of intensity.

Intensity - Lesson 3

1. Upon hearing a recorded musical example, the student will indicate whether the music gradually gets softer or louder.

2. Given a crescendo sign, the student will indicate that the sign means to gradually get louder.

3. Upon hearing a piece of music, the student will choose the sign, crescendo or decrescendo, which shows how the intensity changes in the music.

4. Given two choices, the student will choose the signs that show the intensity changes which would occur in a story about two friends and a motorbike.

5. Given three choices, the student will indicate that intensity is the loudness or softness of sound.

6. The student will plan and perform an original sound piece which contains both a crescendo and decrescendo.

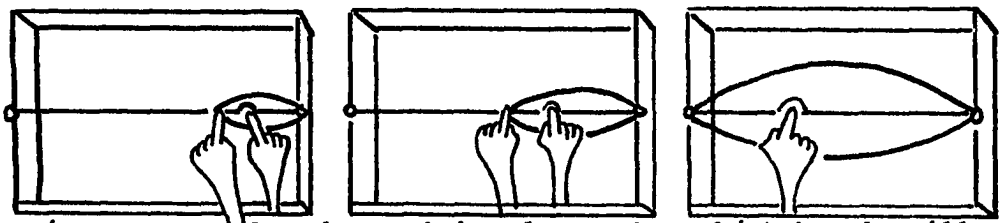
APPENDIX B

Musical Concepts Measure

Musical Concepts Measure

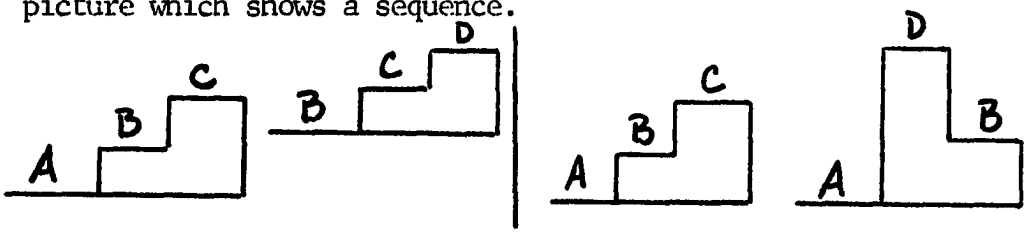
PITCH

1-3. Write H, M, or L under each picture to show which rubber band and box will sound the Highest pitch, the Medium pitch, and Lowest pitch.



4-6. Write H, M, or L under each bottle to show which bottle will sound the Highest pitch, Medium pitch, and Lowest pitch.

7. If you would play the bells in both pictures, which group would sound like a melodic sequence? Put an X in the blank under the picture which shows a sequence.



RHYTHM. Draw a line from the question to the right answer.

Questions	Answers
8. Which example shows melody notes as long as the beat?	Melody / Beat
9. Which example shows melody notes longer than one beat?	Melody / Beat
10. Which example shows melody notes shorter than one beat?	Melody / Beat

TIMBRE

11. Why do sounds made with glass and with paper sound different? Write your answer in a few words.

12. Can most sound sources make only one or more than one sound? Write one or more in the blank.

_____

13. The song "Dixie" would sound different each time if it were played first by a trumpet, then by a clarinet, and then by a flute. Choose the answer below which tells why the song would sound different each time. Put an X in the blank by the right answer.

____ The color of the sound is different for each instrument.

____ The speed of the sound is different for each instrument.

____ The rhythm of the sound is different for each instrument.

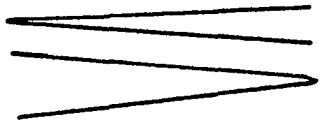
TEXTURE. Draw a line from the question to the right answer.

Questions	Answers
14. What is monophonic texture?	Melody and accompaniment. 
15. What is homophonic texture?	Two or more melodies at the same time, like a round, canon, or partner songs. 
16. What is polyphonic texture?	One melody by itself, without accompaniment. 

APPENDIX B

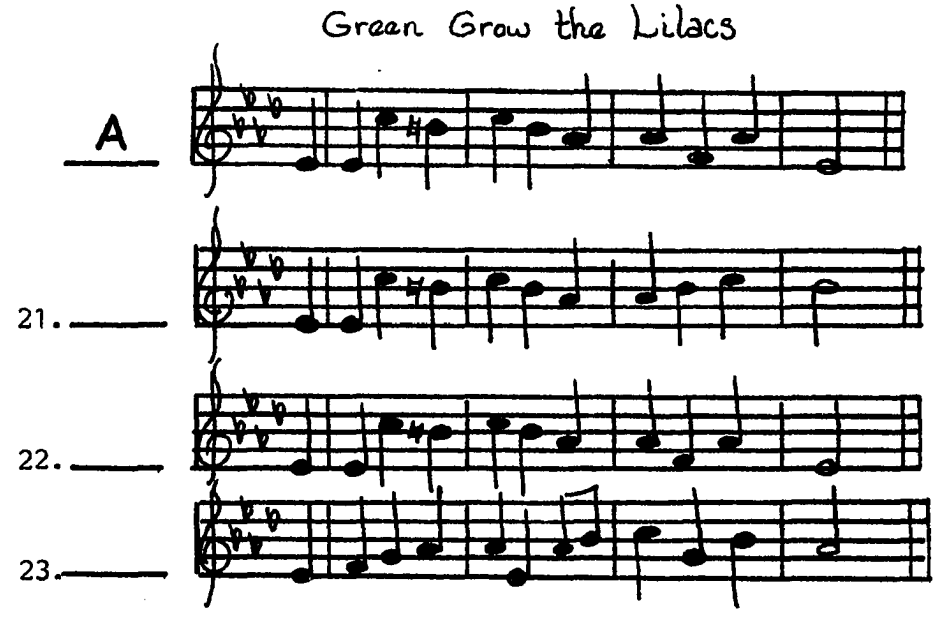
Musical Concepts Measure

INTENSITY. Draw a line from the sign or picture to the right answer.

Sign or Picture	Answers
17. 	Gradually get softer.
18.	Suddenly get softer.
19. 	Gradually get louder.
20. 	Suddenly get louder.

STRUCTURE. Study the song shown on the right to see which phrases are the same, almost the same, or different. On the left you see three boxes with letters. Choose the box with the right answers and write the letters from this box in the blanks by the phrases of the song.

A	A	A
B	A'	B
C	A	C
D	B	A



ELEMENTS OF MUSIC. Draw a line from the word on the left to the answer it matches.

