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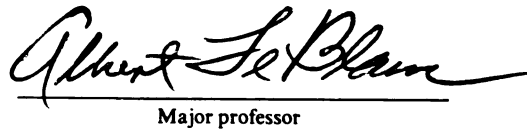
AN INVESTIGATION INTO THE EXTENT OF CONGRUENCY
BETWEEN GENERAL AND MUSIC-SPECIFIC LEARNING STYLE
PREFERENCES

presented by

Richard Warren Tiller

has been accepted towards fulfillment
of the requirements for

Doctoral degree in Music Education



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**AN INVESTIGATION INTO THE EXTENT OF CONGRUENCY
BETWEEN GENERAL AND MUSIC-SPECIFIC LEARNING
STYLE PREFERENCES**

By

Richard Warren Tiller

A DISSERTATION

Submitted to

Michigan State University

in partial fulfillment of the requirements

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ABSTRACT

AN INVESTIGATION INTO THE EXTENT OF CONGRUENCY BETWEEN GENERAL AND MUSIC-SPECIFIC LEARNING STYLE PREFERENCES

By

R. Warren Tiller

This study focuses on the area of musical learning style and the extent to which it may differ from non-musical or general learning style. Learning style is considered to be those characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment (Keef, 1979). This assertion of relative stability lies at the heart of the current research. The investigation measures that degree of learning style stability when individuals move from general to music-specific studies.

Sixty-one subjects participated in the study. They ranged in age from 17 to 42 years and all had current experiences in both musical and general studies. Each subject was surveyed twice using the Productivity Environmental Profile Survey (PEPS) by Dunn, Dunn and Price. On one occasion the subjects were asked to respond to the survey items from an exclusively musical perspective and on the other occasion they were instructed to respond from a non-musical standpoint.

Data from the two surveys were analyzed using the Hotelling's T^2 multivariate test for repeated measures. An F value of 7.9 was calculated indicating a significant difference beyond the .01 level. The PEPS instrument also yielded 20 subscores corresponding to each of the separate areas that constitute the profile.

Using a t confidence interval, the mean differences in these subscores were isolated and 7 areas showed significant differences beyond the 95% level. Areas where the difference

is significant in the direction of musical learning style are; Area 9-Learning Alone/Peer Oriented, Area 10-Authority Figures Present, Area 12-Auditory Preferences and Area 17-Evening/Morning. Areas of significant difference in non-musical learning style are; Area 13-Visual Preference, Area 16-Intake, and Area 20-Mobility. The majority of individuals (43) evidenced an instability in learning style across 5 to 7 areas.

The research leads to the conclusion that individuals can differ significantly in learning style when moving from musical to non-musical studies and that these differences are largely the product of internal inconsistencies which are particular to the individual.

ACKNOWLEDGMENTS

The current research represents the latest stage in a continuing interest in the field of individualized and personalized instruction. Over time, this interest has been supported and encouraged by many people. Gratitude should first be expressed to those students at the Ballarat College of Advanced Education who served as subjects in the project and to the music staff who have always been supportive of my work. Special thanks to Ian Gomm and the Department of Mathematics and Computing for their help with the statistical analysis in this project.

The learning style aspect of the research has been greatly facilitated by the publications and personal attention offered through the Center for the Study of Learning and Teaching Style at St. John's University. My thanks to this institution and its director, Dr. Rita Dunn.

Considerable thanks is also owing to my advisors, Dr. Albert LeBlanc and Dr. Charles McDermid. Dr. LeBlanc in particular has had to deal with all the problems of supervision plus the added complications of communicating with a student half-a-world away.

Finally, I want to extend a particular word of appreciation to my wife and family who have cheerfully gone through major dislocations and lifestyle changes in support of my work.

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CHAPTER ONE

BACKGROUND TO THE RESEARCH

The research described in this dissertation is part of a tradition of inquiry that has focused on the educational implications of individual differences. Work has been done under various headings such as homogeneous grouping, programmed instruction, individualized instruction, personalized instruction, adaptive instruction, cognitive style, and learning style. The common thread which runs through this array of topics is that of a student-centered approach to education. It is a dedication to finding the best possible fit between student and instruction that has given impetus to all the work cited in this dissertation.

Grasha (1984) relates the story of one eighteenth-century assistant astronomer by the name of Kinnebrook who lost his position because he was unable to calibrate the Greenwich Observatory clock in precisely the same way as his supervisor. Twenty years later another astronomer, Bessel, became aware of the circumstances surrounding the Kinnebrook dismissal and decided to investigate the extent of consistency among individuals when they attempted to calibrate observatory clocks. He found that not only did different astronomers calibrate their clocks differently, but they were also internally inconsistent when performing this important task. As a result of his research, Bessel developed a formula which he called the "personal equation" (Grasha, 1984, p. 46). The equation was used to assist astronomers to correct for those individual differences in human perception. The recognition of individual differences and the development of means to deal with them has been a long-standing feature of both science and education.

Individual Differences and Education

Mass education has always had to face those daunting problems associated with teaching large numbers of individuals at the same place and time. It may have seemed that the only way to do this was to sublimate any concern for individual differences and apply a regimen of strict lock-step instruction. In such an environment, where all students are

doing the same thing at the same time, the lecture-recitation model of teaching came to predominate. This approach did have its successes and contemporary educational practice may owe a great deal to the lessons learned in that setting.

It might be misleading to suggest that all concerns for the individual were neglected in the quest for a system of mass education. As Popkewitz (1983) points out, as early as the sixteenth-century the Jesuit schools were developing individualized pedagogies. Their theological concern for personal conversion made it necessary to deal with each person as a discrete individual. The Jesuits recognised that each individual had a self-consciousness which was reflected in a personal way of thinking and feeling. As a result, their educational system developed a process that was designed to draw the student and teacher close together by catering for each learner's particular characteristics.

Grouping

In more recent times the practice of grouping students has been a common response to the concern for particular needs. A variety of approaches has been taken. When the characteristic needs of male and female students have been at issue, single-sex schools were developed. Similar gender-related concerns have also been evident at the level of course work with special subjects such as Home Economics or Industrial Arts being offered. Although one can argue whether these examples relate to actual sex differences or simply to differences in sex roles, they were attempts to deal with what was perceived as significant differences in the school population.

Rosenbaum (1980) indicates that one of the earliest responses to the diversity of student needs was to divide the school into grades. The age-related grade structure of most schools was an attempt to separate the population into more homogeneous groups and thereby facilitate instruction. In most institutions instruction was still being delivered by the lecture-recitation method in a lock-step format. The lock-step approach, with all students doing the same thing at the same time, may have had particular credence in a

graded system where students of the same age would seem better able to "stay together" in their studies.

