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The effect of theme association and visual stimulus upon aural retention and preference in a music listening experience.

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THE EFFECT OF THEME ASSOCIATION AND VISUAL STIMULUS UPON AURAL RETENTION AND PREFERENCE IN A MUSIC LISTENING EXPERIENCE

A Dissertation

by

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D. J. B.

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INTRODUCTION

Music appreciation in the form of listening experiences began to appear in music curricula during the early 1900's. These curricula attempted to build a listening repertoire for children. These early curricula failed in many ways, one of which included the fact that they were being taught by teachers who lacked concern for the musical needs of the majority of the student body and the lack of awareness for a society with a continually changing musical "taste."

Up to the late 1940's, music in the schools was geared to the student who participated and performed in some musical organization. From this point, music educators began to be concerned with the "consumer" of music. This precipitated a change in curriculum thinking based on a different kind of educational objective: to help all students acquire an awareness of the importance of listening to music with discrimination and understanding. Passow has said that "a person is intelligent to the degree that he actively discriminated in his entertainment of stimuli."[1]

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[1]Harry Passow, "Curriculum Crossroads," A Report of a Curriculum Conference (New York: Bureau of Publications, Teachers College, Columbia University, 1962), p. 60.

Purpose of the Study

This study was initiated in response to the apparent lack of information from research in music on the most effective ways of teaching program music, particularly in regard to its unique relationship to theme and imagery. There has been little research on the effectiveness of utilizing story-related visual aids or thematic associations related to persons, scenes, and events that are part of the total musical image found in a program piece.

The purpose of this study is to examine the effect of related thematic material of program music and/or visual supports on ability to identify the music. It is important that methods for generating positive attitudes toward program music among children be found if the music of the past is to survive in our educational institutions.

Statement of the Problem

The problem is finding a means of teaching program music that will be more effective than existing methods which do not use story-related visual aids and/or thematic association as it is related to music-story content. The approaches selected to deal with this issue ~~is~~ are:

A. To compare subjects' ability to recognize a piece of program music by associating the correct title with it under four different modes of learning about the piece both

on second hearing (up to two weeks later) and on a third hearing (two weeks after that).

B. To ascertain the relationship between scores on a title recognition test and scores on a musical preference test.

Hypotheses:

A. Scores on the title recognition test on a second hearing, up to two weeks after first hearing:

1. will be positively related to liking for the music on first hearing;
2. will be positively related to liking for the story on first hearing;
3. will be increased by having seen slides of the story (visual stimulus) while first hearing the piece;
4. will be increased by having heard the themes of the music associated with the appropriate parts of the story before first hearing the piece.

B. Scores on the title recognition test on third hearing, two weeks after second hearing:

5. will be poorer than at second hearing;
6. will be positively related to liking for the music on first hearing;
7. will be positively related to liking for the story on first hearing;

8. will be increased by having seen slides of the story (visual stimulus) while first hearing the piece;
9. will be increased by having heard the themes of the music associated with the appropriate parts of the story before first hearing the piece.

Definition of Terms

Program Music - Instrumental music which is expressly written to describe moods or topics suggested by the title or the program accompanying the music.

Theme Association - The relationship of the melodies to the story, characters, or scenes described in a program piece.

Visual Stimuli - Filmstrips pertaining to the story or scene that the musical composition describes.

Aural Retention - Being able to recognize the name-sound relationship of a particular recording of a musical composition.

Musical Liking - The degree of enjoyment when related to the different musical stimuli.

Title Recognition Test - A test which measures the ability to identify the title of a recorded musical selection through aural perception.

Importance of the Study

In recent years, much has been said about the necessity for improving the teaching of music in the public schools so as to produce students who can respond to music with greater aesthetic sensitivity. Many music teachers seem to be unable to help students develop an appreciation for music. Schardron states that one of the goals in music education is "to raise the level of aesthetic understanding so that the complexity and subtleties of music can become more meaningful to more students."[2] The music, if it is perceived and understood to its ultimate degree of aesthetic sensitivity, should remain in the minds of the listeners for subsequent experiences which should facilitate the application and recall of these musical insights. Zimmerman states that "whatever we listen to we must immediately associate, compare, discern, evaluate, and retain for recall in either its exact or modified form."[3]

It is important to recognize that aesthetic musical growth must be based on a maximum attention factor attained through enjoyment and pleasure rather than through forced

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[2]Abraham A. Schardron, "Aesthetics," Dimension for Music Education (Washington, D. C.: Music Educators National Conference, 1967), p. 67.

[3]George H. Zimmerman, "Listen," Music Educators Journal, XLVII (June-July, 1961), p. 30.

listening. Bartlett says, "listening to music may occur with relatively little awareness of what is happening within the musical performance; however listening attentively necessarily involves some degree of recognition, perception or identification of musical stimuli by the process of distinguishing and sifting out certain stimulus characteristics."[4]

This capacity for attention combined with an enjoyment factor must be facilitated in the listener in a subtle manner so that the method does not detract from the recognition, perception, and identification of different aspects of the music which can result in the appreciation of musical sound, while at the same time, contributing to musical growth. It is most important that the student is aware of this growth and builds on it. There is also a need for guided experiences which will prepare and lead the student into subsequent experiences and which will facilitate the application and recall of those insights that will clarify and re-shape the information which is already part of his musical knowledge and preferences. Reimer believes that "aesthetic education

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[4]Dale L. Bartlett, "The Effect of Repeated Listenings on Discrimination of Musical Structure and Some Relationships Between this Discrimination and Effective Shift" (unpublished Ph.D. dissertation, University of Kansas, 1969), p. 7.

has for its major task the systematic development of each individual's ability to perceive the artistic content of works of art."[5]

Music educators are of the opinion that better ways for developing musical growth and aural understanding must be found. The report of the Yale Seminar on Music Education expresses the position that "of the three main components of the curriculum--composing, performing, and listening--perhaps the most difficult one for the teacher to guide is listening . . . Defenders of a listening program acknowledged that so far it seems to have had little success below the college level, but they attribute this to a lack of proper classroom guidance, due in turn to insufficient knowledge and skills on the part of the teacher."[6]

Many music educators cannot themselves discriminate objectively in the selection of listening material for their classes. Many choose selections that are too long, or are too complex, or lack the excitement and energy that are so often associated with the youth of today. As Phillips says, "the criteria for the selection of music must be of

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[5]Bennett Reimer, "The Development of Aesthetic Sensitivity," Music Educators Journal, Vol. 51 (January, 1965), 35.

[6]Claude V. Palisca, Seminar on Music Education, Cooperative Research Project No. G-613 (New Haven, Conn.: Yale University, 1963), p. 53.

of such a nature that the student will be able to respond to it creatively without becoming lost in its complexities or bored because of its brevity and lack of musical validity."[7] Educators must be aware that some compositions are simply not within the intellectual grasp of elementary students in the early stages of their musical growth. Phillips further states that the cause "may be due to inordinate length, subtlety of structure, sophistication of melodic construction, or some other complexity. The listening experience with such music would tend to be abstruse and would not be profitable."[8] Zumbrumn also states that "since listening is a skill which must be learned, it seems logical that material be presented in such a way that a person can exercise and rehearse in order to develop a desired level of aural sensitivity."[9]

When choosing selections for a music class Campbell says that teachers "should not choose the works that appeal to the

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[7]David G. Phillips, "Sound and Sight in Music: Visual Reinforcement for the Aural Perception of Musical Content for the Non-Music Major in College" (unpublished Ph.D. dissertation, Columbia University, 1967), p. 28.

[8]Ibid., p. 29.

[9]Karen Lee Fanta Zumbrumn, "Effects of a Listening Program in Contemporary Music Upon the Appreciation by Junior High School Students of Representative Literature of Other Periods" (education research project, DHEW, Washington, D.C., September, 1968), p. 3.

experts and to the experienced."[10] Teachers should choose works that have a sensuous and expressive appeal to the listener.

The introduction of program music can be the first step for providing the student with some intellectual background upon which a student can develop needed techniques for responding knowledgeably to increasingly intricate musical compositions. Nelson has observed "that persons with nominal backgrounds of musical training will prefer to listen to programmatic music, since they are able to make reference and association to known objects or ideas when the musical stimulus is presented."[11]

In program music, the visual image can be important in appreciating aural image, and is a reinforcement and enrichment of the experience as a whole. The visual and the aural sensory impressions interact and make the experience more meaningful. It is important, according to Moses, that we should learn "to utilize a wide assortment of new equipment available, electronic and visual, in order to bring students those exciting musical experiences. Through the use of

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[10]D. N. Campbell, "Education for the Aesthetic Experience," Music Educators Journal, Vol. 53, No. 8 (April, 1967), 77-83.

[11]Carl B. Nelson, "The Effectiveness of the Use of Programmed Analysis of Musical Works on Students' Perception of Form" (education research project, DHEW, Washington, D.C., December, 1967), p. 6.

recordings, tapes and films we can bring the modern musical scene into the classroom."[12] It is the opinion of many music educators that "children can, at an early age, be exposed to certain aural visual aspects of music simultaneously. This may prove more interesting and challenging than to isolate the aural aspects for an unusually long period of time."[13]

In actuality, the composer created a musical composition based on a story or scene and one cannot separate the two from one another without losing the intent of its relationship. As Meyer states, associative responses are most important in the affective experience of the listener. Mood and imagery are determinants of value when listening to music and are conditioned by the experience of the individual listener.[14] Lee believes that the untrained listener is not able to comprehend musical elements, so therefore, he tends to rely on association, memories, or musical daydreaming.[15] While Bartlett says, "Mood and imagery effects,

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[12]Harry E. Moses, "General Music in General Education," Music Educators Journal, XLVII (February-March, 1961), 52-53.

[13]Robert G. Petzold, "Auditory Perception of Musical Sound by Children in the First Six Grades" (education research project, DHEW, Washington, D.C., 1966), p. 4.

[14]Leonard Meyer, Emotion and Meaning in Music (Chicago: University of Chicago Press, 1957), p. 258.

[15]Vernon Lee, "Varieties of Musical Experiences," N. American Review, 1918, pp. 748-57.

for example, often play a significant role in maintaining a listener's attention to music."[16]

Students in their environmental situations are more susceptible to program music due to the advent of television and its sound-sight relationship. Many of the cartoons seen on television are noted for their use of program music. As Mursell says, motivation and eagerness are necessary in a learning experience and these qualities can be enhanced if they are related to experiences found in the student's environment.[17] Bartlett also explains that "man strives to organize his environment to include experiences that will create a more pleasant existence. Stimuli to which the student responds positively will tend to become an important part of his environment. Stimuli to which he responds negatively likely will tend to be excluded from his environment."[18]

It is imperative that educators see to it that elementary students get the needed training in aural perception of classically oriented music before the child is caught in the web of today's "pop" music. The teacher must stimulate the students' listening habits through "choice" musical selections.

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[16] Ibid., p. 8.

[17] James Mursell, Education for Musical Growth (New York: Ginn and Company, 1948).

[18] Ibid., p. 15.

If this objective is accomplished through carefully selected music by the time the student attains junior high school age he will have a point of reference for selecting and discriminating musical sounds with a greater aesthetic sensitivity.