24. PITCH	loud and soft
25. RHYTHM	same and different
26. TIMBRE	the number of layers of sound we hear at the same time
27. TEXTURE	high and low
28. INTENSITY	beat and movement of the music
29. STRUCTURE	one color, color of sound

APPENDIX C

Raw Data for the Musical Concepts Measure

Raw Data for the Musical Concepts Measure

Subject	Experimental Group	Control Group	Subject	Experimental Group	Control Group
1	10	14	26	21	12
2	10	14	27	14	13
3	14	14	28	18	9
4	13	12	29	8	19
5	12	13	30	16	11
6	12	6	31	15	10
7	15	22	32	13	16
8	22	20	33	6	13
9	25	15	34	11	7
10	15	16	35	12	9
11	27	3	36	19	9
12	19	10	37	11	7
13	10	9	38	14	14
14	24	10	39	22	17
15	19	15	40	16	14
16	10	8	41	7	12
17	12	7	42	26	10
18	12	9	43	19	8
19	10	10	44	12	6
20	13	10	45	13	12
21	13	12	46	13	19
22	17	9	47	13	14
23	14	12	48	16	10
24	18	11	49	16	4
25	14	22	50	19	10

Raw Data for the Musical Concepts Measure (continued)

Subject	Experimental Group	Control Group
51	17	16
52	21	11
	788	615
	M = 15.154	M = 11.827

APPENDIX D

Analysis of Individual Subject's Incorrect Responses to Criterion Measures

Analysis of Individual Subject's Incorrect Responses to Criterion Measures

	Pitch					Rhythm			Timbre			Texture			Intensity			Structure			Total
Lesson:	1	BB	2	BB	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	18
Responses:	5	5	6	4	5	5	5	5	5	6	6	8	6	8	5	6	6	6	5	5	103
Subject																					
1	0	4	1	–[a]	1	1	2	1	1	1	3	4	3	6	0	4	1	0	0	5	38
2	1	1	1	–[a]	4	3	2	4	1	2	1	1	2	2	1	1	1	0	0	2	30
3	0	0	1	–[a]	1	3	1	0	0	4	3	6	2	5	0	2	0	0	0	1	29
4	0	0	0	0	0	1	1	0	1	3	3	5	3	6	4	2	0	0	0	0	29
5	3	0	2	–[a]	3	3	0	0	0	4	3	5	2	4	2	1	2	0	1	1	36
6	3	5	1	1	5	0	4	3	1	3	2	2	4	6	1	3	2	2	1	3	52
7	0	0	0	2	0	0	1	0	1	2	1	4	1	5	0	1	0	0	0	0	18
8	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	3	7
9	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3	6
10	3	3	3	4	2	0	0	5	1	3	3	3	1	1	2	1	1	3	3	0	42
11	0	0	0	0	3	0	0	1	0	0	1	0	1	0	0	0	0	0	0	2	8
12	1	0	1	–[a]	2	2	1	4	0	2	2	2	1	4	1	1	2	2	0	3	32
13	0	2	1	2	0	4	0	4	0	3	3	6	2	3	1	1	0	4	2	3	41
14	0	0	0	0	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	1	7
15	0	2	1	1	3	0	1	2	0	0	0	0	3	0	1	1	0	0	0	4	19
16	2	–[a]	2	–[a]	1	1	0	3	1	0	1	3	0	2	3	3	1	4	3	1	31
17	1	–[a]	0	2	1	2	2	2	1	0	2	2	2	0	2	2	1	2	2	0	26
18	2	–[a]	4	–[a]	4	2	2	2	2	4	2	2	1	4	3	2	2	0	3	0	41

Analysis of Individual Subject's Incorrect Responses to Criterion Measures (continued)

	Pitch					Rhythm			Timbre			Texture			Intensity			Structure			Total
Lesson:	1	BB	2	BB	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	18
Responses:	5	5	6	4	5	5	5	5	5	6	6	8	6	8	5	6	6	6	5	5	103
Subject																					
19	5	3	0	–[a]	0	2	0	2	0	3	3	4	3	3	0	1	5	0	2	0	36
20	2	4	3	2	3	0	0	2	1	5	2	0	3	3	1	2	2	0	0	2	37
21	4	4	2	4	3	0	0	0	0	0	4	0	1	0	0	0	3	0	1	0	26
22	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	1	0	3	0	8
23	0	1	2	1	1	0	1	1	0	0	1	0	1	3	0	2	1	2	2	3	22
24	0	–[a]	0	0	1	1	0	0	0	1	0	0	0	1	0	0	2	0	0	0	6
25	0	0	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4
26	0	0	0	–[a]	1	0	0	2	0	1	1	1	0	0	0	0	1	2	3	0	12
27	2	0	0	–[a]	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	1	6
28	4	0	0	–[a]	0	0	0	1	1	2	1	2	1	3	0	0	2	3	2	1	23
29	4	–[a]	2	1	3	1	5	2	1	4	4	5	1	6	3	6	3	2	3	4	60
30	3	–[a]	3	3	3	1	0	0	3	6	3	0	2	3	0	2	0	0	1	3	36
31	3	5	3	3	1	0	0	1	1	1	1	4	1	5	0	0	2	0	0	0	31
32	1	0	1	1	0	0	0	3	0	1	1	2	0	0	0	0	0	0	0	0	10
33	1	4	3	2	2	0	0	3	1	0	2	4	1	4	1	0	2	2	0	0	32
34	0	0	1	2	0	2	1	2	0	3	1	2	0	0	0	1	0	0	0	0	15
35	0	0	1	0	0	1	1	3	0	0	0	2	0	0	0	0	0	4	3	0	15
36	0	–[a]	0	–[a]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Analysis of Individual Subject's Incorrect Responses to Criterion Measures (continued)