In spite of its wide acceptance as a method, lock-step instruction had some obvious drawbacks. The pace of teaching was one such dilemma. Even in a graded system, if the tempo of a lesson was aimed at the average student, the slow learner could become demoralized. At the same time, the student who was able to absorb material more quickly might become bored. A similar problem existed with regard to the intellectual level of the information being presented. If instruction was directed at a middle level of intellectual ability, students at either extreme could be disadvantaged.

In an attempt to solve some of these problems, many schools adopted an innovation known as homogeneous grouping. Students in the age-related grades were further divided into groups that reflected a similar intellectual level and past academic success. Instruction for any particular class was aimed at the level of that group. Homogeneous grouping was, once again, an attempt to better cope with some of the differences inherent in the school population.

Alexander (1977) makes the observation that homogeneous grouping was, in fact, an attempt to individualize instruction. In spite of all good intentions, these efforts have attracted opposition on social and / or political grounds (p.1). Rosenbaum (1980) highlights this dilemma in an American context when he states,

As a nation that prides itself on an egalitarian melting pot ideology, Americans are profoundly ambivalent about selecting people and placing them into separate homogeneous groups, and this is particularly true in public education. We are deeply suspicious of any form of selection because of its potential for contributing to social segregation and social inequality. We seem to be caught on the horns of a dilemma, wanting the efficiencies of educational grouping but fearing its possible social consequences. (p.362)

Fortunately (in light of the above statement) other innovations were being developed which could accommodate student diversity without having to be dependent on grouping for success. These strategies utilized new developments in instructional design and are identified under the broad heading of individualized instruction.

Individualized Instruction

In the 20th century, concern for the learner as an individual has been a prominent feature of both the Behaviorist and Cognitivist schools of learning theory (Wang and Lindvall, 1984). As a result, a wide cross-section of educators have been active in exploring ways to effect the best fit between the individual and instruction. One of the most conspicuous developments in this regard came out of behaviorism and is called programmed instruction.

Based on the ideas of B.F. Skinner, the learning materials used in programmed instruction were structured into small sequential steps. Each step was then presented in a written "frame" that provided immediate feedback as to the correctness of the response. These programs were linear in design (where the learner was expected to complete each step as presented) and allowed the student to progress at his or her own pace. All progress was directed at a clearly specified objective. Branching programs, where a particular response determines the next set of steps, were later included as part of the instructional design of programmed instruction. The techniques of programmed instruction were further enhanced through the use of audio-visual and computerized equipment. This combination of programmed instruction and computerized delivery systems has provided many exciting options for individualized instruction.

Instructional designers who operated from a cognitivist perspective also recognized the advantages of allowing each student to move at his or her own pace. They further identified the variable of intellectual level as an important factor. Not only was it desirable for the learner to proceed at his or her own pace, but progress would be greatly facilitated if the materials were written at that individual's level of understanding. Musgrave (1975)

points to these joint concerns for time requirements and intellectual levels as forming the foundation for individualized instruction.

Programmed instruction is only one of many learning activities that can be incorporated into an individualized format. The philosophy of individualized instruction can accommodate teaching strategies from one-on-one tutorials all the way to a "bullhorn in the stadium" lecture. Even though very few teaching or learning strategies can be dismissed as inappropriate, the tenets of individualized instruction as stated by Tuckman (1971) are:

1. A curriculum must be defined in terms of goals as they apply to students.
2. A curriculum must be defined in terms of the structure (learning style) and previous educational experience of students.
3. In terms of learning style, learning of the concrete must precede learning of the abstract.
4. Learning can be maximized by controlling the sequence toward some goal and locating the student in that sequence.
5. Learning is most meaningful when a person learns through interaction with his or her environment.
6. Learning can be made efficient by combining the sequences that are psychologically similar.
7. Individualized instruction can be approximated in groups but these groups will be shifting rapidly in membership over time.
8. Individualized materials will be primarily of a participatory nature where the teacher's role will be to guide the participation so that desired end points may be reached.

The Personalized System of Instruction

In 1963, Fred S. Keller and J. Gilmour Sherman devised an individualized program of instruction for use at the University of Brazilia. It has become known as the Personalized System of Instruction or P.S.I. Its main elements are, (a) a diversity of

learning packets and activities, (b) an internal sequence of ten to fifteen exams, and (c) the use of advanced students as proctors and tutors.

A student using P.S.I. would be given a pretest and, after an entry level had been assessed, be provided with a packet of materials and directions. These directions might tell the student to read certain chapters in a book, or study some relevant printed documents. The student could also be instructed to view a film, attend a lecture, perform an experiment or engage in any other activity that had a bearing on the learning objectives. After each of many such activities, the student would be tested on the material that was learned. Failures on these tests were viewed as indications of a need for further instruction. Further instruction would be forthcoming with the final goal being that of mastery.

Mastery learning was the hallmark of P.S.I. and can be seen in much of the educational literature of the 1970s. The concept of a learning packet was also widely adopted. The use of senior students as proctors and tutors was seen as an important component in developing countries where a lack of trained personnel made this an attractive option. This feature has also been employed in schools that are organized on the basis of family groupings. Research by Mao-Cohen and Lawson (1976) investigating the effect of P.S.I. in the longer term indicates that the study habits and approaches reinforced in this system are generalized to other courses as well.

Programmed instruction and P.S.I. were developed as models for use in individualized settings. During this century many attempts have been made to establish the ideas of individualized instruction on a system-wide basis. Whaley (1978) identifies a number of such programs including the Gary Plan in 1908, the Winnetka Plan in 1919, and the Dalton Plan of 1920. Whaley also lists eight other major systems that were in use more recently. These are, Program for Learning in Accordance with Needs (P.L.A.N.), Individually Prescribed Instruction (I.P.I.), Individually Guided Education (I.G.E.), Individualized Mathematics System (I.M.S.), Programmed Logic for Automated Teaching

Operations (P.L.A.T.O.), the Duluth Plan for Individualization, Personalized Learning (Miami Springs), and Independent Study Program (Hawaii).

P.S.I. and programmed instruction also found a ready place in the open classroom. The movement toward the open classroom had much in common with the spirit of individualized instruction. In particular, it represented another attempt to break the lock-step, lecture-recitation cycle of the traditional school. In its place was to be an environment that stimulated exploration and discovery through individual and small-group directed learning. The open classroom's variety of special interest centers provided convenient niches for the programmed and personalized materials.

Programmed and Individualized Instruction in Music

Evidence of music education's interest in programmed and individualized instruction can be seen in a Carlsen and Williams (1978) annotated bibliography on the subject. These authors list 65 studies in programmed music instruction for the years 1950 through 1972. The areas covered include 18 studies involving ear training programs, 4 projects in the field of harmony, and 6 studies which focused on instrumental performance. An additional 3 applications were directed toward music appreciation, music fundamentals was the subject of 16 research projects and 1 study was devoted to music literature/history. The bibliography goes on to list 2 studies involving musical form and style, and 7 research efforts in rhythmic training. Finally, score reading attracted the attention of 5 investigators while sight singing and vocal performance accounted for 1 and 2 studies respectively.