It is reasonable to assume that if students can learn to retain for future comparison and scrutiny the selections heard in a music class, they will increase their capacity and desire for music listening experiences as adults. "Guided listening as a means of understanding and acquaintance with the monuments of music literature past and present, deserves a larger place than it occupies today in the elementary and secondary schools."[19] "It is clear that a well arranged course in listening to music can in short time work a great improvement in the accuracy of pupils' judgments of orchestral selections."[20]

Limitations of the Study

This study is limited to fifth grade students of the Fort Meadow Elementary School at Westfield, Massachusetts. It deals only with music with programmatic inflections and did not include absolute music (music that is not descriptive.) It also deals with preference of students towards

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[19] Ibid., p. 53.

[20] M. L. Mohler and M. R. Trabue, "Scales for Measuring Judgement of Orchestral Music," Journal of Educational Psychology, XIV (December, 1923), 545-61.

the story the composition describes and the music that is associated with the story.

This study seeks to ascertain the interrelationships between visual, aural, and associative aspects of musical stimuli and their effects upon student responses.

C H A P T E R II

REVIEW OF THE LITERATURE

Studies in the field of music appreciation and music listening have been conducted for many years. In recent years however, research in these two areas has been increased considerably due to the growing awareness of the need and desire on the part of music educators to find answers to perplexing problems in defining the role of the listener. For instance, Jancke[1] describes two types of listeners: those that base their musical conclusions upon a knowledge of musical form, structure, texture, etc., and those that listen to music because of its emotional and sensorial appeal.

All studies that were investigated were concerned with the effect on learning of repeated listening, cognitive behavior and affective response, enjoyment and pleasure in music, and structural elements of the music. None of the studies pertained to theme association or visual-story relationships and very few of the studies dealt with program music. Research concerning program music has been more or

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[1]H. Jancke, reported by Zumbrumn, "Effects of a Listening Program."

less incidental to major studies in music education. Researchers have noted the presence of program music but have not placed great emphasis on it.

Effects of Mood and Imagery

One of the most important sources of affective experiences is derived from the role that is played by the imagination of the listener when mood and imagery is evoked. Images can be aroused and conditioned by listening experiences that are controlled by the music educator.

Nelson's[2] investigation was to ascertain whether or not students' aural perception of form can be improved with programmed materials. Three hundred non-music majors were randomly assigned to six treatment groups. In one of the experiments students were asked to listen to three programmatic compositions (Scheherezade, Die Moldau and Romeo and Juliet), and to compare preference ratings with absolute music. To measure the like-difference between compositions the students were asked to select one of two compositions played. The three absolute and three program pieces were arranged in fifteen possible pairings, for preference ratings.

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[2]Carl B. Nelson, "The Effectiveness of the Use of Programmed Analysis of Musical Works on Students' Perception of Form" (education research project, DHEW, Washington, D.C., December, 1967).

It was concluded that the absolute composition consistently ranked lower than the program pieces on the preference scale.

Downey and Knapp[3] tested 33 college students on eight classically oriented compositions, once a week for five weeks. The eight recordings were classified as selections representing: National Feeling, Poetic Thought, Program Music and Formal Construction. The result indicated: (a) there was a continuous increase in pleasantness upon repetition, (b) there was a greater increase for the more "subtle" and aesthetic compositions, (c) the placement of the composition influenced the degree of preference (first and last place compositions were most preferred). It was concluded that "familiarity certainly increased the affective value of the more subtle musical compositions and might be counted upon as a factor for training in musical appreciation."

Rigg[4] used three groups of college students and had them listen to 18 records, to determine the listener's mood

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[3]June E. Downey and George E. Knapp, "The Effect on a Musical Programme of Familiarity and of Sequence of Selections," The Effects of Music, ed., by Max Schoen (New York: Harcourt, Brace and Company, Inc., 1927), pp. 225-35.

[4]Melvin Rigg, "An Experiment to Determine How Accurately College Students can Interpret the Intended Meanins of Musical Compositions," Journal of Experimental Psychology, XXI, No. 2 (August, 1937), 223-29.

within certain responses. It was found that: (1) program notes could be an influence in establishing association, (2) musical and non-musical students' scores were very similar.

Hornyak,[5] using 1,300 school students of all ages, wanted to find out the degree of favorable responses of students toward contemporary music and program music. The experiment determined that instruction of stylistic features of serial music (program music) tended to produce more favorable response than the historical or biographical approach. However, instruction relating to the stylistic, biographical, or historical approach of other compositions did not result in a significant degree of favorable responses.

Higginson[6] tested a group of school children ten to fourteen years of age. In his study 1,230 boys were used to determine the effect of association, mood, and imagery when listening to program music. It was determined that students did associate moods and imagery with music and also did respond to program pieces through a means of association.

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[5]Robert R. Hornyak, "An Analysis of Student Attitudes Towards Contemporary American Music," Council for Research in Music Education Bulletin No. 8 (Fall, 1966), pp. 1-14.

[6]J. H. Higginson, "The Associational Aspect of Musical Response in School Children," Journal of Educational Psychology, XXVII (1936), 572-80.

Effects of Repetition and Preference

There seems to be a general agreement that repetition and preference go hand in hand in a musical experience. The majority of studies have concluded that repetition is a prime requirement for aesthetic and affective response toward a musical composition.

The central purpose of the thesis done by Getz[7] was to investigate what effect familiarity based on repetition of previously unfamiliar serious music has on the degree of musical preference of a group of seventh grade children. Three hundred and thirty-nine subjects listened to forty selections during a ten-week repetition listening experience of a four-week preliminary hearing of the same recordings.

Analysis of the data revealed that familiarity through repetition was the reason given most often by the students as a determinant of their preference. Musical factors mentioned as a reason for preference in the order of frequency were tempo, rhythm, melody, mood, dynamics, variation in pitch, variety of material,smoothness of music, repeated

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[7]Paul Russell Getz, "The Influence of Familiarity Through Repetition in Determining Optimum Response to Seventh Grade Children to Certain Types of Serious Music," (unpublished Ph.D. dissertation, Pennsylvania State University, 1963).

melodic material and harmony. Musical factors eliciting Like Reactions were in order of frequency, fast tempo, variety of volume, melodic repeats, flowing rhythm, jumpy melody, variety of melodies and mode, in that order.

Implications resulting from this study are as follows: (1) factors in intelligence and musical ability should not be a factor in organizing a music course of study, (2) educators should select initially compositions containing musical elements of fast tempo, rhythmic emphasis, and easily distinguished melody, and (3) the teacher should afford students the opportunity of hearing musical compositions at least two or three times after their introduction.

Gilleland and Moore[8] in an investigation involving 35 college undergraduates, played recordings of classical and jazz selections five times a day for five consecutive days for a total of 25 repetitions. These students rated each composition on a ten-point preference scale. It was found that classical music increased in pleasantness upon repetition while jazz selections remained constant or decreased slightly upon repetition.

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[8]A. R. Gilleland and H. T. Moore, "The Immediate and Long-Time Effects of Classical and Popular Phonograph Selections," Journal of Applied Psychology (1924), pp. 309-23.

In a study done by Williams,[9] 200 subjects were tested on a five-point scale on a degree of like and dislike. Selections by Bach, Beethoven, Brahms, Milhaud, Ravel, and three selections from the "pop" idiom were used. When the same selections were played the second time the following day, it was found that there was no significant change in the affective response of the group, although it did increase slightly.

In a study done by Verveer, Barry and Bousfield,[10] two jazz recordings were presented to a group of subjects. The subjects listened to the recordings eight times during two different sessions given two weeks apart. The students rated the music after each hearing. The affective response of his subjects was (1) higher after two listenings, (2) diminished progressively with further repetition, (3) pleasantness increased for the selections after a period of rest, and (4) popular compositions reached a higher degree of preference more quickly but decreased faster with repetition.

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[9]Geneva D. Williams, "The Effect of Order of Appearance on the Appreciation of Musical Selections," Journal of General Psychology, XXVII (1942), 295-310.

[10]E. M. Verveer, H. Barry, Jr., and W. A. Bousfield, "Change in Affectivity With Repetition," American Journal of Psychology, XLV (1933), 130-34.

Krugman[11] chose seven subjects and placed them into three categories. Three subjects were chosen for their preference for classical music, while three were chosen for their preference for swing and one was chosen because of his indifference to both types of music. The seven subjects listened to their three chosen recordings once a week for eight weeks. After choosing the three recordings that, in the opinion of the subjects, had a preference rating of indifference, it was concluded that the preference rating increased consecutively for all subjects during the first six sessions, then decreased slightly after that time.

Studies by Washburn, Child and Abel[12] reported similar findings. Using 220 college students and eight unfamiliar recordings, an experiment was devised to test the degree of pleasantness on the immediate repetition of musical selections. There were four classifications, popular, easy popular classical, serious popular classical, and seriously classical. The first recording was repeated five times before playing each successive recording.

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[11]Herbert E. Krugman, "Affective Response to Music as a Function of Familiarity," Journal of Abnormal and Social Psychology, Vol. 38 (1943), 388-92.

[12]M. F. Washburn, M. S. Childs, and T. M. Abel, "The Effect of Immediate Repetition on the Pleasantness or Unpleasantness of Music," The Effects of Music, ed. by Schoen, pp. 199-210.

It was found that: (1) maximum affective response was reached sooner with popular music than with seriously classical compositions, (2) repetition tended to lower the degree of pleasantness for popular music, and (3) the degree of pleasantness decreased sooner for musical than for non-musical subjects.

Mull[13] was concerned with finding what the effect repetition has upon preference regions in a musical composition. Thirty "musical" students listened to three unfamiliar musical compositions three times each. Preference regions within the composition were derived by a show of hands from the students. Mull concluded that: (1) no one region within the musical selection was especially pleasing to all observers, (2) 50% of the thirty students considered the same regions in the composition pleasing, (3) of the 14 regions that were found pleasing nine were repetition of thematic material. (One important factor here is that some of the repeated themes were not especially pleasing on first hearing, but began to become pleasing on subsequent hearings), and (4) like responses were more frequent with simple melodic ideas than with complex or dissonant melodic sections.

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[13]Helen K. Mull, "Effect of Repetition Upon the Enjoyment of Modern Music," Journal of Psychology, XLIII (1957), 155-62.

Using a group of junior high school students, which met six times a week, Nash[14] for his experiment compiled six recordings with explanation accompanying each recording. It was found that students had a higher degree of enjoyment from folk music, than from orchestral or operatic music. It was also derived that repetition had an effect on the preference of lively orchestral music versus slow orchestral music.

Mull and Merrill[15] used 30 musical and non-musical college students in their study. It was found that non-musical subjects were less discriminating in their responses than musical subjects in the three compositions used (Bach, Brahms, and Chopin). Of 1,765 "high spots" responses, musical subjects gave twice as many "high spots" and four times as many common responses than the non-musical subjects. Repeated hearings did increase preference regions for all subjects.

In a study done by Duerksen[16] an audio-visual device

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[14]Louis P. Nash, "The Enjoyment of Music by Junior High School Students: Their Responses to Five Methods of Presenting Recorded Music" (unpublished Ph.D. dissertation, University of California, 1962).