	Pitch					Rhythm			Timbre			Texture			Intensity			Structure			Total
Lesson:	1	BB	2	BB	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	18
Responses:	5	5	6	4	5	5	5	5	5	6	6	8	6	8	5	6	6	6	5	5	103
Subject																					
37	0	–[a]	0	–[a]	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	2
38	1	3	1	–[a]	4	0	1	3	0	0	1	1	2	1	0	2	0	3	2	2	27
39	0	–[a]	2	–[a]	3	0	0	1	0	3	1	6	3	0	1	0	1	4	3	2	30
40	3	4	0	–[a]	4	2	1	2	0	0	0	3	1	3	0	0	0	0	0	0	23
41	2	2	0	–[a]	3	3	2	4	1	1	2	7	2	5	1	5	1	2	1	2	46
42	0	0	0	0	0	0	0	0	0	1	0	1	0	3	0	0	0	0	0	0	5
43	0	0	0	0	0	0	0	0	0	2	1	2	0	1	1	4	0	0	0	0	11
44	0	2	2	–[a]	3	4	2	2	1	1	1	5	0	4	0	1	2	2	2	3	37
45	0	0	2	4	2	1	1	2	0	1	2	3	3	4	0	0	1	0	2	4	32
46	4	3	3	–[a]	0	0	1	0	0	0	1	5	0	1	2	4	1	0	0	0	25
47	0	1	1	0	1	0	2	3	0	1	1	6	0	0	2	0	0	0	0	0	18
48	0	0	1	2	3	0	0	2	1	1	2	0	2	0	1	0	0	0	0	0	15
49	0	2	0	1	0	3	3	1	0	1	0	0	0	0	0	2	0	0	2	0	15
50	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	2	0	0	0	0	6
51	0	0	0	0	2	0	0	3	0	1	0	0	3	0	0	3	1	0	0	0	13
52	0	0	0	2	1	1	0	1	0	0	0	1	3	2	0	0	0	0	0	0	11

[a]Subject did not respond to Brain Busters.

APPENDIX E

Sample Frames and Criterion Measures from the Self-Instructional Units

Pitch - Lesson 2

8. Pitch - the highness or lowness of sound.

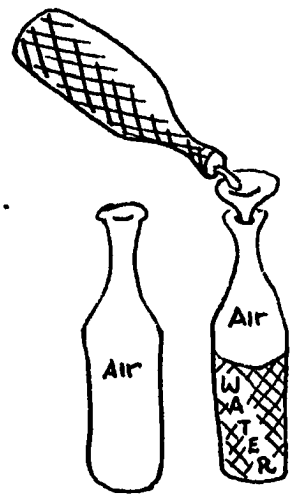
(1) Blow across the top of the empty bottles.

(2) Listen to the pitches. Are the pitches <u>high</u> or <u>low</u>?

(3) Add some water to one of the bottles.

(4) Blow across both bottles again.

(5) Listen to the pitches.



What happens to the pitch when you shorten the air column?

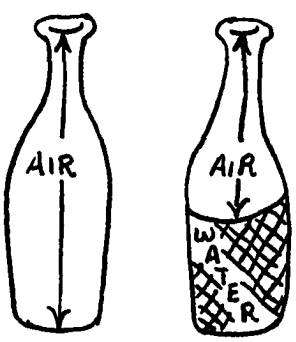
Does it stay the same or change?

Is the pitch higher or lower?

Blow across both bottles to make sure of your answer.

---

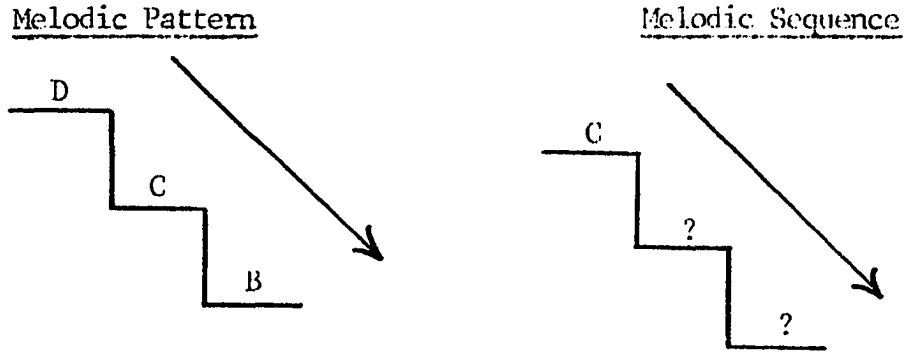
8. ANSWER



When you add water, you shorten the air column and the pitch sounds <u>higher</u>.

Pitch - Lesson 3

15.



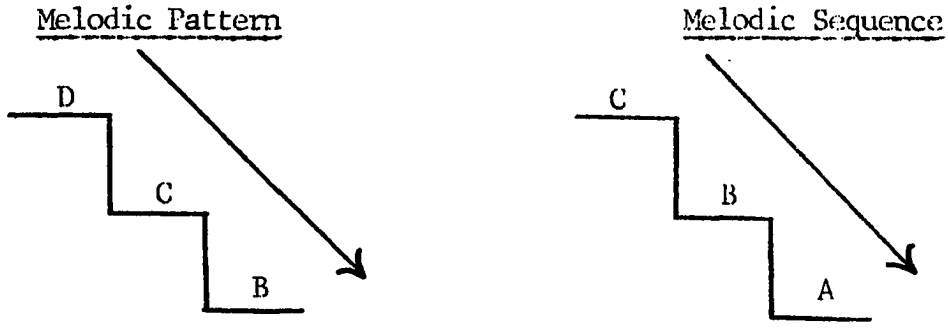
Play the melodic pattern D C B.

Play a melodic sequence beginning on C.

What are the names of the other two pitches in the sequence?

---

15. ANSWER



Begins on a lower pitch - C.

Play the melodic pattern and sequence.