In addition to the abovementioned research, Knapp (1976) reported a significant amount of day to day work being done by classroom teachers in the field. He conducted a survey to assess the degree of individualization in general music classes. The study revealed considerable use of individualized instruction strategies through items such as job cards, learning activities packages, work sheets, contracts, games, and creative projects.

Other examples of work being done with individualization could include a P.S.I. model that was employed by Jumpeter (1980) for the teaching of a music appreciation course, and a programmed instruction approach for the development of listening skills by O'Conner (1976). By 1975 this interest in individualized instruction was great enough to encourage the Music Educators' National Conference to publish a text on the subject entitled Individualized Instruction in Music compiled by Meske and Rinehart.

In addition to the efforts to individualize materials in the general music classroom, some interesting projects were being undertaken with regard to instrumental instruction. An adaptation of the teaching machine was used by Woelflin (1964) for the teaching of clarinet fingerings. The machine was a slide projector that presented a visual display of the fingerings to be learned. The student's knowledge of these fingerings was checked by a self-correcting branching program and short performance exercises. When the program-taught students were compared with others in a traditional instrumental class, it was concluded that the programmed method fostered results that were as good as those achieved through class instruction. The advantage, as seen by Woelflin, was that with the program one half of the teacher's classroom time was saved.

Pupolo (1970) developed an individualized program for use with the beginning instrumentalist. He employed structured cassette recordings that contained verbal descriptions, model performances, and several paced practices. The students were to listen to the verbal instructions and model performances and then play along with the paced practice drills. These performances were arranged from a slow initial attempt through subsequent readings at faster tempos. The study compared the performance achievement of students who were working with the program to those who were practicing on their own. The students who used the tape recorded program showed a significant gain over those who did not.

James McCarthy (1974) conducted a research project which measured the effect of individualized instruction on the performance achievement of beginning instrumentalists.

In this research, beginning band students were divided into control and experimental groups and given instruction that differed markedly. The control group studied in a traditional lock-step format whereas the experimental students pursued their instruments individually and received instructions from the teacher only when they requested help. Those in the experimental group proceeded through their lesson materials at their own pace and, when they had completed a segment of their book, they could request a proficiency test by the teacher. The instructor would administer the test, correct their mistakes, give a mini-lesson, and send them on.

Using this individualized approach, McCarthy was able to achieve significantly higher performance results from the experimental group. The study leads to the conclusion that uniform teaching methods may impede a student's progress and that an individualized instructional format can overcome this undesirable effect.

A study of Froseth (1976) took a different tack with regard to individualizing instrumental instruction. Important elements in this work include the re-organization of written materials, the use of the singing voice, movement, and improvisation. In particular, the materials were structured so that each piece could be played at three levels of competency simultaneously. This approach allowed the instructor to have students of differing abilities all working together without frustration. Students were also allowed greater freedom in choosing material to be played and activities to be undertaken. In this respect, a large part of the instruction was self-initiated and self-directed.

An experimental group of students using the above method of instruction was compared with a control group which was proceeding in a traditional lock-step manner. The results of a performance achievement test on those two groups showed a significant advantage to the experimental students. Froseth's conclusions suggest that individualized group instruction is a useful alternative to traditional modes of teaching.

Individualization within the group instrumental lesson was once again the focus of attention in a research and development project carried out by Tiller (1976). In this work

an integrated system of individualized instruction was devised for use with beginning guitarists. It used the concepts of the language lab, along with a branching program and on-demand instruction. Students were allocated to two groups on a matched-pair basis. Some individuals received instruction through small group lessons while others were taught in large classes using program-assisted instruction. When the two groups of students were compared on a variety of performance criteria, there was no statistical difference between them. This result, along with the experience gained in the project, has motivated the researcher to continue work on programmed and individualized instruction in music.

Learning Styles

In all the examples cited thus far, the unifying factor has been the intent to devise materials, instructional strategies, and delivery systems that allow the student to progress at his or her own pace. In addition, the materials being used had to provide rapid feedback and be written at the student's level of understanding. With more recent research it is becoming evident that pace, frequency of feedback, and level of understanding are only a part of a larger domain known as learning style.

Learning style may be the next frontier for individualizing instruction. Teachers have long recognized that some students do not work well on their own. Given the most up-to-date materials and state-of-the-art instructional technology, there are still individuals who seem to need human interaction. Others find it important to seek out a cool environment, have background music, eat food, or turn on a bright light. It would appear that any individual can exhibit a variety of personal traits that are linked to the effectiveness of his or her own learning. Educators and researchers have now started to look carefully at this more inclusive catalogue of human dimensions called learning style.

Learning style has been defined by Keef (1979) as those characteristic cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment. Various models

of learning style have been proposed and they will be reviewed in the second chapter of this paper. Consistent with the Keef definition is a model put forward by Dunn, Dunn, and Price that identifies a set of learning style dimensions in the following categories:

1. Environmental factors, that include individual preferences for levels of sound, light, temperature, and environmental design.
2. Emotional factors, which relate to an individual's level of motivation, persistence, responsibility and need for structure in the learning environment.
3. Sociological factors, encompassing student preferences for learning with colleagues, by themselves, in a pair, in a team effort, under an authority figure, or in a variety of ways.
4. Physical factors, such as preference for learning through one of the senses in particular, the need to eat or drink when studying, a preference for learning at a certain time of day, or a requirement for mobility when learning.
5. Psychological factors, that include the bi-polar characteristics of an individual learner with regard to his or her tendency to be analytical or global in thinking, showing right or left cerebral preferences, and being reflective or impulsive when making judgements.

Teachers are being encouraged to become aware of these aspects of student learning style and to adapt instruction to match. Tests and inventories have been developed to ascertain the learning style preferences of students. Using the individual profiles from one of these tests, the teacher can alter the instructional environment and choose the most appropriate materials for each learner. While it is still not possible to be all things to all people, there is the hope that one can be more things to more people.

Articles by Brandt (1985) and Bernstorff (1986) indicate a growing awareness of the importance of learning style to the music educator. In particular, these writers call attention to the need for music teachers to be informed as to the sociological, and modality (psychological) preferences of their students.

The Focus of this Research

It is the assertion concerning the relative stability of learning style that lies at the heart of this current research project. Some evidence would suggest that individuals do apply a relatively consistent approach to learning over a broad range of subjects. This evidence appears to have particular credence when dealing with learning of a cognitive nature. However, does this continue to hold true when one is interacting with musical sound and simultaneously engaged in a complex psycho-motor activity? If an individual's approach to music is largely the same as his or her approach to other learning activities, then the music educator could use a test of general learning style with some confidence. If, on the other hand, significant differences were to be found between the general and music-specific aspects of learning style, the music educator may have need for a more specialized tool.