[15]Gertrude Merrill and Helen K. Mull, "A Further Study of Preferred Regions in Musical Compositions and the Effect of Repetition Upon Them," American Journal of Psychology, Vol. 55 (1942), 110-11.

[16]George Duerksen, "Recognition of Repeated and Altered Thematic Materials in Music" (unpublished Ph.D. dissertation, University of Kansas, 1966).

was constructed for 1,914 students of high school and college age to measure recognition of repeated and altered themes in 14 musical examples. In addition, like and dislike responses were measured to these same items. Out of a possible 124 correct answers to the recognition test, 43.5 was the mean score. Those students who indicated a high liking for classical music tended to achieve higher scores on the recognition test. Inverse relationships were found when liking and recognition scores were compared with current "pop" music.

Effects of Elements in Music

Research concerning the effect of elements in music within a musical composition have resulted in conflicting reports. There seems to be no clear-cut answer to the affective responses of the listener while being exposed to musical elements such as: melody, rhythm, tempo, pitch, harmony, dynamics, tone quality, etc.

In a thesis done by Evans,[17] the results achieved were of a negative nature, when the relationship of factors pertaining to musical preference and elements of music were reported. Using a group of seventh grade general music students, Evans played 30 tape-recorded compositions.

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[17]Jesse G. Evans, "The Effect of Especially Designed Music Listening Experiences on Junior High School Students' Attitudes Towards Music" (unpublished Ph.D. dissertation, Indiana University, 1965).

These compositions were taken from four historical periods and represented eight different styles of music. The eight selections were repeated eight times, while 22 compositions were played only once. Class periods were devoted to listening to recordings and lectures about structure, form, instrumentation and other musical elements. The results of the investigation were determined by giving a pretest-postest for preference to the students and deriving the near differences between the scores. The results showed: (a) there was no relationship between preference and understanding the elements of music, (b) there was significant increase in the degree of musical learning, and (c) that increased preference resulted from the eight recordings upon eight repeated hearings.

Mueller,[18] using the elements of music as her base for research, wanted to measure the ability of 117 college students. After hearing three playings of the third movement of Mozart's G Minor Symphony, it was assumed that students would be able to discriminate structural differences within the musical composition. Each hearing was followed by the students' agreement or disagreement to a list of questions pertaining to the structure and form of the musical compositions. Over 75% of the subjects agreed to statements

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[18]Kate Hevner Mueller, "Studies in Music Appreciation," Journal of Research in Music Education, Vol. 4, No. 1 (Spring, 1956), pp. 3-25.

concerning repetition of melodic passages, but there were fewer agreements about introduction, rhythm, and meter. Subjects' attempts to discriminate among too many stimuli at the same time, seem to negate results of parts of the study.

In the study reported earlier by Washburn, Childs and Abel,[19] subjects were asked to respond to a five-point preference factor of increasing and decreasing pleasantness. It was found that the elements in music had an effect on how the subjects responded. Increased pleasantness occurred: (1) when the comprehension of the composition increased, (2) when greater attention was given to melody, harmony, rhythm, and instrumentation, and (3) when the familiarity factor was increased.

Hahn[20] determined that the elements in music such as tone, color, rhythm, staccato-legato tempo, and loudness levels was most important in enhancing musical preference. Other factors used as determinants for musical preference were phrase, structure, repetition and form.

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[19] Ibid.

[20] Marcus E. Hahn, "A Proposed Technique For Investigating The Relationship Between Musical Preferences and Personality Structure" (unpublished Ph.D. dissertation, University of Kansas, 1954).

Henkin[21] chose selections from the different periods in music (baroque, classical, romantic, and contemporary) for his study. Two hundred and forty-three subjects were used to determine the effect of melody, rhythm, harmony, and orchestral color upon the affective judgement of the listener. It was concluded that the students place most of their attention on melody during the first hearing of the piece. However, a shift of attention to the other elements within the composition occurs with repeated listenings.

Zumbrumn[22] found a more favorable response occurred when subjects listened to rhythm, percussion, and wind orchestra and not to stringed instruments and piano timbres. Interest of the students were at their lowest when atonal and impressionistic music was heard. Teachers reported that the greatest amount of student interest among twentieth century music was in jazz, electronic music, and percussion music.

Kearns,[23] using an illustrated magnetic tape in his investigation, successfully attempted to teach non-music majors to listen for specific musical elements. He dubbed

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[21]Robert J. Henkin, "A Factorial Study of the Components of Music," Journal of Psychology, Vol. 39 (1955), 161-81.

[22]Zumbrumn, "Effects of a Listening Program."

[23]William K. Kearns, "A New Approach to Listening in the Music Literature Class," Official Report (Washington, D.C.: National Education Association, 1964), pp. 365-79.

his voice on the tape directly over the music, giving the students numbered reference points so as to match the students' numbered drill sheets which represented ideas and hints about the music and its structure. It was concluded that the students did increase their perception level for musical structure and form.

Petzold's[24] investigation deals with the nature and development of musical skills when focused upon the aural perception of a child's musical development. Tests were administered to the subjects requiring an overt musical response to an aural presentation of the test items. It was concluded that complex melodic, rhythmic and harmonic items were found to be difficult for young children and to some degree for older children. The ability of students to imitate the presentation of certain musical ideas was not a factor for understanding music structure.

The purpose of Rasmussen's[25] study was to develop basic listening skills in music appreciation. A series of programmed tapes were designed for this experiment. Two fourth

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[24]Robert G. Petzold, "Auditory Perception of Musical Sounds by Children in the First Six Grades" (education research project, DHEW, Washington, D.C., 1966).

[25]Warren I. Rasmussen, "An Experiment in Developing Basic Listening Skills Through Programmed Instruction" (unpublished Ph.D. dissertation), cited in Dissertation Abstracts, XXVI, p. 7359.

grade classes met for 13 weeks and listened to 25 programmed lessons. Perception of rhythm, melody, tone color, texture and form were the skills to be developed by the students. "Listening skills were defined as the aural ability and intellectual capacity to perceive musical elements and their relationship to music." Results showed that: (1) sequential planning is an effective tool for teaching music appreciation, (2) programmed tape recordings are an effective tool for developing listening skills, and (3) interest remained at a high level throughout the experiment.

In the following investigation, Oberdin's[26] plan was to determine whether the use of notated examples in a fifth grade music appreciation class would increase the student's ability to aurally recognize musical themes. The conclusion reached was that there was no significant difference between the aural recognition of a theme which was presented with the aid of a notated thematic example and one which was presented without a visual aid when fifth grade students were used as subjects. The factor of intelligence, sex, and musical aptitude had no effect upon the results of the experiment. From observing the results of this experience, it would appear that fifth grade students have not yet

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[26]Helen E. Oberdin, "The Use of Notated Examples in Fifth Grade Music Appreciation Classes," Journal of Research in Music Education, Vol. 1t, No. 4 (Winter, 1967), 300-304.

reached a maturation level on which the notated strips would begin to be of value.

Dittemore's[27] investigation deals with ability of secondary students to recognize variations of known musical themes. These 430 secondary students were required to match 24 musical excerpts with one of three melodies which they became acquainted with before the testing started. The 430 subjects had a mean score of 14.37 from a possible correct response of 24, with senior high students outscoring the junior high students.

Effects of Preference Upon Age, Sex, and Socio-Economic Background

In determining the effect of age, sex, and socio-economic background, most researchers have concluded that preference is a significant factor among and within groups. As Farnsworth[28] relates in his investigation, there appears to be a positive relationship between a particular generation and culture, and musical taste.

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[27]Edgar E. Dittemore, "The Ability of Secondary School Students to Recognize Variations of Known Musical Themes" (unpublished master's thesis, University of Kansas, 1964).

[28]Paul Farnsworth, The Social Psychology of Music (New York: Dryden Press, 1958), pp. 61-77.

Kelly[29] listed three categories for his investigation: classical, semiclassical and popular. Using 210 musically trained students from different socio-economic backgrounds, but similar musical backgrounds, it was found that: (a) sex made little difference in the preference of musical selections, (b) 8th- through 12th-grade students showed an increased preference for classical music, (c) over 50% of the students preferred live music to the different media (television, radio, phonograph), (d) age and socio-economic background have a significant relationship to preference, (e) musical training and preference for classical music seem to be positively related.

Parker,[30] conducted a study with 1,174 high school subjects categorized according to the occupation of their parents. The test was applied to show the relationship between the aesthetic sensitivity and intelligence, socio-economic status and musical ability. Tests used were Gaston's, A Test of Musicality, and Wings', Tests of Appreciation. A non-significant rating was determined

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[29]D. T. Kelly, "A Study of Musical Preferences of a Select Group of Adolescents," Journal of Research in Music Education, IX, No. 2 (Fall, 1961), 118-24.

[30]Griffith Olin Parker, "The Study of the Relationship of Aesthetic Sensitivity Ability, Intelligence, and Socio-Economic Status" (unpublished Ph.D. Dissertation, University of Kansas, 1961), Dissertation Abstracts, XXII, p. 2416.

between the relationship of aesthetic sensitivity and intelligence, socio-economic status and musical ability.

Rogers,[31] in a test conducted with 635 students of different grade levels determined that popular music was preferred over classical music by students of all age brackets. The categories used were: popular music, dinner music, popular classical, and seriously classical. There were three sessions of one and one-half hours each. It would seem, in this investigator's mind, that fatigue would be a factor due to the length of time for each session. Preference ratings, for classical music, were somewhat higher among upper socio-economic students, but this preference seems to decrease with the increased age of the subjects.

Fischer[32] drew 251 subjects from two sixth and two ninth grade classes. She proceeded to choose five obscure classical compositions so as to determine what effect familiarity has upon preference and if socialized preferences are learned reactions. It was determined that preference difference between sex groups, age groups, and socio-economic groups were insignificant.

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[31]Vincent P. Rogers, "Children Expressed Musical Preference at Selected Grade Levels" (unpublished Ph.D. dissertation, Syracuse University, 1956), Dissertation Abstracts, XVI, p. 917.

[32]Lee Rhonda Fischer, "Preferences of Different Age and Socio-Economic Groups in Unstructured Musical Situations," Journal of Social Psychology, XXXIII (February, 1951), 147-52.

Schuessler,[33] in an investigation which included 1,200 persons from varying social and occupational groups, found that changes in musical taste were conditioned by a person's sex, age, occupation, and social background. Schuessler played eight recordings which were rated on a five-point scale. The selections chosen were from the classical idiom as well as jazz, popular, folk, and hillbilly. Like and dislike ratings changed proportionally with changes in familiarity.

Aesthetic Qualities in Music

Hevner,[34] in a study done with 450 college students, concluded that slow tempo stimulates a calm feeling while fast tempo suggested happy, gay feelings. It was also found that pitches played in the higher register elicited a humorous and playful feeling while pitches in the lower register made the listener feel dignified and sad. In an earlier study, Hevner[35] related that listeners described the minor mood as a reflection of sadness while the major

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[33]Karl Schuessler, "Social Background and Musical Taste," (Indiana University, 1949), Psychology Abstracts, XXIII, 727.