Texture - Lesson 2

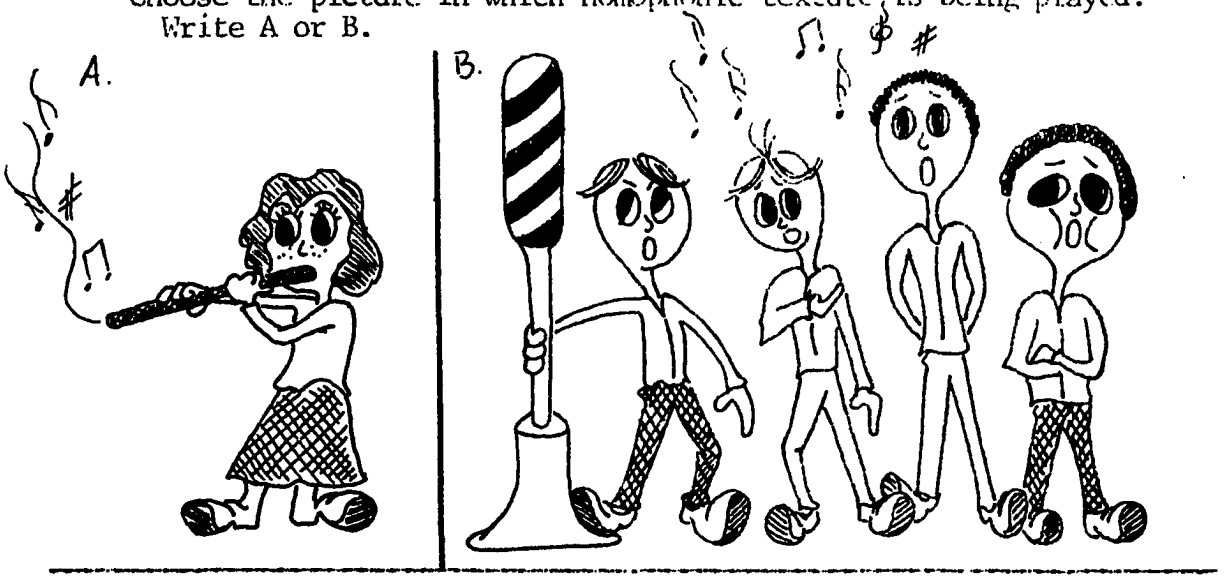
CRITERION MEASURES

6. The two pictures you see here show people making music.

   If we could hear the music, we would hear two kinds of texture.

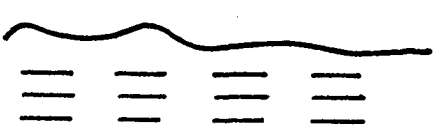
   Only one picture shows music being performed that has homophonic texture.

   Choose the picture in which homophonic texture is being played. Write A or B.



ANSWERS

1. B
2. Yes
3. 1
4. B
5. Your picture should show a melody on top with some layers for the chords under the melody, such as in the picture -



6. B

8. Have you ever made up a secret code?

A code is like a sign or signal which means something.

Sometimes we use a code in music to show which phrases are the SAME or DIFFERENT.

Phrase 1 A
Phrase 2 A } SAME
Phrase 3 B — Different

The code for this song is A A B.

Listen and point to the code letters as you hear each phrase.

---

10. REVIEW

Structure - phrases may be the SAME or DIFFERENT.

Code - if the phrases are the same, give them the same letter name, like A A or

A 

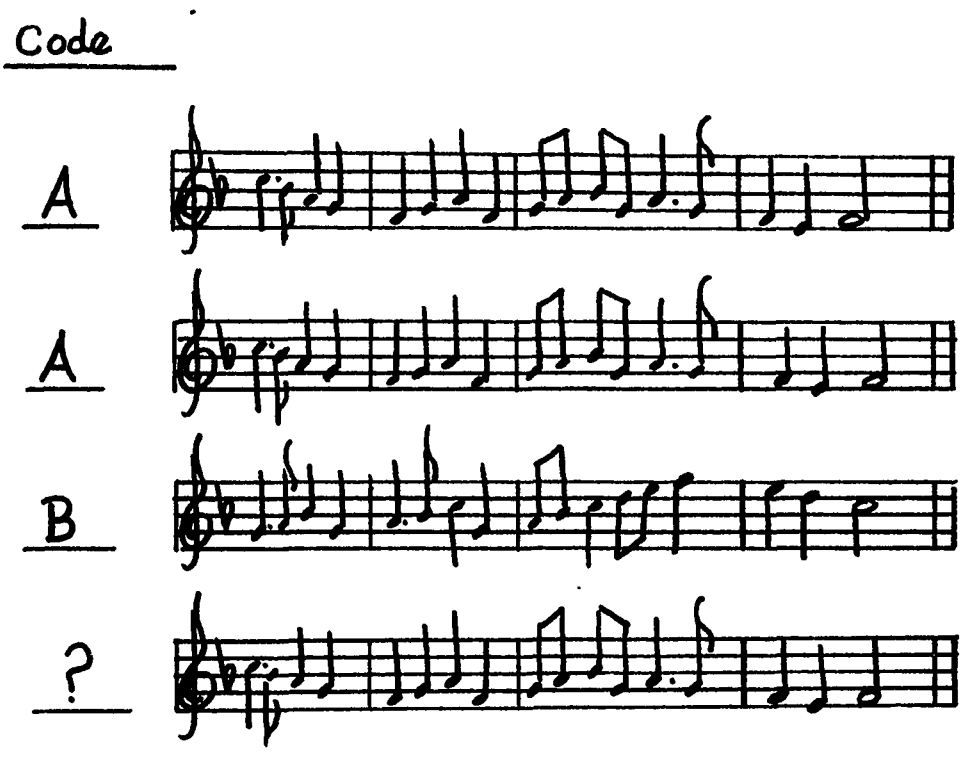
A 

- when phrases are different, use different letter names, like A B or

A 

B 

7.



Study Phrase 4.

Is Phrase 4 the same as any of the other phrases, or is it different from all of them?

See if you can figure out the code letter.

---

7. ANSWER

Phrase 1 A

Phrase 2 A

Phrase 3 B

Phrase 4 A

Structure – Lesson 2

9. We have worked with phrases which are the same or different.

Sometimes phrases are almost the same.

They start the same ——————————

——————————— but end differently.

Listen to this phrase.

Listen to a second phrase.

The phrases sound the same at the beginning.

Do they end the same way?

Listen again.

---

9. No. The phrases end differently.

Sing the two phrases with me.

Phrase 1 Kum Bah Yah, My Lord. Kum Bah Yah.

Phrase 2 Kum Bah Yah, My Lord. Kum Bah Yah.

Structure - Lesson 3

4. Watch the notes as I play the song.

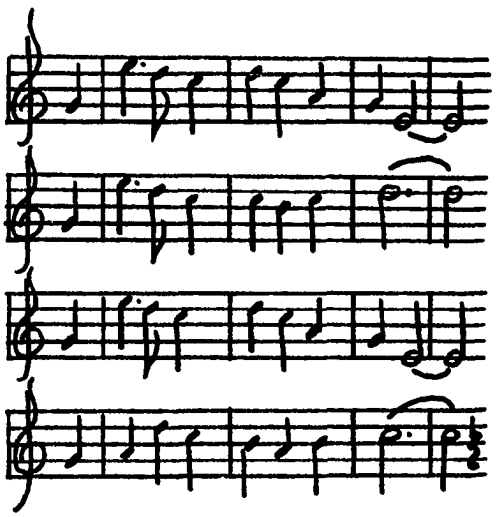
   Point to two phrases which are the SAME.

   Point to a phrase which is ALMOST THE SAME.

   Point to a phrase which is DIFFERENT.

   Now choose a letter name for each phrase.

   Stop the tape.