The research described in this thesis will seek to shed some light on the basic question regarding the stability of learning style. Specifically, the investigation will be looking for any significant differences that exist between the way individuals prefer to learn musical material as opposed to the way they prefer to learn non-musical, or general, subject matter. This project is seen as a necessary first step in what may become a continuum of research into learning style as it relates to music.

Purpose of the Study

This study will test for the extent of congruency between the musical and non-musical, or general, learning style of individuals by comparing their responses when they:

1. reflect on their music-learning activities, and
2. reflect on their non-musical, or general, learning experiences.

Definitions

Learning Style - Those characteristic cognitive, affective and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact with and respond to the learning environment (Keef, 1979).

Musical Learning - Those learning activities of a creative or recreative nature where the concurrent product is musical sound. Learning activities that are principally verbal, even if music is the topic, are excluded from this study.

Non-Musical or General Learning - Those learning activities where the individual is not concurrently producing musical sound.

Mind Set - The subject's particular perspective when answering the survey items. The mind set for each test sitting will be given to the subjects in a supplementary set of test directions. Those supplementary directions will ask the subjects to respond from their perspective on musical learning and then from the standpoint of their non-musical or general learning, experience.

Assumptions

1. It is assumed that the subjects in this study are capable of delivering an accurate and valid self-report on the twenty aspects of learning style as measured by the Productivity Environmental Profile Survey by Dunn, Dunn and Price (1982).
2. It is possible for the subjects to respond to the survey instrument from both a musical and non-musical, or general, perspective.
3. It is possible to supplement the directions for the Productivity Environmental Profile Survey in order to obtain valid and reliable data with regard to an individual's musical and non-musical learning style.

Limitations

The study is not longitudinal but samples a point in time. As stated previously in the definitions, the term musical learning will refer only to those creative and recreative activities where the concurrent product is musical sound.

Need for the Study

Research into the various aspects of learning style has been and continues to be prodigious; however, only a small percentage of this work has involved music. It would seem important for music education to develop its own body of knowledge in this area,

particularly where the needs of its students are concerned. In addition, if music educators are going to apply the results of learning style research to their own programs, they will need to know to what extent the concepts are applicable. In particular, music educators would need to be aware of any special features of musical learning style that may be important to the implementation of their programs.

CHAPTER TWO

REVIEW OF THE LITERATURE

In the literature review that follows there is a survey of some of the important models that have given shape to learning style research. Specific research studies will then be summarized as they relate to the model being used in this project. Finally, a group of studies with a music bias will be discussed.

Cognitive Style

One of the strongest and most focused of the research models involves the concept of cognitive style. This term is closely identified with the work of H. A. Witkin who in the later part of the 1940s became interested in certain aspects of human perception. Initially this interest concerned the ways in which individuals determine the relative positions of objects in space (Partridge, 1983). Two tests (the rod and frame test and the body adjustment test) were employed to measure this phenomenon. It was discovered that some individuals could make accurate judgements concerning the orientation of objects in space that were quite independent of the background field. By contrast, other subjects evidenced a marked dependence on the background field when making the same judgements. The former group of subjects was labelled as being "field-independent" and the later group was designated "field-dependent." As Witkin and Goodenough (1981) make clear, these labels were intended to identify the extent of reliance on visual field or body orientation in perception of the upright.

Later, this research effort was broadened to see if field-dependence/independence might be a more pervasive characteristic. Another test instrument was devised called the Embedded Figures Test. It consisted of two presentations of a two-dimensional figure. The first figure was a relatively simple shape, the second was a more complex shape which has the simple shape contained within it. The research found that subjects who experienced difficulty in separating the simple figure from the complex design were the same individuals who were field-dependent in the orientation tests. By contrast, those

people who were field-independent on the orientation tests were quite adept at finding these embedded figures. Field-dependence/independence was therefore seen as a "perceptual-analytical ability that manifests itself pervasively throughout an individual's perceptual functioning" (Witkin & Goodenough, 1981, p.15). Witkin, Moore, Goodenough and Cox (1977) describe their conceptual model as a continuum which indicates, "the extent to which a person perceives part of a field as discrete from the surrounding field; or the extent to which the organization of the prevailing field determines the perception of its components" (p.7).

Field-dependence and field-independence have been found to be a stable quality in an individual's cognitive capacity and these characteristics are manifest in many ways. For example, teachers of social science have been studied and it appears that those identified as field-dependent made a practice of teaching concepts in an interrelated manner. By contrast, the teachers who were field-independent had the tendency to present concepts as discrete entities (Witkin, et al 1977). The characteristics of field-dependence and field-independence have been designated in much of the literature as "cognitive style." The Witkin model, with its strong theoretical basis and reliable test instrumentation, has served as a framework for a large body of research.

Learning Style

Gregorc and Ward (1977) present a model to describe the learning style characteristics of individuals by juxtaposing the bipolar concepts of concrete-abstract with sequential versus random. In this model, the use of abstract and concrete serve as reference points for a person's preferred mode of thinking whereas sequential and random relate to preferences for ordering. These dualities combine to form a set of four distinct learning preference patterns or modes "abstract-random", "abstract-sequential", "concrete-sequential", and "concrete random". The research into those preferred modes of learning, undertaken by observation and interview, indicates that people use all four. However, 90% of the individuals surveyed expressed a definite preference for one or two ways of

acquiring information. Gregorc and Ward also identify the strengths of each of the four learner types and make recommendations for instructional choices.

The use of bipolar concepts in cognitive style research has proven quite popular. Partridge (1983) lists 11 such theoretical constructs that have been used to investigate the topic. Along with the field-dependent/independent idea there has been work on aspects of analytical - non analytical conceptualizing, impulsivity-reflectiveness, risk taking-caution, perceptive/receptive-systematic/intuitive, leveling-sharpening, cognitive complexity/simplicity, scanning-focusing, constricted/flexible control, broad/narrow categorization, and tolerance/intolerance for the unusual.

Fischer and Fischer (1979) portray a more global concept of learning style by using the term to refer to a pervasive quality that persists even though the content may change. These authors identify nine types of learners beginning with the "incremental learner." The incremental learner is one who moves step by step and could therefore benefit from linear programmed instruction. These are also the type of learners who like to gather a great deal of information before generalizing.

A second category of learner is the "intuitive type." This individual makes mental leaps in various directions, has sudden insights, and arrives at meaningful and accurate generalizations from an unsystematic gathering of information. For such a learner, the quality of their thinking exceeds their ability to describe the steps to any conclusion.