[34]Kate Hevner, "The Affective Value of Pitch and Tempo," American Journal of Psychology, XLIX (1937), 621-30.

[35]Kate Hevner, "Experimental Studies of the Elements of Expression in Music," American Journal of Psychology, Vol. 48 (1936), 246-68.

mood was termed as happy and merry. Simple harmonic pieces affected the listener in a serene way while complex harmonies caused a feeling of agitation. She also points out that exciting rhythms evoke feelings of vigor while smooth rhythms evoke feelings of happiness and gracefulness. The effects upon the listener, of rising and falling melodic lines, were not significant.

Gatewood,[36] in his study, found that harmony, melody, rhythm and timbre affected the sensual pleasure and had a satisfying effect upon the listener. Instrumental music had an apparent effect of excitement, joy, and power, while vocal music represented more of an emotional quality to the listener. Rhythm in music created a feeling of happiness and excitement. The sound of brass instruments was more enjoyable to students than string sounds.

Washburn and Dickinson[37] concluded that compositions that were highly quieting or highly exciting were more enjoyable and agreeable than selections that were more neutral in nature.

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[36]Esther L. Gatewood, "An Experimental Study of the Nature of Musical Enjoyment," The Effects of Music, ed. by Max Schoen (New York: Harcourt, Brace and Co., 1927), Chaps. 4, 5.

[37]Margaret F. Washburn and George L. Dickinson, "The Source and Nature of the Affective Reaction to Instrumental Music," Schoen, op. cit., p. 126.

Farnsworth[38] states that tonal patterns that are repeated enough times arouse a feeling of expectancy. However, melodies that modulate from key to key fail to effect a mood change within the listener. As in the case of rhythm, it can benefit the listener by helping him to perceive more of the compositional structure. Loudness affects the hearer in a way that stimulates the sense of attentiveness.

Mursell[39] relates that the melody of a composition is most important to the listener deriving a source of pleasure and interest from this component. Although modulation as stated by Farnsworth does not stimulate the senses of the average listener it tends to affect the aesthetic quality of the composition if it is perceived by the listener.

Rigg,[40] in his investigation, determined that fast tempo and happiness tended to go hand-in-hand while slow tempo suggested a sad feeling to the listener.

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[38]Farnsworth, op. cit.

[39]James Mursell, The Psychology of Music (New York: W. W. Norton, 1937), pp. 212-17.

[40]Melvin G. Rigg, "Speed as a Determiner of Musical Mood," Journal of Experimental Psychology, XXVII (1940), 566-71.

Preference as Related to Familiarity and Complexity

Schoen and Gatewood[41] found that familiarity is an important part in the enjoyment factor of persons with limited musical background as opposed to subjects with a high degree of musical training. It was also concluded that familiar selections were enjoyed more than unfamiliar music by a ratio of three to one.

Pitts'[42] investigation deals with the use of 38 college students listening to seven musical selections each having greater complexity than the one preceding. The complexity factor was determined by pairing selections and having students check which was the less complex of the two. The most complex compositions were replayed 21 times to determine whether various levels of complexity would change with repetition. Using a five-point scale, it was concluded that the affected response remained low for high and low complexity compositions while those compositions with rating of moderate complexity were somewhat higher.

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[41]Max Schoen and Esther Gatewood, "Problems Related to the Mood Effects of Music," The Effects of Music, ed. by Max Schoen (New York: Harcourt, Brace and Co., 1927), chap. 8.

[42]Carl E. Pitts, "Affective Arousal to Music as a Function of Deviations in Perceived Complexity from an Adaptation Level" (unpublished Ph.D. dissertation), Dissertation Abstracts, XXV, 2006.

Sharfe[43] tested 20 college subjects with 42 different melodic sequences associated with electronic music. These melodies were rated on a seven-point complexity scale (ranging from low complexity to high complexity). These students listened to the melodic sequences and rated them from very unpleasant to very pleasant. After 20 days of testing it was found that pleasantness gradually increased for the high complexity melodies, while the reverse was evident with the low complexity examples. The pleasantness scores for the moderate complexity compositions remained basically stationary.

Pepinsky,[44] in a study done with elementary school children at the sixth grade level, found that students increased in their preference for music of Mozart, Haydn, and Gluck. The class met daily for 20 minutes for one-half a year. Based on a pretest-posttest determinant she concluded that liking for the composition increased, both for known and unfamiliar selections.

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[43]Audrey M. Sharfe, "The Role of Complexity and Deviation in Changing Musical Taste" (unpublished Ph.D. dissertation), Dissertation Abstracts, XXVII B, 3696.

[44]Minerva Pepinsky, "Sixth-Grade Children's Attitudes Toward Music of Gluck, Haydn and Mozart and Toward Other Music" (unpublished dissertation), Dissertation Abstracts, Vol. 20, No. 9 (March, 1960), 3771.

Bauman[45] did a study with 600 teen-agers without differentiation as to age, sex, or socio-economic class. Subjects listened to 20 classical, 20 popular and ten "traditional" compositions. Bauman concluded that popular music was preferred over classical music but failed to determine whether or not the evidence was significant enough. Since popular music did have a higher preference rating, Bauman feels that maybe it can be used to illustrate meaningful or correlative material.

Archibeque,[46] in a study using only contemporary music, found that seventh grade students, regardless of their knowledge concerning twentieth century music, showed a marked preference for this type of music than music from earlier periods in history. Another result from this experiment was the indication that students who studied contemporary music produced a higher preference score than other students.

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[45]Victor Bauman, "Teen-Age Musical Preferences," Journal of Research in Music Education, VIII, No. 2 (Fall, 1960), 75-85.

[46]Charlene P. Archibeque, "Developing a Taste for Contemporary Music," Journal of Research in Music Education, XIV, No. 2 (Summer, 1966), 142-47.

Effects of Discussion

Keston[47] conducted a study with eighty-nine senior high school students. One group of students was exposed to serious classical music while the other group heard serious classical music with discussion and explanatory comments. He found that the method utilizing commentary and discussion proved to be superior to the method lacking comments.

Rigg,[48] in another study, this one concerned with the affect of propaganda, determined that students who were given unfavorable propaganda decreased in enjoyment while those students who heard favorable propaganda in the discussion, doubled their gain score. A five-point rating scale was used to determine the degree of enjoyment.

Mohler[49] tested 200 high school and college students to find out whether or not the teacher's lectures had any effect on the accuracy of a student's judgement of instrumental pieces. Group 1 listened to 22 recordings twice without comment, while group 2 listened to the same

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[47]Morton J. Keston, "An Experimental Evaluation of the Efficacy of Two Methods of Teaching Music Appreciation," J. Exper. Ed., XXII (1953), 214-26.

[48]Rigg, op. cit.

[49]M. L. Mohler and M. R. Trabue, "Scales for Measuring Judgement of Orchestral Music," Journal of Educational Psychology, XIV (December, 1923), 545-61.

recordings supplemented by the teacher's commentary. It was found that group 2 did, in fact, show greater improvement in musical taste and accuracy.

Effects of Motivation

In a study done by Porter,[50] a questionnaire was designed to identify certain musical experiences and interests of college students. This analysis was intended to aid the instructor in adapting subject content and teaching procedures to the abilities, needs and interests of the students. It was concluded that the performance skill and participation in performance group organizations are not primary means to full understanding of musical content, and that many students reported that they found satisfaction and enjoyment in listening to music even though they lack knowledge and understanding of the subject. This finding strengthens the position that knowledge and understanding of music are not essential to the enjoyment of music.

Hare[51] states that the more intense the music stimulant, the greater the possibility of attracting attention. He also

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[50]Donald Frank Porter, "An Exploratory Study of the Development of Improved Teaching Procedures in a Music Appreciation Course for General College Students" (University of Oregon, 1965).

[51]Robert Hare, "The Pedagogical Principles of Music Appreciation" (unpublished Ph.D. dissertation, Syracuse University, 1959), Council of Research in Music Education Bulletin No. 6 (Fall, 1965).

relates that teachers of music appreciation should choose compositions which will not burden the untrained listener's attention span.

Beale,[52] in his investigation found that listening experiences are most effective when the interest and attention of the music students are adhered to.

Other Related Studies

Peterson's[53] study was designed to evaluate the listening ability that children have acquired through present instructional practices. A group of 3000 students in grades four through seven were used for this experiment. A Melodic Listening Survey was administered with the use of a tape recorder. Children in each grade were randomly divided into two groups. One group listened to the tapes with the use of notation while the other group listened without notation. This was done to determine the auditory and visual perception factor with listening development. It was reported that auditory-visual discrimination is a factor in listening development and that an increase in achievement corresponds to the increase in grade levels.

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[52]L. Beale, "On the Aesthetics of Listening" (unpublished Ph.D. dissertation, American University, 1958), Dissertation Abstracts, XIX, No. 3, 469.

[53]Viola A. Peterson, "Exploratory Study of Development in Primary and Secondary Schools," (education research project, DHEW, Washington, D.C., December, 1969).

Zumbrumn,[54] in the same study reported earlier, conducted a taped guided listening program of contemporary music and its effect upon understanding other styles of music. Seven hundred and twenty junior high school students were chosen for this experiment, of which 226 received 18 one-half hour taped listening lessons which did not include contemporary music. Two hundred and one were placed in a typical general music classroom situation and did not receive a listening experience, and 161 served as a zero control group which was not exposed to musical instruction of any kind. Results indicated that: (a) knowledge gained through the study of contemporary music was not transferred to music of the past, and (b) twentieth century art music programs had greatest success in inner-city deprived schools.

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[54] Zumbrumn, "Effects of a Listening Program."

Summary

This chapter is concerned with the findings of investigators and researchers in the area of music listening. First of all, program music seems to arouse a more favorable response from the listener than absolute music. Association, mood, and imagery are significant factors in maintaining the listener's attention and interest. Furthermore, all studies indicate that repetition and familiarity are major factors in increasing the preference of the listener, while complexity in music tends to cause an unfavorable response. However, complexity becomes more acceptable with repetition.

Factors of age, sex, and social background seem to affect the preference of students toward music. Changes in musical taste are conditioned by a person's age, sex, occupation and social background. Yet all studies indicate that certain properties in music stimulate the listener's senses in varying degrees. However, research concerning the effect of elements in music has resulted in conflicting reports. Certain elements were more important and effective than others, while a shift of attention to these other elements occurred with repetition.

The utilization of discussion and explanatory comments were found to be a necessity in producing favorable responses to music. And, it was also found that attention and interest with understanding are the prime requisite for effective music teaching.

C H A P T E R III

PROCEDURE

Description of the Sample

The study involved 96 students at an elementary school in Westfield, Massachusetts. The subjects made up the total enrollment in all four fifth grade classes of a predominantly white middle-income elementary school. Of the 116 students in these four classes, 96 subjects completed all phases of the experiment. Subjects who did not complete all phases were deleted from the study, leaving 96 subjects, 24 in each of four conditions.

Selection of Subjects

The subjects were randomly assigned to the four conditions by giving each student in each class a letter running consecutively from A to D. The letter categories were then selected at random for each group.

The four groups met separately three days a week for two weeks for a total of six listening lessons each. Each listening experience lasted approximately 20 minutes. All listening experiences were given in a typical classroom situation. Since the recognition tests were administered to all subjects simultaneously, the tests were given in the cafeteria.