---

4. ANSWER

Phrase 1 A

Phrase 2 A^1

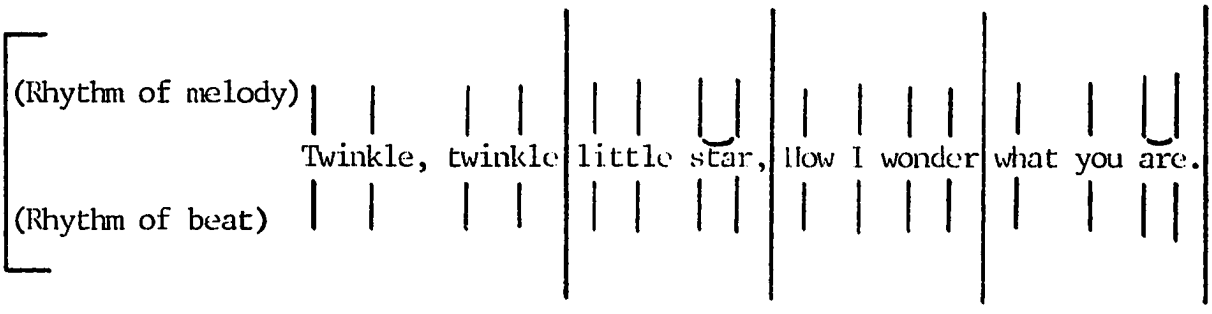
Phrase 3 A

Phrase 4 B

If your answers are different than the ones you see here, turn back to the front of this frame. Study the phrases until you understand the right answer. Stop the tape if you need to do this.

5. 

As I sing the song TWINKLE, TWINKLE, LITTLE STAR, you will hear me tap either the rhythm of the beat or the rhythm of the melody. Listen. Which kind of rhythm am I tapping?

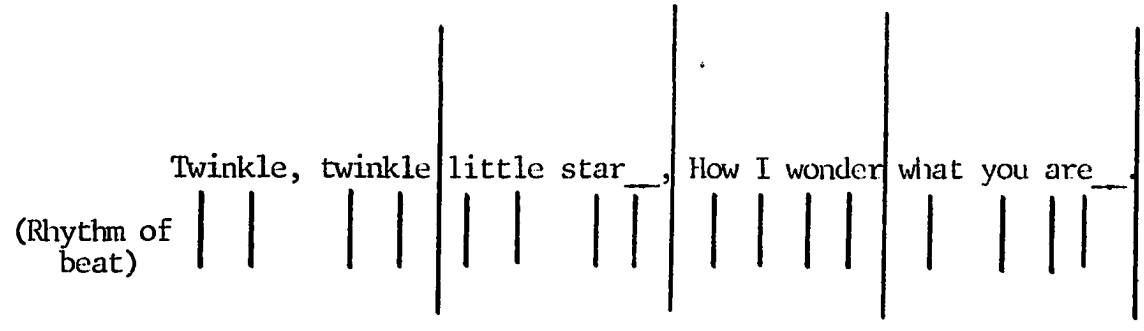


---

5. ANSWER

The rhythm of the beat.

Listen again.



Rhythm - Lesson 2

12.

SCHOOL DAYS

School days, school days, dear old gol-den rule days.

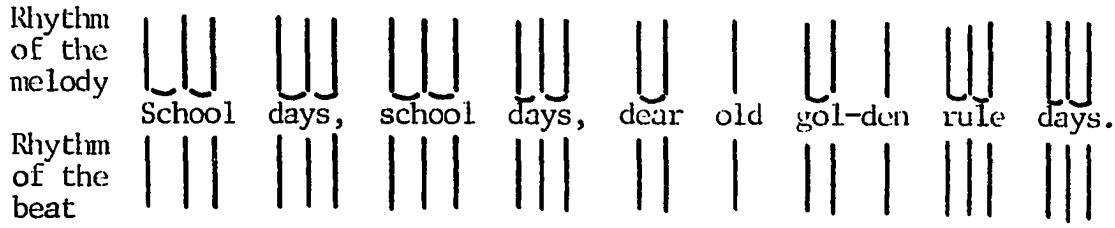
Tap the beat with me and watch the words.

Do the circled words sound for one beat or longer than one beat?

---

12. ANSWER

Longer than one beat.



Listen again. Tap the beat and watch the rhythm of the melody.

Rhythm – Lesson 3

7.

"KOOKABURRA"

A. Tap the rhythm of the beat.

B. Clap the rhythm of the melody.

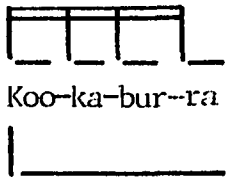
C. YOU clap the rhythm of the melody and I'LL tap the rhythm of the beat.

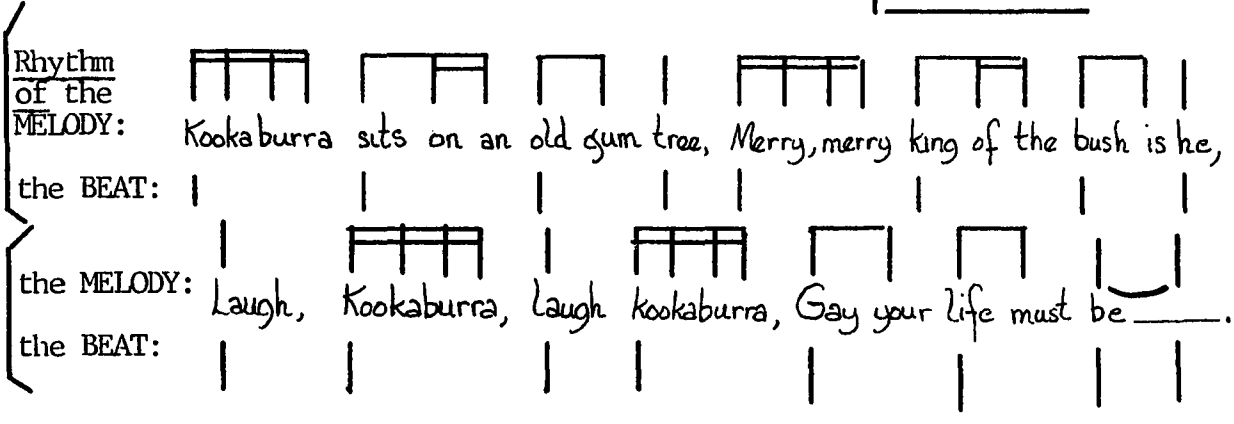
D. Decide if most of the melody tones are LONGER or SHORTER than one beat.

---

7. ANSWER

Most of the tones sound shorter than one beat.