A third learner type, according to the Fischers, is the "sensory specialist." These individuals depend on one dominant sense for the meaningful formulation of ideas. Number four in this list is the "sensory generalist" who employs all senses and is often over-sensitive to the instructional environment. A fifth style of learner is described as "emotionally involved" and seems to need an educational setting with a high emotional charge. Such individuals profit from open discussion and a strong interplay of ideas and activities. By contrast, "emotionally neutral" learners are a sixth type of student and appreciate a low-keyed classroom atmosphere where the tone is intellectual and analytical.

The "explicitly structured" learner expects all learning tasks to be clearly spelled out and unambiguous. Furthermore, he or she wants limited goals that are carefully stated. On the other hand, an "open ended learner" works best when there is room for divergence. This individual resists tight structure and tends to see connections between what they are learning and other facets of life. The "eclectic learner" (number eight in the Fischers' List) is characterized by flexibility and the ability to shift from one style to another and still be successful. Finally there is the "damaged learner" whose self-concept, social competency, aesthetic sensitivity or intellect have been dislocated so that a negative learning style develops.

Another even more eclectic model of learning style has been developed through the joint efforts of the Center for the Study of Learning and Teaching Style and the National Association of Secondary School Principals. Research carried out under the auspices of these two organizations has led to the identification of a 21 dimensional model for learning style. Dunn, Dunn and Price (1982) have developed a self-report instrument, The Learning Style Inventory, to measure these 21 aspects of learning style and to provide information that will help in the instructional decision making process.

The 21 dimensions of learning style are grouped under the five broad headings of environmental factors, emotional factors, sociological elements, physical concerns, and psychological elements (see Chapter 1, p. 11). The environmental elements are sound, light, temperature, and design. The emotional factors include motivation, persistence, responsibility, and structure. Sociological elements consist of colleagues, self, pair, team, authority, and varied. Physical factors include perceptual, intake, time and mobility. Psychological elements are the bipolar dimensions of analytic-global, right-left cerebral preference, and reflective-impulsive. A pictorial representation of this model is presented below in Figure 1.

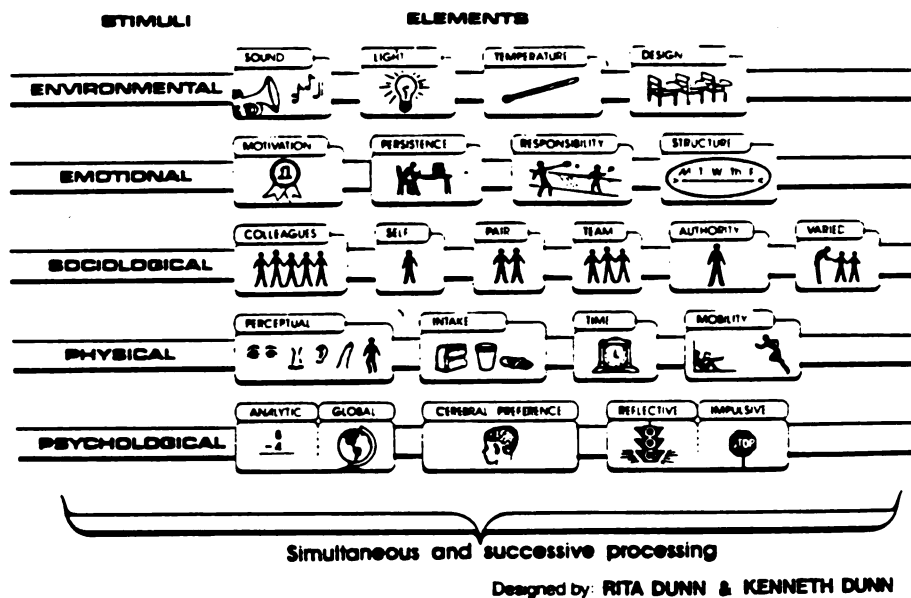


Figure 1. The Dunn and Dunn Learning Style Model

In addition to the Learning Style Inventory previously mentioned, Dunn, Dunn, and Price have produced a test instrument intended for use with adults called the Productivity Environmental Profile Survey. It is this model and test instrument that was used to collect data for this research project.

General Research

Individual research projects have been concerned with many of the same elements that are contained in the foregoing models. A description of that research will follow the pattern set out in Figure 1 with studies being grouped under the categories of environmental, emotional, sociological, physical, and psychological.

Environmental Aspects of Learning Style

Mullikin and Henk (1985) investigated the effect of auditory background on reading comprehension. Their study grew out of research which seemed to indicate that extraneous

noise was detrimental to reading comprehension whereas background music had been shown to facilitate other educational activities. It appeared that certain musical backgrounds could drown out potential distractions and relax the learner while, at the same time, they could stimulate active reasoning and creativity. The researchers also cited their own observation that most adult learners will articulate a definite preference for one auditory background or another and that such preferences are related to the condition that the learner believes is most beneficial.

In the Mullikin and Henk study, 45 children in grades four through eight were chosen at random from a pool of students that had demonstrated at least average reading ability. Three social studies passages of equal difficulty were chosen for each grade level and a set of 10 comprehension questions were drawn from each. The students did their readings under three treatment conditions, (a) no music, (b) with classical background music, or (c) rock background music. The analysis of results showed no significant effect regarding grade level or any significant interaction between grade level and background music. Significant differences were found between the three treatment conditions. These findings indicated that soft, slow classical music generated the highest mean performance, with no music yielding the second highest scores. Rock music provided the least favorable comprehension results.

The researchers do advise caution in any generalized application of these findings. The subject sample was drawn from students attending a private school and the small number representing each grade level could be seen as limiting factors. In addition, Mullikin and Henk point out that 3 of the 45 subjects actually did better under the rock music conditions. They therefore suggest that, although slow classical music tends to facilitate performance, it does not work in all cases. The researchers also call attention to a line of thought called "suggestology" which uses Baroque musical compositions with a tempo of about 60 beats per minute to reduce heart rate and blood pressure. This treatment

is provided with the intention of reducing anxiety among students in a given learning environment.

Another study dealing with the learning style preference for levels of sound was carried out by Pizzo (1981). The purpose of the study was to investigate the relationship between the acoustic environment and a student's diagnosed preference for sound on reading achievement. The hypothesis was that students who were tested in acoustic environments consistent with their preference for levels of sound would gain significantly higher scores than their peers who were tested in an incongruent acoustic environment.

One hundred and twenty five 6th-grade students were tested using the Dunn, Dunn and Price (1978) Learning Style Inventory and 64 students were chosen as the sample for the investigation. Subjects were identified as having a distinct preference for either quiet or sound in their learning environment. The individuals were then assigned randomly and equally to one of two treatment conditions; (a) a quiet environment where ambient sound was in the 40-45 dBA range, and (b) a noise environment that was engineered by using a tape recording of unpredictable classroom sounds in the 75-80 dBA range. In this second instance, the noise generated by the tape produced sound at random intervals of varying duration interspersed with silence.