Description of Procedure

Ninety-six students were divided into four groups of 24 students each (one control group and three experimental groups). Six recorded selections with programmatic inflections were chosen for this listening experiment. They were as follows:

Sorcerer's Apprentice

Danse Macabre

On the Trail (from the Grand Canyon Suite)

Street in a Frontier Town (from Billy the Kid)

In the Hall of the Mountain King (from Peer Gynt Suite)

Dance of King Kastchei (from the Firebird Suite)

After hearing each recording the students were asked to circle their preference for the music and story on a scale of seven points:

1. Dislike very much
2. Dislike moderately
3. Dislike slightly
4. Neutral--neither like or dislike
5. Like slightly
6. Like moderately
7. Like very much

All four groups were told the title of the composition. In addition, the title was written on the blackboard by the teacher. The story or scenes associated with the music was related verbally to the students before the recorded composition was heard. After the musical selection had been listened to in its entirety, all subjects in all groups were instructed to circle his or her liking for the music and story (on a scale of 7 points) on a mimeographed sheet that was passed out to each student by the teacher.

The groups differed with regard to procedures and treatment as follows:

Group 1 (the control group) - no additional procedures.

Group 2 - heard tape-recorded excerpts of themes found in the musical composition and were told of their relationships to certain events, scenes or characters that each theme represented. The musical composition was then played in its entirety.

Group 3 - was shown filmstrips of the story or scenes associated with the musical composition. These filmstrips were shown during the playing of the music.

Group 4 - heard tape-recorded excerpts of themes found in the musical composition and were told its relationship to the events, scenes or characters that each represented. Filmstrips of the story or scenes associated with the musical composition were then shown while listening to the musical selection.

Testing of the Subjects

In each group, after the procedure was repeated for six different compositions, the subjects were asked to take a Title Recognition Test. This test was given following the two weeks of listening to the compositions.

The first recorded selection was played for three minutes after which the students were asked to place a number "one" next to the title of the composition they believed they heard, number "two" for the second selection played, and so on. The other five compositions were played in the same manner and the students were asked to repeat the same procedure for all six compositions. Two weeks after the first test each group was tested again exactly as above.

Criteria for Selections of Musical Examples

1. All musical selections used in the experiment had programmatic inflections.
2. Choice of selections were made on seemingly exciting music and story-scene content.
3. To diminish the fatigue factor, musical examples which were no more than 10 minutes long were selected.
4. Availability of filmstrips for projection of story or scene.
5. All musical compositions used were from records.

6. All musical thematic excerpts (Groups 2 and 4) were re-recorded on tape and played from tape.

Materials Used in the Experiment

Tape-recorder - Sony TC 110

Filmstrips - Jim Handy Organization
Educational Audio Visual Incorporated

Slide Projector - Standard Projector Model 750C

Records - Grand Canyon Suite, Mercury Records #M650049

Sorcerer's Apprentice, RCA Victor #LM2056

Danse Macabre, RCA Victor #LM2056

Peer Gynt Suite, RCA Victor LSC2766

Firebird Suite, RCA Victor #LSC2766

Billy the Kid, Columbia Records #MS6175

Summary

Each subject was told the title and the story of the piece by the teacher. Shortly thereafter every subject heard the recorded composition.

Variables Between Subjects:

Vis (Seeing story). Half of the subjects saw filmstrips of the story while hearing the recorded compositions.

T (Hearing themes). After hearing the title and the story, half of the subjects heard tape-recorded themes of the piece and were told by the teacher which part of the

story was associated with each theme, before hearing the composition in its entirety.

Variables Within Subjects:

D (Delay). There was a two-week delay between first Title Recognition Test and second Title Recognition Test.

C H A P T E R IV

ANALYSIS OF DATA

The Title Recognition scores (both first and second test) for all subjects for all pieces were analyzed by a 2 x 2 x 2 x 6 Factorial Analysis of Variance with two factors (Visual Story and Themes) between subjects and two factors (Delay and Pieces) within subjects.

Analysis of Variance (4-way) of the results of the immediate and delayed tests was used to test the significance of the effects on scores on the Title Recognition Test of:

1. Visual Story: seeing filmstrips of the story while first hearing the piece;
2. Themes: hearing the themes of the music associated with the appropriate parts of the story before first hearing the composition;
3. The interaction between Visual Story and Themes;
4. Delay (of test): two weeks' delay between the first and second tests;
5. Pieces: differences among the six musical selections;
6. Interactions between Visual Story, Themes, Delay, and Pieces.

TABLE 1

OVERALL ANALYSIS OF VARIANCE OF RECOGNITION TEST SCORES INCLUDING PIECES

Source of Variance	Sum of Squares	df	Mean Square	F	Crit. Value	p
Between Subjects	44.02	95	0.46	2.63	1.30	sig at 1%
Groups (Cells)	4.72	3	1.57	3.68	2.72	sig at 5%
Visual	0.63	1	0.63	1.48	3.96	not sig
Theme	2.63	1	2.63	6.15	3.96	sig at 5%
Vis x Theme	1.46	1	1.46	3.42	3.96	not sig
Residual Between Cells	39.30	92	0.43			
Within Subjects	185.75	1056	0.18			
Delay	0.63	1	0.63	4.87	3.85	sig at 5%
Pieces	42.79	5	8.56	65.89	4.42	sig at .0001
Delay x Pcs	0.11	5	0.02	0.02	2.22	not sig
Vis x Delay	0.25	1	0.25	1.93	3.85	not sig
Vis x Pcs	2.09	5	0.42	3.22	3.04	sig at 1%
Vis x D x Pcs	1.08	5	0.22	1.66	2.22	not sig
Themes x D	0.007	1	0.007	0.06	3.85	not sig
Themes x Pcs	2.26	5	0.45	3.49	3.04	sig at 1%
T x D x P	0.53	5	0.11	0.81	2.22	not sig
V x T x D	0.46	1	0.46	3.54	3.85	not sig
V x T x P	2.01	5	0.40	3.10	3.04	sig at 1%
V x T x P x D	2.09	5	0.42	3.22	3.04	sig at 1%
Residual Within Subjects	131.43	1012	0.13			
Total	229.77	/ 1151				

Overall Analysis of Variance of Recognition Scores (including pieces)

The purpose of this part of the experiment was: (1) to determine the effect (if any) that visual cues have on the ability of students (Groups 3 and 4) to recognize the title of a musical composition through aural perception versus those students without visual cues (Groups 1 and 2), (2) to determine what effect theme association has on the ability of students (Groups 2 and 4) to recognize the title of a musical composition through aural perception versus those students who did not receive theme association stimuli (Groups 1 and 3), and (3) to ascertain the effect of the combined interaction of both visual and theme stimuli.

As shown in Table 1, the Title Recognition scores varied significantly among the 96 subjects in the experiment at the .01 level. In addition, the Title Recognition scores varied significantly among the four groups (cells) of 24 subjects at the .05 level.

Overall scores of Title Recognition Tests 1 and 2 indicate that groups 3 and 4 who received visual cues did not obtain significantly higher scores on both tests (Mean: 4.50) than groups 1 and 2 (no visual cues) (Mean: 4.10). However, those groups that received the thematic association stimuli (groups 2 and 4) scored significantly higher on both tests (Mean: 4.64) than groups 1 and 3 (no thematic association)

(Mean: 4.06) at the .05 level. There was no interaction between thematic and visual cues.

The means of the scores on the Title Recognition Test 1 of groups 3 and 4 (48 students) who received visual cues (Mean: 4.54) were not significantly different from the means of groups 1 and 2 (48 students) who did not receive the visual cues (Mean: 4.43). On the other hand, groups 2 and 4 (48 students who received theme association as a stimulus) did score (Mean: 4.79) significantly higher than those without theme association (Mean: 4.18) at the .05 level. The interaction between thematic and visual cues was not significant.

The results of the analysis of Title Recognition Test 2 scores showed that groups with visual cues (Mean: 4.43) versus groups with no visual cues (Mean: 3.97) was not significant. The means of the scores on the Title Recognition Test 2 of groups who received thematic cues (Mean: 4.47) were not significantly different from the means of groups who did not receive thematic cues (Mean: 4.43). However, a significant interaction did occur between visual and thematic cues in Title Recognition Test 2 at the .05 level.

Analysis of Within Subjects Variables

Delay in itself was significant at the .05 level due to the higher Mean Scores on Title Recognition Test 1 (Mean: 4.41) versus Mean Scores on Title Recognition Test 2 (Mean: 4.22).

The discrepancies of score results found among the six musical selections were so great that the significance of pieces was calculated at .0001 level. Notice especially the Mean Scores of In the Hall of the Mountain King and Dance of King Kastchei.

Musical Selections (Pieces)	Percent of Correct Recognitions (all groups)
Sorcerer's Apprentice	82%
Danse Macabre	79%
On the Trail	88%
Street in a Frontier Town, etc.	86%
In the Hall of the Mountain King	38%
Dance of King Kastchei	50%

The above scores reveal that there were four easily recognizable pieces ranging from 79% to 88% Correct Recognition and two hard-to-recognize pieces ranging from 38% to 50% Correct Recognition.

Analysis of Ten Interactions Within Subjects

In analyzing the ten interactions between the following four variables--delay, pieces, visual, theme (as seen in Table 1 under the within subject category)--the following results were found:

There were significant interactions (at the .01 level) between visual cues and pieces ($F=3.22$), and thematic cues

and pieces (F=3.49). In other words, the effects of visual cues and thematic cues were not the same for each of the six musical selections. Visual cues improved recognition for the four easily recognizable pieces (Sorcerer's Apprentice, Danse Macabre, On the Trail, Street in a Frontier Town), while they reduced recognition for the two hard-to-recognize pieces (Dance of King Kastchei, In the Hall of the Mountain King). Thematic cues slightly improved recognition for the four easily recognizable pieces (see above), while they greatly improved recognition for the two hard-to-recognize pieces (see above).

There was a significant interaction (at the .01 level) between visual cues and thematic cues and pieces. The interaction between visual cues and thematic cues was not the same for each of the six pieces.

In general, none of the other effects interacted with delay. Whatever held true at the first recognition test was also true for the second recognition test. The only exception to this was that there was a significant four-way interaction between visual cues, thematic cues, pieces and delay. It was not possible to find the reason behind this interaction. The following interactions with delay were not significant:

Delay x Pieces	not significant
Visual x Delay	not significant
Visual x Delay x Pieces	not significant
Themes x Delay	not significant
Themes x Delay x Pieces	not significant
Themes x Visual x Delay	not significant

Relationships of Preference and Test Scores

The objective of this segment of the experiment was to determine the relationship between preference for music (and story) and performance on the first Title Recognition Test and second Title Recognition Test taken two weeks later. The correlation coefficient used was the Point Biserial.

Overall Relationship between Recognition Scores and Preference

Computation of the overall total score of Liking (story and music) with Title Recognition (Test 1 and 2 combined) across all 96 subjects did not produce a significant relationship.