Rhythm - Lesson 3

CRITERION MEASURES

1. The words to a song are shown here. I will sing the melody and tap the rhythm of the beat.

   Decide if MOST of the melody tones

   A. have the same rhythm as the beat.

   B. sound longer than one beat.

   C. sound shorter than one beat.

   Song words -

   I'm with you and you're with me and so we are all together,

ANSWER: C.

---

3. You will hear a song called "MINKA."

   As you listen, tap the rhythm of the beat with me and decide if most of the melody tones

   A. have the same rhythm as the beat.

   B. sound longer than one beat.

   C. sound shorter than one beat.

   Write A, B, or C in the blank.

ANSWER: C.

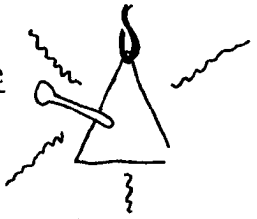
Timbre - Lesson 1

2. The timbre of a sound is a result of several things.

(1) The timbre of a sound depends on the material in the sound source.

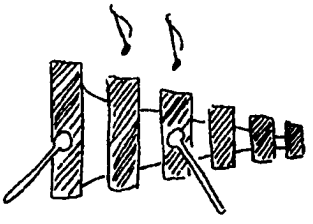
triangle

(metal)



xylophone

(wood)



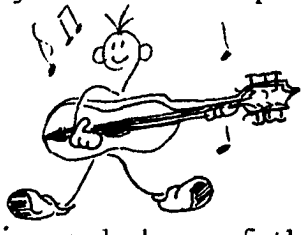
(2) The timbre of a sound depends on the way the sound is produced.

trumpet

(blown)

guitar

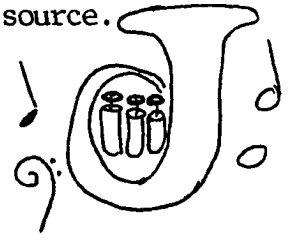
(plucked)



(3) The timbre of a sound depends on the size and shape of the sound source.

tuba

(low)



piccolo

(high, shrill)

CRITERION MEASURES

1. Four sound-producing materials

   A. metal

   B. paper

   C. plastic

   D. wood

   You will hear a sound.

   The sound will be made from one of these four materials.

   Listen to the sound.

   Write the letter name of the material you hear in the blank.

Timbre - Lesson 2

3. Most sound sources can produce more than one timbre.

Let's use our  for a sound source.

We can CLAP, RUB OUR PALMS TOGETHER, and SNAP OUR FINGERS.

We use one sound source, our hands, to make three different sounds.

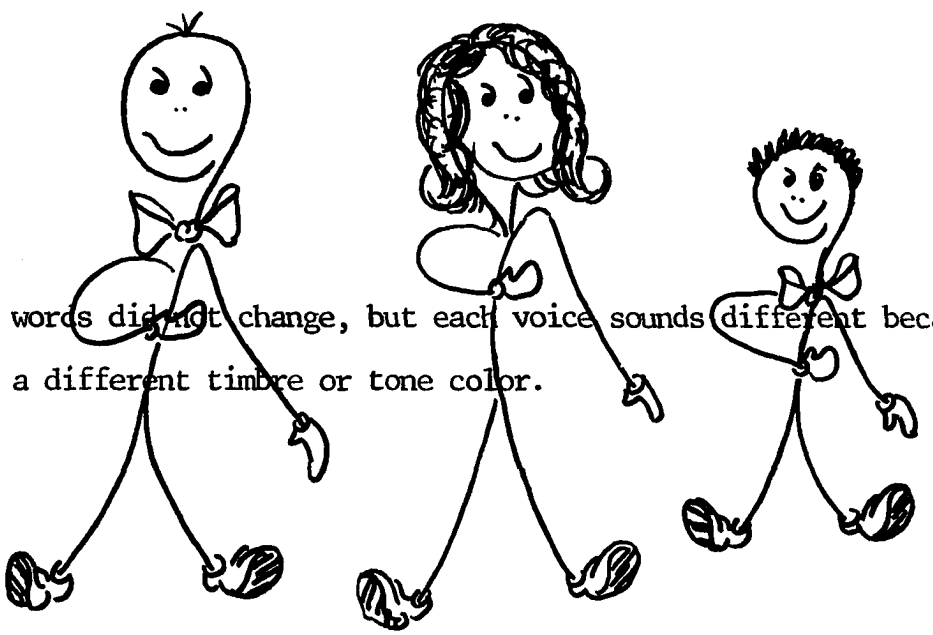
What is this sound?

What is this sound?

CONCEPT: A sound source may produce more than one timbre.

Timbre - Lesson 3

2. "I pledge allegiance to the flag of the United States of America" -

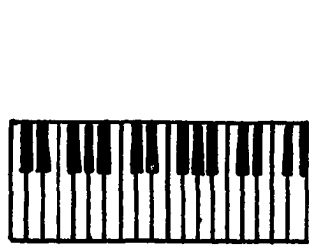


The words didn't change, but each voice sounds different because it has a different timbre or tone color.

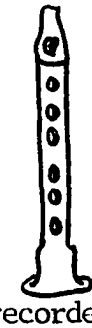
Timbre - Lesson 3

3. The same musical idea may have a different timbre when it is produced on another sound source.

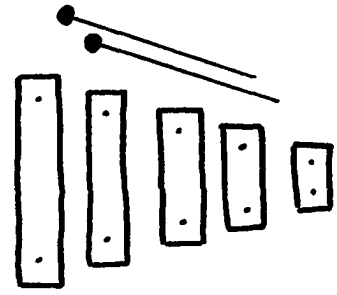
Suppose "Jingle Bells" is played three times -



piano



recorder



bells

Will the timbre stay the same or will it be different for each instrument?