The students were tested under the above conditions using the Comprehension subtest of the Gates-MacGintie Reading Tests. The results indicated a significant interaction between the acoustic environment and the individual's learning style preference for sound. A second significant interaction was revealed with regard to the sex of the subject, indicating that both males and females did better when tested in an acoustic environment congruent with their identified preference. It was concluded that individuals do differ in their preference for sound in the learning environment and that, if these preferences are matched with the appropriate environment, a significant enhancement of educational outcomes can result.

The environmental element of light was the aspect of learning style studied by Krinsky (1982). His investigation looked at the possible relationship between an individual's preference for light as a learning style factor and his or her performance on a reading test when operating under matched and mismatched conditions. Krinsky used the Learning Style Inventory, (Dunn, Dunn and Price 1978), to ascertain the preference for light in a group of 4th-grade students. Those students who preferred extremely bright light and those who preferred extremely dim light were randomly selected and equally assigned to one of two experimental groups. One group was tested in a brightly lit environment, the other in a dimly illuminated setting. Using the Gates-MacGintie Test for Reading Speed and Accuracy and employing a 2 x 2 factor ANOVA for statistical analysis, it was found that scores on both reading speed and accuracy were consistently and significantly higher when the students were tested in an environment that matched their preference for the amount of light. It was also found that there was no significant difference in the test results between those students who preferred bright light as compared with those whose preference was for dim light. In Krinsky's view, this demonstrated that neither bright or dim light was crucial for success but rather the match between environment and learning style preference.

Murray (1983) undertook a project to analyze the relationship(s) between the thermal environment and the corresponding learning style preference for temperature. Using the Learning Style Inventory, Murray surveyed 268 students from the seventh grade and categorized them into three groups based on their preference for a cool or warm environment and those with no particular preference in either direction. These 268 subjects were assigned randomly and equally to two experimental groups and tested twice, once in a setting that was consistent with their temperature preference and once in an environment at variance with that preference. The warm classroom was maintained at 80 F, the cool classroom was set at 60 F. The subjects' performance on a word recognition task was significantly better when they were operating in the thermal environment that matched their

identified learning style preference. The results were seen by Murrain as particularly important in light of the fact that there were only marginal differences in the level of preference among these subjects.

The environmental element of design was the subject of a study by Shea (1983). He hypothesized that subjects tested in an environment consistent with their identified preference for design would achieve significantly higher reading comprehension scores than peers tested in an incongruent environment. Four hundred and ten 9th-grade students were tested for their design preferences using the Dunn, Dunn and Price Learning Style Inventory and those with strong preference for either formal or informal environments were identified. These individuals were further screened for IQ with only those in the 85-115 range used in the study. A final group of 32 students was chosen and those who preferred formal design and others whose preference was for informal design were randomly and equally assigned to two experimental groups. Using the Metropolitan Achievement Test, Reading Comprehension Subtest (1978), one group was tested in a formal situation containing hard wooden and steel chairs and desks. The second group was similarly tested in an informal environment of upholstered chairs, sofas, pillows and carpeting.

Employing the statistical procedure of a 2 x 2 ANOVA, Shea was able to demonstrate a significant interaction between the learning style preference for design and the actual environmental design. This was reflected in higher reading comprehension scores when the subjects were in the setting that matched their preference.

Not all studies of this type have yielded significant results. A study by Stiles (1985) (that closely resembled the previously reviewed research projects and dealt once again with design) did not find any significant effect.

Emotional and Sociological Aspects of Learning Style

Hunt (1979) reports on research that was directed toward the need for structure as a learning style element. Using a paragraph completion method of testing for conceptual level, Hunt found that in a sample of 6th-grade students, 54% felt the need for considerable structure, 31% needed some structure, and only 15% required little structure. A 9th-grade sample, however, showed virtually the reverse of these percentages with 18% feeling the need for a high amount of structure, 28% indicating the need for some structure, and a full 54% who were confident in their ability to work successfully with little structure.

Research by Perrin (1984) compared the effects on achievement in problem-solving, word recognition, and attitudes when students who had a strong sociological learning style preference were taught in ways that either matched or mismatched those preferences. The sample for this study was composed of 39 normal and 17 gifted 1st- and 2nd-grade children. These students were surveyed for their sociological preferences with regard to learning alone or with peers. The sociological subtest of the Dunn, Dunn and Price Learning Style Inventory (Primary) was employed for this purpose. The results indicated significant differences in relation to both achievement and attitudes when the subjects were matched with complementary instructional strategies.

Physical Aspects of Learning Style

Two studies, Weinberg (1983) and Martini (1986), investigated the modality or perceptual preference of students and its relationship to the mode of instruction. Perceptual preferences (see Figure 1) involve the tendency of various individuals to favor one sensory mode in the learning process. The Weinberg study provided inconclusive results but did show that learners with a visual preference actually made statistically greater improvement when instructed through a visual instead of an auditory approach. In the Martini study, significantly higher achievement and attitude scores were realized for all students who were taught in a manner consistent with their perceptual preferences.

Research by MacMurren (1985) looked at the learning style variable of intake. The Dunn, Dunn and Price Learning Style Inventory recognizes the need of some students for food or drink while learning and this preference is identified as a subscore of the test instrument. Using that subscore in a sample of 173 students from sixth grade, individuals with a strong preference for either intake or no intake were selected and randomly assigned to two experimental groups. Both groups were administered the Gates-Mac Gintie Test for Reading Speed and Accuracy and the Semantic Differential Scale by Pizzo (a test to measure the attitudes of students toward the instructional environment). One group, however, was tested in a setting with intake available and the other was tested in an environment without intake possibilities.

Results of this experiment showed no significant differences between subjects with either a strong preference for intake or a strong preference for no intake. No significant differences were found in the test results relating to the instructional settings providing for intake or not providing for intake. However, for those students who had been identified as having a strong preference for intake, reading speed, accuracy, and attitude scores were significantly higher when their instructional environment was matched for that element.

Biggers (1980) studied a sample of 641 students in the 7th- to 12th-grades with regard to their perceived "body rhythms." The subjects were asked to identify those time periods when they normally slept and to indicate those times of the day when they were most alert or most sluggish. Significant relationships were found between the subject's age and that individual's state during the day, with younger students being most alert in the afternoon and older students citing the morning as the period of most alertness. A significant relationship was also found between this body rhythm information and grade point average. In this regard, those subjects who were at their most alert in the morning had the highest grade point success. In discussing the data, Biggers speculates that the schedule of teaching in the school would seem to favor the morning alert segment of the

school population and that efforts may be needed to reorganize the teaching day in order to take these individual differences in body rhythm into account.