$r = .15$ not significant

Correlating the total scores of liking (story and music) with total scores of Title Recognition (Test 1 and 2 combined) for each of the four groups (24 subjects) it was found that significant correlations did not occur in any of the four groups except when theme association (group 2) was added as a stimulus. Group 1 no additive, Group 3 visual, and Group 4 visual and theme, did not show a significant correlation between the two factors.

Group 1 (Control)	$r = -.32$ not significant
Group 2 (Theme)	$r = .44$ significant at .05 level
Group 3 (Visual)	$r = .27$ not significant
Group 4 (Visual and Theme)	$r = .35$ not significant

Correlating of Title Recognition Test 1 Scores and Liking Music Scores

As indicated in Table 2, of the six compositions played to the 96 subjects, only "On the Trail" showed a significant relationship at the .01 level between Liking for the Music and recognition of the music of Test 1. The Point Biserial Correlation Coefficient was .40.

When Point Biserial Correlations were calculated between Liking Music and Title Recognition Test 1 for each of the four treatment groups (representing twenty-four subjects each), for each of the six selections only four Correlation Coefficients were significant at the .05 level.

Groups	Musical Selections (Pieces)	Signif. of Difference
Group 1 (Control)	On the Trail (from Grand Canyon Suite)	Sig. .05 level
Group 2 (Themes)	On the Trail (from Grand Canyon Suite)	Sig. .01 level
Group 2 (Themes)	In the Hall of the Mountain King (from Peer Gynt Suite)	Sig. .05 level
Group 3 (Visual)	Dance of King Kastchei (from Firebird Suite)	Sig. .01 level

TABLE 2

CORRELATION BETWEEN MUSIC AND TEST 1 RATINGS FOR SIX MUSICAL SELECTIONS AND FOUR GROUPS

Groups	Sorcerer's Apprentice	Danse Macabre	On the Trail	Street in a Frontier Town	In the Hall of the Mountain King	Dance of King Kastchei
1	-.002	.06	.43*	-.12	-.06	.26
2	-.03	-.15	.87**	-.21	.41*	.25
3	.05	-.17	+	+	.18	-.65**
4	-.32	.06	+	-.22	.02	.11
Total Sample	-.05	.06	.40**	-.11	.09	.05

*Significant at .05 level
**Significant at .01 level
+Correlation could not be calculated--all subjects recognized the piece correctly

Correlation of Title Recognition Test 1 Scores and Liking Story Scores

Results of Table 3 indicate that of the six selections within the four groups, only "On the Trail" and "Danse Macabre" (Group 2, Theme) showed a significant relationship at the .05 level between Liking for the Story and Title Recognition Test 1. The Point-Biserial Correlation Coefficient was .77 and .48 respectively.

Total sample scores reveal that two compositions showed a significant relationship. They were: "On the Trail" and "Dance of King Kastchei."

TABLE 3

CORRELATIONS BETWEEN STORY AND TEST 1 RATINGS FOR SIX MUSICAL SELECTIONS AND FOUR GROUPS

Groups	Sorcerer's Apprentice	Danse Macabre	On the Trail	Street in a Frontier Town	In the Hall of the Mountain King	Dance of King Kastchei
1	-.20	-.31	.17	.27	.03	.31
2	-.01	.77**	.48*	.13	.05	.35
3	.15	.04	+	+	-.13	.28
4	-.04	-.12	+	.17	.24	.15
Total Sample	-.11	-.05	.26*	.02	.08	.25*

*Significant at .05 level
**Significant at .01 level
+Correlation could not be calculated--all subjects recognized the piece correctly

Correlation of Title Recognition Test 2 Scores and Liking Story Scores

Only two individual pieces had a significant relationship between Liking Story and Recognition of Music on Test 2. They were: Group 1, (Control) "Danse Macabre," (Correlation Coefficient -.41), Group 2, (Themes) "On the Trail," (Correlation Coefficient .60). There were no significant relationships between liking the story and title recognition in the total sample results of any of the six selections.

TABLE 4

CORRELATION BETWEEN STORY AND TEST 2 RATINGS FOR SIX MUSICAL SELECTIONS AND FOUR GROUPS

Groups	Sorcerer's Apprentice	Danse Macabre	On the Trail	Street in a Frontier Town	In the Hall of the Mountain King	Dance of King Kastchei
1	-.22	-.41*	-.18	.34	-.32	-.06
2	-.02	-.01	.60**	-.16	.05	.11
3	.21	.05	+	-.13	.06	.08
4	.26	-.17	-.15	-.07	-.17	.34
Total Sample	-.004	.04	.16	.04	-.09	.14

*Significant at .05 level
**Significant at .01 level
+Correlation could not be calculated--all subjects recognized the piece correctly

Correlation of Title Recognition Test 2 Scores and Liking Music Scores

The results of Table 5 indicate that of the total sample of the six compositions heard by the 96 subjects, only "Street in a Frontier Town" showed a relationship significant at the .05 level between Liking for the Music and Title Recognition Test 2.

Two individual compositions out of 24 possibilities had a significant Correlation Coefficient. They were: Group 2, (Themes) "On the Trail" and "Dance of King Kastchei."

TABLE 5

CORRELATION BETWEEN MUSIC AND TEST 2 RATINGS FOR SIX MUSICAL SELECTIONS AND FOUR GROUPS

Groups	Sorcerer's Apprentice	Danse Macabre	On the Trail	Street in a Frontier Town	In the Hall of the Mountain King	Dance of King Kastchei
1	-.12	-.08	+	.12	.21	-.15
2	-.17	.33	.55**	-.06	.07	.40*
3	-.02	-.07	+	-.12	.04	.09
4	.11	-.27	-.30	-.18	.28	.31
Total Sample	-.04	-.19	.11	-.21*	.08	.12

*Significant at .05 level
**Significant at .01 level
+Correlation could not be calculate--all subjects recognized the piece correctly

Comparison of Control Group Versus Three Experimental Groups

The following values were computed using the Dunnett Comparison Test (where the comparison was decided on before looking at the data).

The combined scores of Title Recognition Test 1 and 2 showed that the average number of pieces (Mean: 3.71) recognized by Group 1 (control) was significantly less (at the .01 level) than the average number of pieces (Mean: 4.56) recognized by the three experimental groups (with visual cues, or thematic association, or both).

$F = 6.17$ significant at .01 level

The same comparison was significant at each of the Title Recognition Tests.

Test 1, Group 1, the Mean: 4.04 was less than the Mean: 4.64 of the three experimental groups.

$F = 4.54$ significant at the .05 level

Test 2, Group 1, the Mean: 3.38 was less than the Mean: 4.49 of the three experimental groups.

$F = 9.97$ significant at the .01 level

TABLE 6

MEAN SCORES OF GROUPS ON TITLE RECOGNITION TESTS

Groups		Test 1 Mean	Test 2 Mean	Total Mean
1	Control	4.04	3.38	3.71
2	Theme	4.83	4.58	4.71
3	Visual	4.33	4.50	4.42
4	Visual and Theme	4.75	4.38	4.56

Effect of Visual and Thematic Cues Upon Recognition of Pieces

Data were analyzed using the (Posterior) Scheffe technique for comparing selections after looking at the data.

Analysis of the data confirmed that visual cues were a significant factor in improving recognition (at the .01 level) of the four <u>easily</u> recognizable pieces (Danse Macabre, Sorcerer's Apprentice, On the Trail, Streets in a Frontier Town) when compared with groups who did not receive visual cues.

$F = 2.77$ significant at .01 level

Visual cues <u>were not</u> a factor in improving recognition for the two <u>hard</u> to recognize pieces (Dance of King Kastchei, In the Hall of the Mountain King) when compared to groups that did not receive visual cues.

$F = 0.53$ not significant

Thematic cues had an effect on recognition opposite from that of visual cues. It was found that thematic cues did not improve recognition of the four easily recognizable pieces (Danse Macabre, Sorcerer's Apprentice, On the Trail, Street in a Frontier Town) when compared with groups who did not receive thematic cues.

$F = 1.75$ not significant

Thematic cues were a factor in improving recognition for the two hard-to-recognize pieces (Dance of King Kastchei, In the Hall of the Mountain King) when compared to groups that did not receive thematic cues.

$F = 15.20$ significant at .001 level

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to determine (1) what effects different modes of presentation of program music have upon the ability of students to recognize the title of a musical composition and (2) the relationship of a subject's ability to recall a title to his preference for music and story.

Summary

The study sought to answer questions concerning effects upon immediate and delayed Title Recognition Test scores of:

1. Visual Story: seeing filmstrips of the story while first hearing the pieces;
2. Themes: hearing the themes of the music associated with the appropriate parts of the story before first hearing the composition;
3. Delay (of test): two weeks' delay between the first and second tests;
4. Pieces: differences among the six musical selections.

The study involved 96 students from four fifth grade classes of a predominantly white middle-income elementary school. Six musical selections with programmatic inflections

were chosen for the listening experiment. The subjects were randomly assigned to four groups (one control, three experimental). The four groups met separately three days a week for two weeks for a total of six listening lessons each. Each listening experience lasted approximately 20 minutes. Each group met in the same room and at approximately the same time each day.

After hearing each recording the students were asked to circle their preference for the music and the story on a scale of seven points from "dislike very much" to "like very much." After hearing the six musical selections during a two-week period a Title Recognition Test was given to all subjects. Two weeks later the same test was given again.

Conclusion

1. Recognition was improved by the addition of cues at the time of first hearing (visual or thematic or both).

2. Overall, a subject's preference for the music and/or story of a piece was not related to his ability to remember its title. When the four groups were considered separately, group 2 (thematic cues) showed a positive relationship (+.435) between Liking for a piece and recognizing its title (the other groups showed no relationship). Of the six pieces, On the Trail showed a consistent positive relationship between how well it was liked and whether it was recognized on Test 1.

3. The addition of thematic cues did in general improve recognition (test 1 significant, test 2 not significant).

4. The addition of visual cues did not in general improve recognition on either recognition test.

5. There was no overall interaction between thematic and visual cues and no interaction in test 1. However, there was a significant interaction in test 2 between thematic and visual cues.

6. Ability to recognize composition titles decreased after a two-week delay. Mean score on Title Recognition Test 1 was significantly higher than mean score on Title Recognition Test 2 (after two-week delay).

7. Some pieces were more recognizable than others. Four of the pieces were easy to recognize and two were much more difficult to recognize.

8. There was a significant interaction between visual cues and musical pieces. However, the effects of visual cues on recognition were not the same for each of the six musical selections. Visual cues improved recognition for the four easily recognizable pieces (Sorcerer's Apprentice, Danse Macabre, On the Trail, Streets of a Frontier Town), while they reduced recognition for the two hard-to-recognize pieces (Dance of King Kastchei, In the Hall of the Mountain King).

9. The effects of thematic cues on recognition were not the same for each of the six musical selections. Thematic cues slightly improved recognition for the four easily recognizable pieces (same as above), while they greatly improved recognition for the two hard-to-recognize pieces (same as above).

10. The interaction between the effects of visual and thematic cues was not the same for each of the six pieces.

11. In general, none of the other effects interacted with delay. Whatever held true at the first recognition test was also true for the second recognition test. The only exception to this was that there was a significant four-way interaction between visual cues, thematic cues, pieces and delay. It was not possible to find the reason behind this interaction.