---

3. ANSWER

Different. (Each instrument has its own timbre.)

piano

recorder

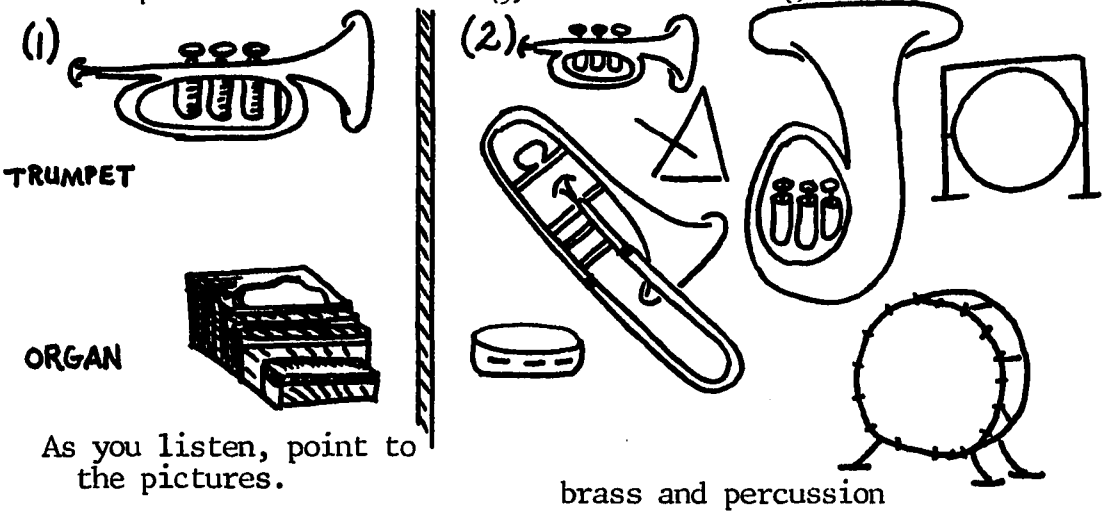
bells

Timbre - Lesson 3

5. "The Prince of Denmark March" by Jeremiah Clarke.

The same musical idea is played two times.

To keep the music interesting, the timbre changes.



As you listen, point to the pictures.

brass and percussion

---

6. Benjamine Britton, an English composer, uses this musical idea over and over in a piece called "A Young Person's Guide to the Orchestra."

The musical idea is played six times.

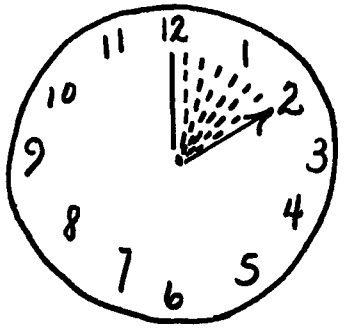
To keep the music interesting, the timbre changes each time.

FULL ORCHESTRA (all families)			
	BRASS FAMILY (trumpet)	PERCUSSION FAMILY (drum, etc.)	
STRING FAMILY (violin, cello)			WOODWIND FAMILY (flute, clarinet)

As you listen, point to the box which names the FULL ORCHESTRA or family you hear playing. One group plays twice, but not two times in a row.

ANSWER: Full orchestra, woodwind, brass, string, percussion, full orchestra.

Intensity - Lesson 1

9. 

"The 10 second sound."

Make a sound with a sound source, such as a pencil or your hands.

Keep the same sound going for ten seconds.

Change the intensity only a few times by making the sound louder or softer.

Make the sound for another ten seconds.

Change the intensity many times.

---

3. You will hear a musical example.

As you listen, decide whether the intensity is

A. LOUD - SOFT - LOUD - SOFT - LOUD

B. SOFT - LOUD - SOFT - LOUD - SOFT or

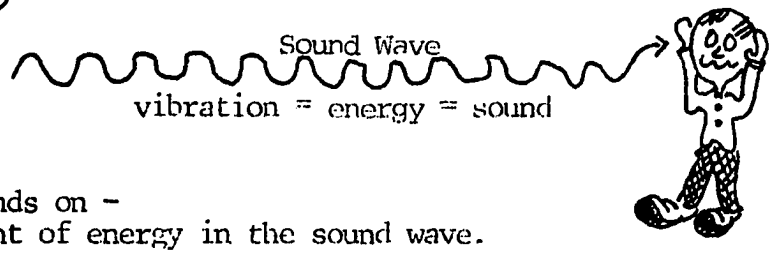
C. LOUD - LOUD - LOUD - SOFT - SOFT.

Write A, B, or C in the blank.

ANSWER: A.

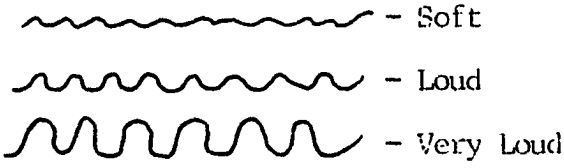
Intensity - Lesson 2

Intensity is the loudness or softness of a sound.

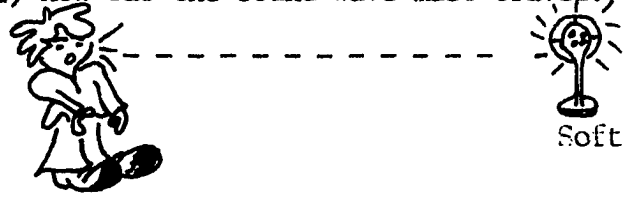


Intensity depends on -

(1) The amount of energy in the sound wave.



(2) How far the sound wave must travel.



"Pop, Goes the Weasel"

All around the cobbler's bench,
the monkey chased the weasel.
The monkey thought 'twas all in fun,
Pop, goes the weasel.

Can you think of a place in this song to use a SUDDEN change of intensity?

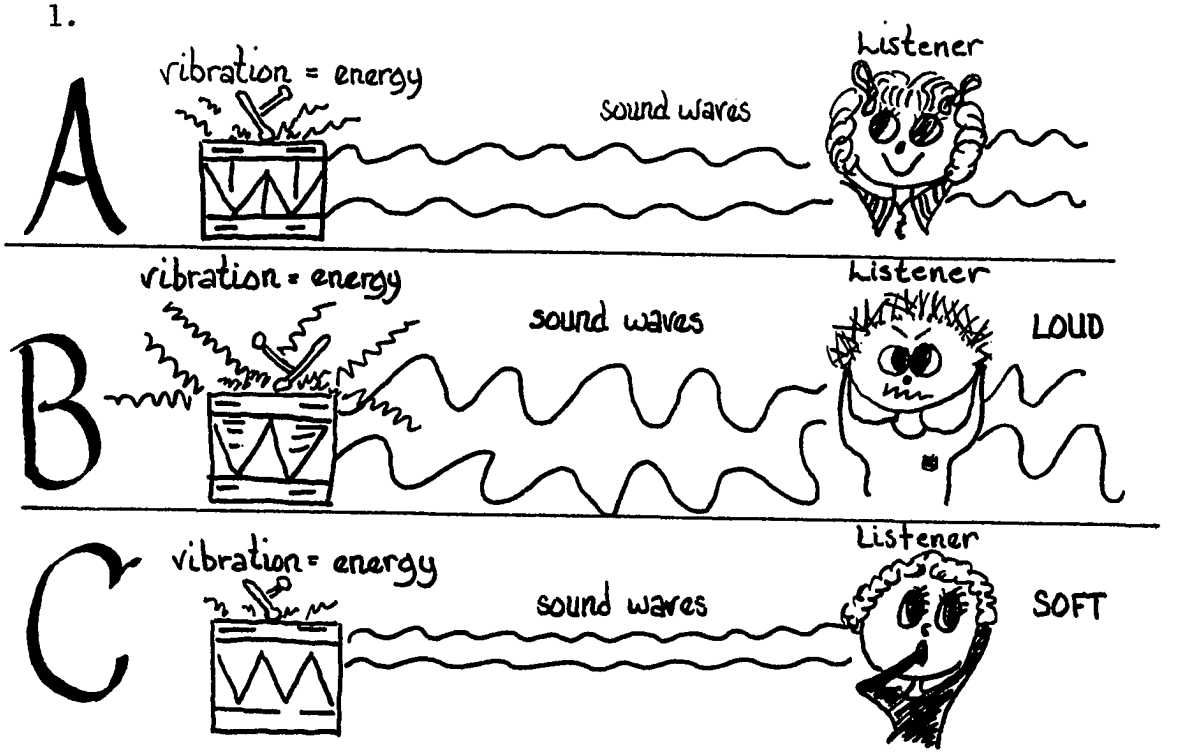
Would you start softly and suddenly change to loud, or start loudly and suddenly change to soft?