The learning style preference for time of day was the subject of research undertaken by Lynch (1981). He used the Dunn, Dunn and Price Learning Style Inventory to determine the preferences among a sample of 11th- and 12th-grade students for learning in either early morning, late morning, afternoon, or evening. These students had also been previously identified as chronic truants. It was hypothesized that there would be no significant differences in the mean English course grades or the mean number of days of partial or full truancy when matched or mismatched in teacher assignment, (the actual instructor who taught the class) and learning style time preference. The null hypothesis was tested through a three-way ANOVA and a post-hoc Tukey test.

Lynch reports that when individuals were matched with regard to their time preference it affected attendance more significantly than the teacher assignment. He goes on to recommend the matching of students and students' time preferences as the primary focal point for individualized instruction.

Time preferences was also the subject of a study by Freeley (1984). The subjects in the research were teachers and, of course, adults. The learning style test instrument that is designed for use with adults is the Dunn, Dunn and Price Productivity Environmental Preference Survey (1979). It was this instrument that was employed to gauge the time preference of the 73 subjects in the sample. A researcher-designed post test questionnaire was used to determine the attitudes and degree of implementation that followed a series of workshop sessions devoted to small group learning strategies. It was found that subjects whose time preferences and workshop schedules coincided had significantly higher post test mean scores with regard to implementation.

Another study that investigated the matching and mismatching of instructional schedules and time preferences was undertaken by Virostko (1983). This research looked at a full two years of student experience in an instructional environment that was either

consistent or at variance with their identified learning style preference in regard to time. Once again the Learning Style Inventory was used to identify the time preferences of 286 students from the third, fourth, fifth, and sixth grades. Using a three-way ANOVA and a .05 level of confidence criterion, it was found that subjects whose time preference and class schedules were congruent achieved significantly higher test scores in both math and reading.

Another physical aspect of learning style is that of a preference for various degrees of mobility. Della Valle and Dunn (1986) report on research that has been conducted with a focus on this element. In this study, 417 students drawn from the seventh grade were tested using the Dunn, Dunn and Price Learning Style Inventory and a subject sample of 40 students was chosen (20 with an extreme preference for mobility and 20 with an extreme preference for passivity). Tasks were developed that employed word-pair recognition activities in both a mobile and passive situation. All students participated in both conditions. The research results found that students with a preference for mobility performed significantly better in an environment that matched their preference than when confined to a passive learning situation. In similar fashion, students with a preference for passivity performed significantly better when in a matched environment.

Psychological Aspects of Learning Style

Cerebral dominance and cognitive style have been two main areas of research with regard to the psychological dimensions of learning style. Individuals are seen to have certain preferred ways of processing information that are linked with either left or right brain activity and with field-dependent or field-independent characteristics. The concepts concerned with right or left brain activity postulate that the left side of the brain processes information in an orderly, sequential, and digital manner whereas the right hemisphere is considered to be more holistic, integrated, and analogue in its approach.

Torrance, Reynolds, Riegel, and Ball (1977) have employed the right/left brain dichotomy as the basis for development of an instrument to measure learning style. Using

the bipolar concept of digital-analogue, they have produced a test entitled *Your Style of Learning and Thinking*. This test contains 40 items, each with a three-part forced-choice response option. These responses survey an individual's preference for a right brain, left brain, or an integrated approach to learning. For example, a typical statement on the test would require the testee to indicate his or her preference for intuitive, logical, or both intuitive and logical ways of solving problems. At other points in the test, responses would be sought regarding learning style preferences for (a) visualization as opposed to language, (b) learning details versus establishing an overview, or (c) dealing with one problem at a time as opposed to considering several problems simultaneously. In each case an integrated choice is offered so that the testee can indicate no overall preference for either extreme or the preference for a variety of approaches. The scoring of the test results in a quotient that reflects the extent of right, left, or integrated brain preference.

Models of Hemispheric Specialization

This work of Torrance, Reynolds, Riegel, and Ball is theoretically based on research into hemispheric specialization. Allen (1983) has summarized the various models that have guided such research from about 1865 to the last decade. He describes five general classes of models, the first of which postulates unilateral specialization. In this model only one hemisphere is responsible for any one psychological process. The left hemisphere is seen as the center for language (in particular speech production) and for the control of purposive motor sequences. The right hemisphere is seen by some theorists as the repository of visuospatial functions along with a class of behavior in which the spatial environment is manipulated by the hands. This manipulation is referred to as *manipulospacial* and would include activities such as drawing, arranging, constructing and actively touching.

Face recognition is also a claim made for the right hemisphere along with the hypothesis that information processing in this hemisphere is done in a parallel fashion. By parallel it is meant that the time needed to process information is not dependent on the

number of elements. By contrast, the left hemisphere is thought to be serial in its approach and, therefore, the time it takes to process information increases with the number of elements to be considered.

A second group of models that has been the subject of much research employs the idea of hemispheric cooperative interaction. These theories involve a "bilateralization" in which both hemispheres possess the capacity to perform any given function. One line of thought holds that both hemispheres execute a function at the same time and that the overall result is the product of an integrated or joint effort. Another theoretical position postulates that each hemisphere does a particular subprocess and the overall performance depends on a coordinating mechanism thought to reside in the corpus calosum and brain stem.

Third in Allen's survey of models are those of negative interaction. These models once again incorporate the idea of both hemispheres acting simultaneously but in this instance they are actively suppressing each other. This suppression takes place at the level of the corpus calosum and brain stem and in such a model the left hemisphere would inhibit the right when involved in verbal tasks with the right inhibiting the left in visuospatial domains.

A fourth class of models theorizes that both hemispheres are operating simultaneously and independently. These are termed parallel models and are divided into two types, ones asserting that each side of the brain is performing the same function and others contending that the two hemispheres are performing different functions or, at least, different sub-components of a larger function.

The fifth and final class of models in Allen's survey involves the concept of allocation. In these models both hemispheres are seen to be capable of a given task but only one actually does so at any particular time. Such models are described as being bilateral but neither interactive nor parallel. This final class of models has particular relevance for learning style. It theorizes that a control mechanism exists whereby an individual can voluntarily allocate information to one or the other hemisphere for

processing. In any specific instance this input allocation is termed a "strategy"; when viewed overall it can be seen as an individual's "cognitive style." If the allocation of hemispheric activity is somehow under the direct control of the learner, the use of the right or left side of the brain could be seen as an aspect of individual differences and individual preferences.

Dunn, Cavanaugh, Eberle, and Zenhausern (1982) have conducted research on the concept of hemispheric preference as an element of learning style in the study of biology. This research compared the identified learning style characteristics of 353 high school students relative to right or left brain hemispheric preference. The data gathering instruments used in this project were Dunn, Dunn and Price's Learning Style Inventory and Zenhausern's Differential Hemispheric Activation Test. The results of a statistical analysis led to two overall conclusions, (a) a statistically significant correspondence can be found between an individual's learning style and his or her hemispheric preference, and (b) left-preferenced and right-preferenced individuals show different learning style characteristics that indicate a need to provide different settings and instructional approaches.