Recommendations

1. Similar studies should be made in the other five elementary grades so that test results could be compared and analyzed between grade levels. Another determinant from this experiment would be to ascertain what age level, theme association, and visual cues become most effective in producing higher recognition scores and preference scores.

2. Research should be undertaken to determine and categorize what program pieces are highly recognizable and preferable as opposed to program pieces that are least

recognizable and least preferable so that teachers could refer to a source book to find program music that has been proven to be highly successful in stimulating aural awareness.

3. Because of the inconsistencies of scores between the six musical compositions (pieces), it is recommended that teachers take great care in selecting program music that appeals to the listener, and creates a positive attitude toward attentiveness.

4. Research should be done comparing responses toward Program Music as opposed to Absolute Music (no program) and their effects on recognition and preference. The results of this experiment would be beneficial in aiding elementary teachers in deciding what types of music (program or absolute) is most effective in producing a positive affective response among students at this age level.

APPENDIX

Instructions for Testing:

I will play recordings of the six program pieces that we heard in class during the past two weeks. Each of the six musical selections will be played for three minutes. After hearing each composition, you will place a number in the parentheses next to one of the six musical selections which you believe is the correct answer. The first record played will receive a number 1, the second record number 2, the third record number 3, etc. After hearing all six program pieces you should have a number next to each of the six compositions listed on your paper.

Are there any questions? Let's begin.

MUSIC LISTENING TEST

PERSONAL NUMBER_____ GROUP NUMBER_____

( ) SORCERER'S APPRENTICE

( ) DANSE MACABRE

( ) ON THE TRAIL (GRAND CANYON SUITE)

( ) STREET IN A FRONTIER TOWN (BILLY THE KID)

( ) IN THE HALL OF THE MOUNTAIN KING (PEER GYNT SUITE)

( ) DANCE OF KING KASTCHEI (FIREBIRD SUITE)

Instructions for Preference Ratings:

Now that you have heard the selections, please indicate how you liked the music by circling one of the numbers on the rating scale. For example, if your response is "Like slightly," then you should circle that number.

If you are finished, please answer the second question. How much did you like the story or scenes described to you (verbally or visually or both)? Please circle the number that best describes your feeling toward the story or scene.

PREFERENCE RATING SHEET

PERSONAL NUMBER_____ GROUP NUMBER_____

How much did you like the music? (circle one answer only)

1. Dislike very much
2. Dislike moderately
3. Dislike slightly
4. Neutral - neither like or dislike
5. Like slightly
6. Like moderately
7. Like very much

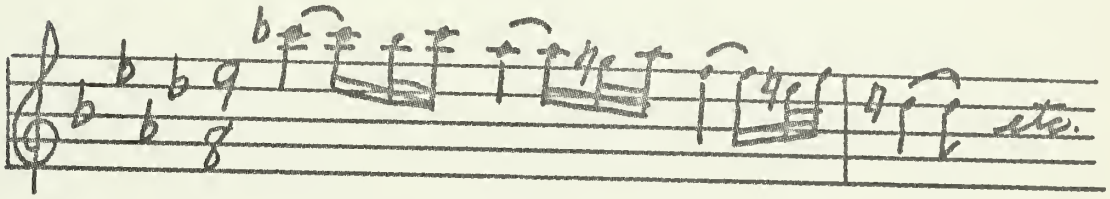
How much did you like the story? (circle one answer only)

1. Dislike very much
2. Dislike moderately
3. Dislike slightly
4. Neutral - neither like or dislike
5. Like slightly
6. Like moderately
7. Like very much

LESSON 1 - SORCERER'S APPRENTICE

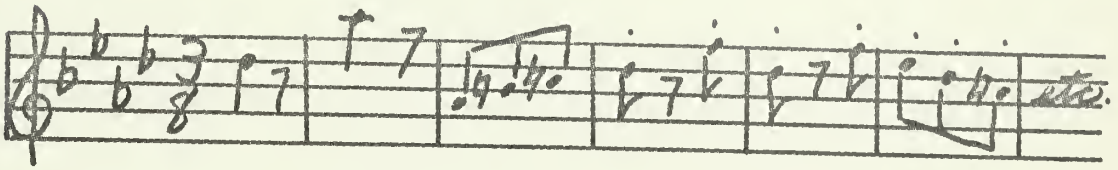
We are going to begin a study of program music. First of all, what is program music? It is instrumental music specifically written to describe stories, scenes, or moods.

Today we are going to listen to our first program piece entitled "Sorcerer's Apprentice." (write the title on the blackboard.) The story concerns a master sorcerer's young apprentice who decides, in the absence of his master, to pronounce the magic spell that transforms a broom into a helper. Here is the magic spell melody. (play tape.)[1]



[1]All thematic excerpts (tape) for all six compositions were played to Experimental Groups 2 and 4 only.

As the broom sprouts arms and legs the apprentice commands the broom to get water from the well, which is a chore usually reserved for the apprentice. The broom melody sounds like this. (play tape.)



A problem arises when the apprentice cannot stop the broom. In his fright, the apprentice strikes the broom, splitting it in two. Now there are two brooms carrying water. As the apprentice is about to be engulfed by the rising water, the magician arrives and pronounces the magic words, making the water disappear while the broom returns to its corner, saving the apprentice.

Now let's hear the music that describes these events. While you're listening to "The Sorcerer's Apprentice," I will show filmstrips of the story.[2]

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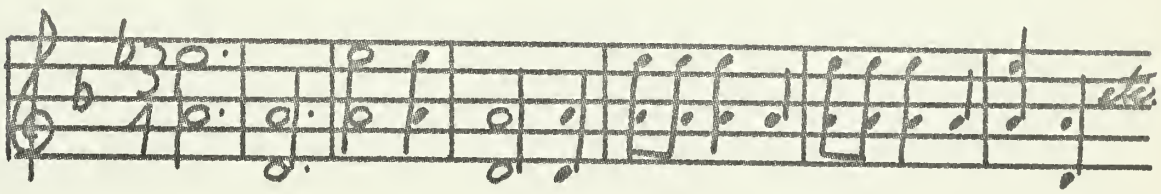
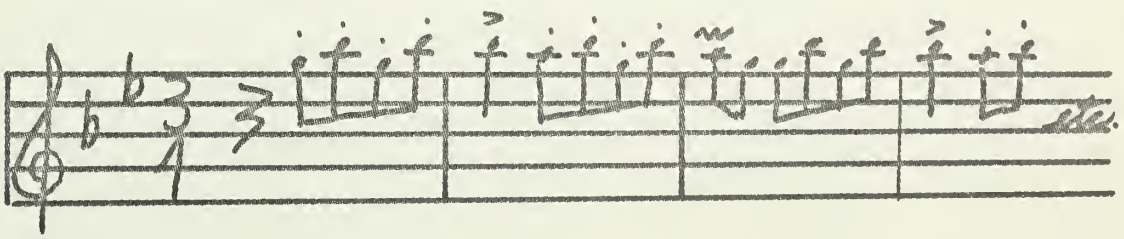
[2]Filmstrips of the story or scenes, for all six compositions, were shown to Experimental Groups 3 and 4 only.

LESSON 2 - DANSE MACABRE

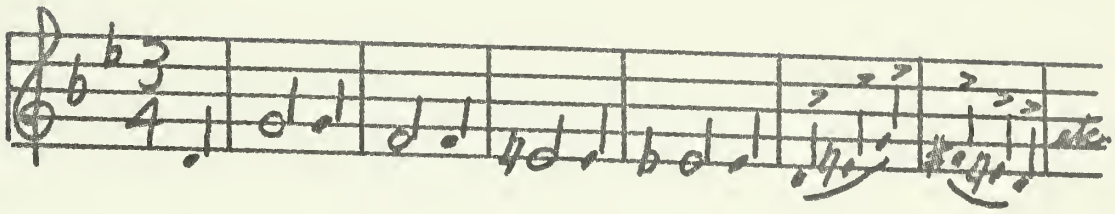
Today we are going to listen to a program piece called "Danse Macabre." (write the title on the blackboard.) The story begins with death striking a tombstone with his heel. Next, we hear death tuning his violin at midnight, and this is what it sounds like. (play tape.)



Skeletons and ghosts appear from their graves and move through the darkness running and leaping to the dance tunes played by death. This is the first dance melody. (play tape.)



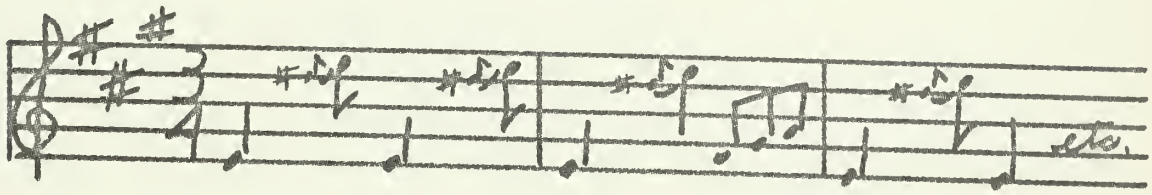
This is the second dance melody. (play tape.)



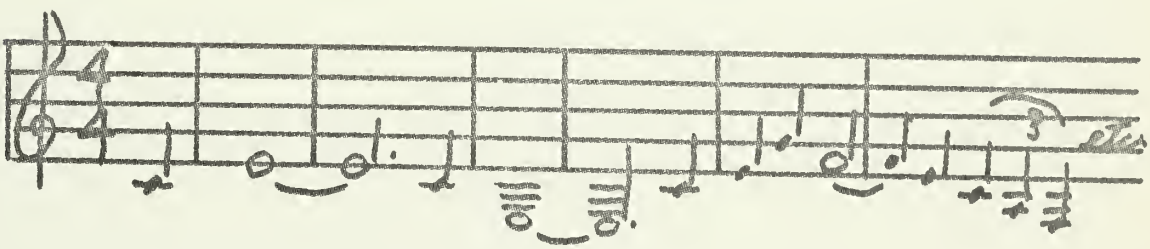
After dancing all night long, they leave suddenly to return to their graves upon hearing the cock crow. Now, everything is peaceful and quiet as dawn approaches. Now, let's hear the music. While you're listening to the music, I will show filmstrips of the story.

LESSON 3 - ON THE TRAIL

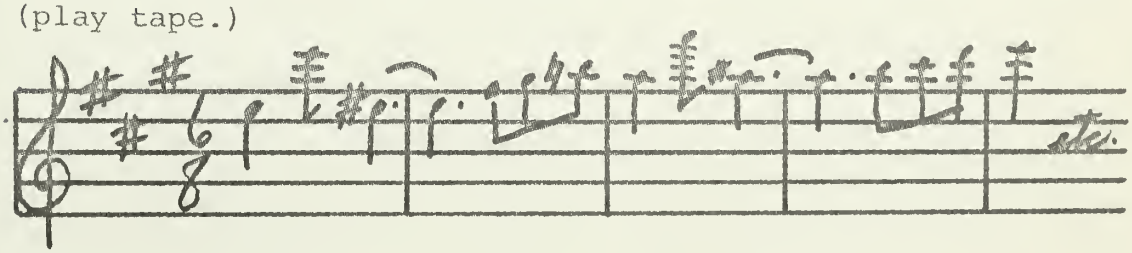
Today we are going to listen to a program piece called "On the Trail" from the "Grand Canyon Suite." (write the title on the blackboard.) The scene depicts a traveler and his burro traveling on the trails of the Grand Canyon. This is the burro melody. (play tape.)