Sing the song to yourself and answer these questions.

ANSWER: Begin softly and suddenly change the intensity to loud on the word "Pop."

Intensity - Lesson 3

1.



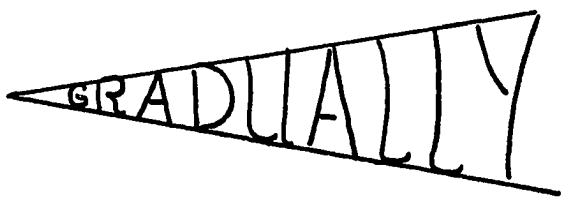
3. When intensity changes gradually, the change happens a little at a time.

From soft to loud  or from

loud to soft. 

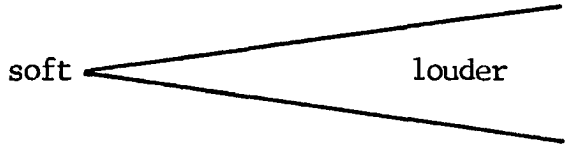
Gradual = little by little.

Listen to this music. The intensity changes

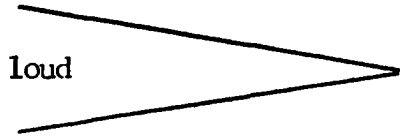


Intensity - Lesson 3

5.



CRESCENDO = gradually get louder.



DECRESCENDO = gradually get softer

You will hear a piece of music.

In this music, the intensity changes.

You will hear either a CRESCENDO or a DECRESCENDO.

Listen.

Point to the sign which shows how the intensity changes.

CRESCENDO DECRESCENDO

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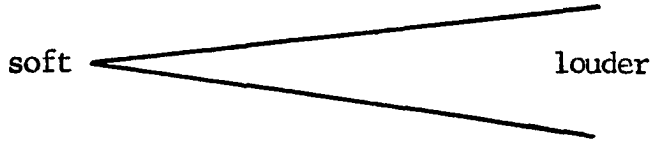
5. ANSWER

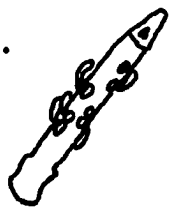
CRESCENDO



The music gradually gets louder.

Intensity - Lesson 3

10.



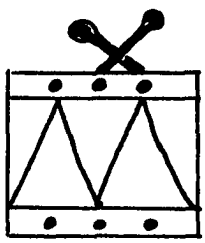
"SOUND PIECE"

(To be played on your sound source.)

Begin at A and make the sounds written by each letter.

Pick up your sound source.

Stop the tape and play the "SOUND PIECE."



A. 1 loud sound

B. 5 soft sounds

C. crescendo (begin softly and gradually get louder)

D. 5 loud sounds

E. descrescendo (begin loudly and gradually get softer)

F. 5 soft sounds

G. 1 loud sound

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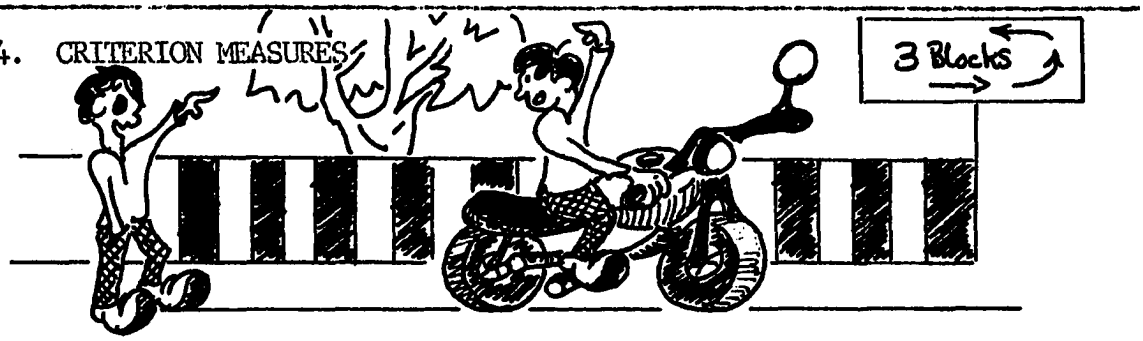
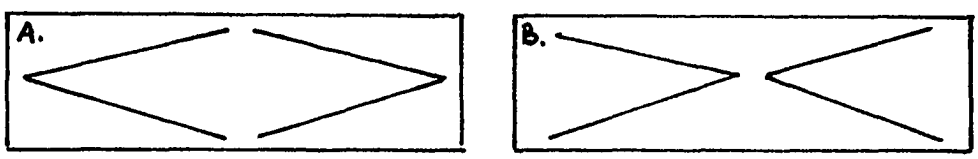
4. CRITERION MEASURES



The story: Two friends were standing together at a street corner. One friend got on the motorbike. He started the motorbike, rode down the street three blocks, turned, and rode back to his friend.

The signs in one of the boxes below show how the motorbike sounded to the friend who waited at the corner.



Question: How did the motorbike sound to the friend who waited at the corner? Like the intensity signs in Box A or Box B? Write A or B.

ANSWER: B.