The musical hoof-beats of the animal continue until the sound of a waterfall tell them of a nearby stream. This is what the waterfall scene sounds like. (play tape.)



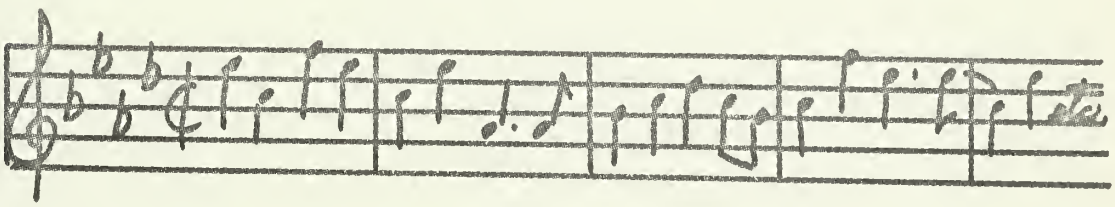
Once again the traveler and the burro are heard descending the trail. Soon a cabin is sighted and a music box is heard (played on a celesta). This is the music box melody. (play tape.)



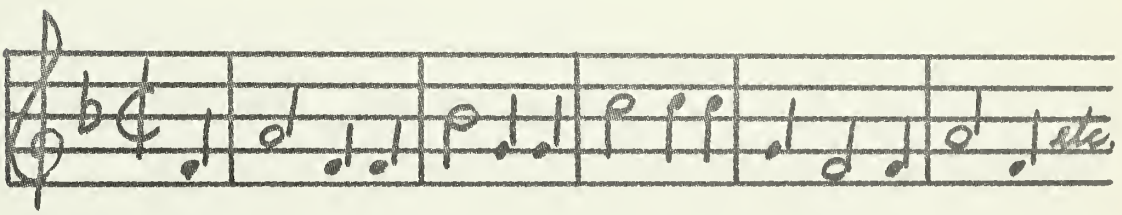
Finally, the traveler and his burro are on the trail again. They disappear into the distance galloping at a livelier pace as the music ends. (show filmstrips while the recorded music is playing.)

LESSON 4 - STREET IN A FRONTIER TOWN

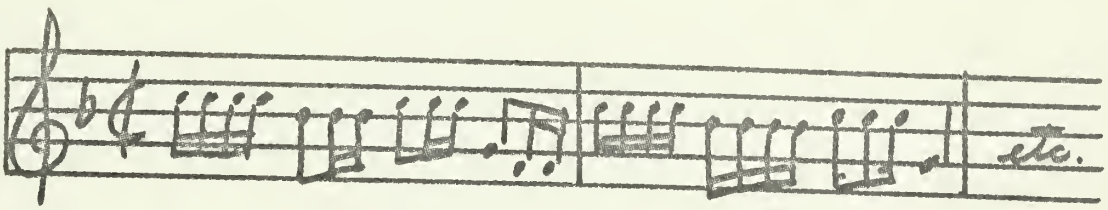
Today we are going to listen to a composition called "Street in a Frontier Town" from a suite called "Billy the Kid." (write the title on the blackboard.) The first scene describes a street in a typical western frontier town in the late 1800's--cowboys on horseback, others with lassos, others riding on their horse-drawn carriages, and others loitering on the boardwalks. Here are two melodies that reflect this scene. This is the first one. (play tape.)



Here is the second melody. (play tape.)



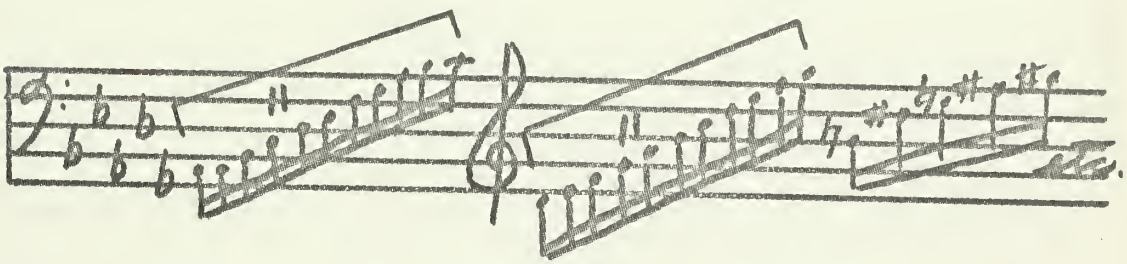
The next scene pictures a rodeo with all the action and excitement that is accompanied with it. Here is the rodeo melody. (play tape.)



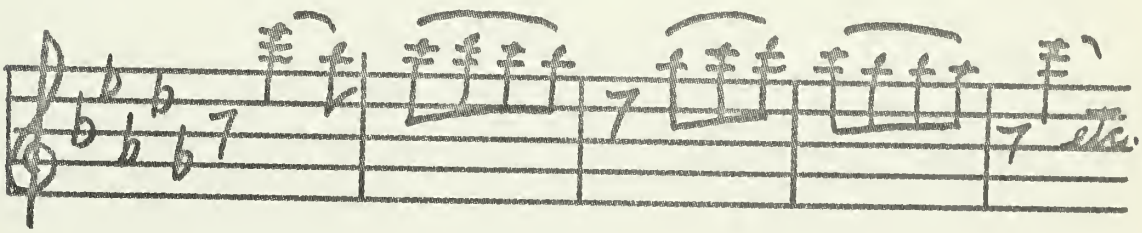
Now, let's hear the music. (play recording and show filmstrips.)

LESSON 5 - DANCE OF KING KASTCHEI

Today we are going to listen to a composition called "Dance of King Kastchei" from the "Firebird Suite." (write name on the blackboard.) The story begins with Prince Ivan hunting in the forest, where he captures the beautiful Firebird who gives him a magic plume. Here is the melody that represents the flying of the Firebird. (play tape.)

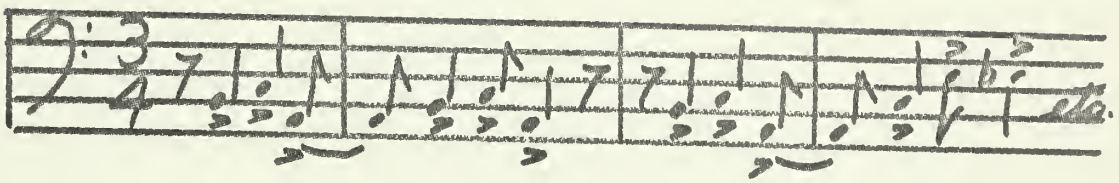


As he goes farther into the forest, Ivan is warned by a princess not to go any farther. This is the princess's melody. (play tape.)



She states that King Kastchei has captured many people and has turned them into stone. As Ivan continues into the

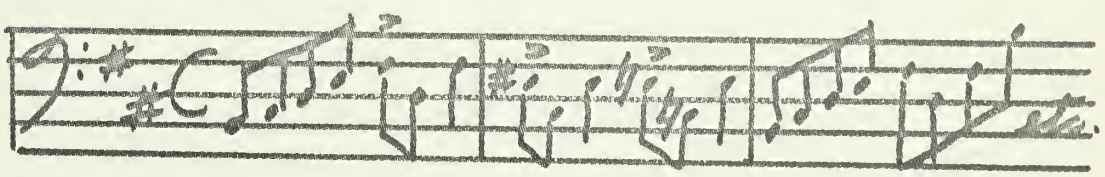
forest he is attacked by King Kastchei and his devils. This is King Kastchei's melody. (play tape.)



But King Kastchei's evil powers cannot turn Ivan into stone because of the magic plume. As King Kastchei and his devils dance themselves into a state of exhaustion, the Firebird tells Ivan that if he breaks the secret egg King Kastchei and his devils will die. Upon breaking the egg Ivan discovers that the princess and all the other people who were turned to stone become human beings once again. (play recording and show filmstrips.)

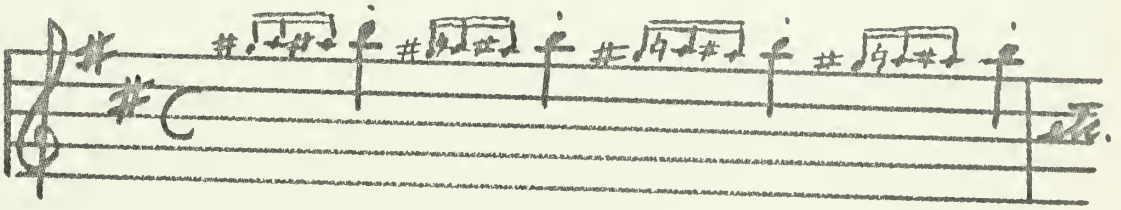
LESSON 6 - IN THE HALL OF THE MOUNTAIN KING

Today we are going to listen to a composition called "In the Hall of the Mountain King" from the "Peer Gynt Suite." (write name on the blackboard.) Peer Gynt was a boy who liked to tell wild tales. One day, at a wedding party, he stole the bride and carried her into the mountains and left her there. When the townspeople found her, Peer Gynt was nowhere to be found. A very strange thing happened to Peer. He had stumbled and struck his head on a rock. When he awoke he found himself inside a mountain in the kingdom of the trolls. The trolls were circling around Peer so as to get a good look at him. Here is the troll melody. (play tape.)



In the great hall, Peer was asked by the king to become a prince. Not knowing what was in store for him, he consented. But when Peer heard that he had to eat troll food, marry the king's daughter, and have his eyes slit so that he might see as a troll, he refused.

As he tries to escape, the trolls, in shrieks of fury, fall upon Peer, scratching and pinching him. Here is the melody that reflects this scene. (play tape.)



Finally, the sound of distant church bells is heard, a sound no troll can endure. And with a final crash the troll palace disappears as Peer escapes from the mountain kingdom. Here is the music. (show filmstrips.)

Dunnett Comparison[3]

$$F = \frac{\left[\sum c_a t_a\right]^2}{na\sum c_a^2} \times \frac{1}{MSe}$$

Scheffé Comparison[4]

$$F = \left[\frac{(\sum c_j t_j)^2}{(n\sum c_j^2)(MSe)}\right] \times \frac{1}{R-1}$$

Pearson-product-moment Correlation Coefficient[5]

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2][N\sum Y^2 - (\sum Y)^2]}}$$

Point-Biserial Correlation Coefficient[6]

$$r_{pbi} = \frac{M_p - M_t}{\sigma_t}\sqrt{\frac{p}{q}}$$

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[3]B. J. Winer, Statistical Principles in Experimental Design (New York: McGraw-Hill Company, 1962), pp. 89-207.

[4]Ibid., pp. 69-88.

[5]J. P. Guilford, Fundamental Statistics in Psychology and Education (New York: McGraw-Hill Book Company, 1965), p. 97.

[6]Ibid., p. 323.

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