Cody (1983) investigated the relationship between learning styles and ability groups. In her research the learning style component of hemispheric dominance was of particular importance. She used the Torrance, Reynolds, and Kalsounis children's form of the test *Your Style of Learning and Thinking* to obtain specific information on this dimension. The Dunn, Dunn and Price Learning Style Inventory was also employed to gather data on environmental, emotional, sociological, and physical characteristics.

Two hundred and forty students in grades 5 to 12 were divided into three levels of ability, (average, gifted, and highly gifted). This was done on the basis of IQ scores and the results indicated significant differences among these three IQ groupings on six elements of learning style. Average students (IQ 100-119) evidenced a preference for quiet, warmth, late day, and structure. These subjects also showed less motivation and were

more inclined to left and integrated hemispheric dominance. The gifted students (IQ 130-139) preferred moderate temperature, morning time slots, less structure, were more highly motivated, and indicated an integrated to right hemispheric dominance. The highly gifted students (IQ 145+) contrasted by showing a preference for sound in the environment, were the most highly motivated, wanted cooler temperature, preferred evening as a time for learning, and required the least amount of structure. In addition, these highly gifted students tested out as more integrated and right hemisphere dominant.

Cody points out that the tendency for gifted and highly gifted students to show a significant preference for right hemispheric and integrated information processing is an important finding. She observes that this may contrast rather sharply with the emphasis on left hemispheric, verbal, and sequential processes that one finds in many educational settings.

Tanenbaum (1982) engaged in research that looked at the possible relationship between the learning style component of structure and that of field dependence/independence (cognitive style). The Oltman, Raskin, and Witkin Group Embedded Figures Test was administered to 248 high school students. Out of the original pool of students, 100 individuals were identified as either field dependent or field independent and randomly and equally allotted to two treatments. The treatments involved a lesson in nutrition that was presented in two ways, (a) in a highly structured manner employing deductive reasoning, convergent questioning, and written answers, and (b) a random approach with inductive reasoning and divergent questioning. A pretest was administered three weeks before the treatments and was used also as a post test one day after. The gain on this test was analyzed with a two-way ANOVA to determine if the treatments could be responsible for any change in score. This analysis showed a significant interaction between cognitive style and treatment method. Subjects identified as field dependent did better in a high-structure instructional environment, whereas field-

independent subjects made significantly higher scores when taught with the method low in structure.

Jonassen (1985) conducted research on the question of cognitive style and its relationship to independent study. The 81 subjects in this study were college students and the testing employed four instruments; Rosenberg's Self-Esteem Scale, Potter's Internal External Scale, the Hidden Figures Test, and the Emotional Cognitive Style Inventory. Students were offered two choices of instructional mode for their introductory instructional media course. They could choose a traditional classroom with a teacher-paced form of instruction, or they were able to follow a self-paced instructional package. Seventy-four percent of the students chose the traditional approach. Of the remaining students who opted for the independent study format, it was found that the factors of field-independence, internal locus of control, and a low degree of family influence and/or authority figures were significant predictors of an individual's choice.

Research on Learning Style and Cognitive Style in Music

Gosh (1979) conducted research that was designed to examine the differences in cognitive styles among gifted and talented students in mathematics, music, and art. The data gathering instruments in this study included the Torrance Your Style of Learning and Thinking, Kagan's Matching Familiar Figures Test, and Witkin's Group Embedded Figures Test. One hundred and ninety-eight high school students were the subjects in this project and they had been previously identified for their excellence in either mathematics, music, or art. Three areas of cognitive style were used as criterion variables. These were: left-right brain specialization, reflection-impulsivity; and field-dependence/independence. The two predictors were area of excellence (math, music, or art) and sex.

With regard to their area of excellence, Gosh reported no significant difference among the groups on the dimension of reflection-impulsivity; however, on the remaining two criterion variables differences were identified. Those subjects with a demonstrated excellence in mathematics tended toward a left/integrated mode of hemispheric

specialization and were field-independent in perception. Art majors were right/integrated on the dimension of hemispheric dominance and field independent in cognitive style. The subjects with musical strengths were described as being right/integrated in hemispheric specialization and field-dependent in cognitive style.

Heitland (1982) studied the assumption that cognitive styles influenced auditorily initiated mental processes. He concluded that his assumption was confirmed when it was found that individual differences in cognitive style accounted for about nine percent of the differences on a battery of music tests. Heitland also reported that two of the five measures of style correlated significantly with each of the separate music tests.

Schmidt (1984) was motivated by the Heitland research to investigate the relationship among the learning style elements of field-dependence/independence and language-bound/optional to musicians' performances on tasks of aural discrimination. The research project used Kagan's Matching Familiar Figures Test, Witkin's Group Embedded Figures Test, and a test of temporal order discrimination for word components by Keele and Lyon. Aural discrimination was examined using a test that was part of the ear-training course in which the subjects were enrolled. There was a significant advantage to field-independent subjects in their mean scores on this aural discrimination exam. Schmidt speculates that field-dependent students might benefit from small group drill sessions while field-independent students could profit from individual sessions on a computer.

Schmidt and Sinor (1986) were responsible for an investigation of relationships among music audiation, creativity and cognitive style. These researchers focused on the style dimensions of reflection/impulsive which was compared with achievement scores in convergent and divergent musical tasks. Thirty-four 2nd-grade students were tested using the Primary Measures of Music Audiation, Measure of Creative Thinking in Music, and the Matching Familiar Figures test. The significant findings from this research indicate that a relationship does exist between the subject's position on the reflection/impulsive scale and musical audiation. There was a non-significant negative relationship found between

rhythmic scores and musical creativity as well as sex differences where creativity was tested.

Music is one of the creative arts and the subject of creativity was the focus of a study by Noppe (1984). In particular, this research investigated the relationship among aspects of cognitive style, formal thought, and creativity. A battery of tests was used to gather data on these various elements. The tests included: the Jackson, Messick, and Myers Hidden Figures Test, Golden's Stroup Color Word Test, the Formal Thought Assessment Scales by Noppe and Noppe, Merrifield and Guidford's Match Problems V, the Letter Sets test by Ekstom, and Gatzel and Jackson's the Uncommon Uses Test. The research findings indicated a strong positive relationship between some of the variables in the cognitive styles tests and those scores associated with creativity. In particular, Noppe identifies the constructions of field-dependence/independence along with formal thought as being "reasonably effective predictors of creative ability" (p. 94).

Matson (1978) also looked at the field-dependence/independence spectrum in an attempt to determine what role this dimension plays in children's responses to musical tasks. Data were collected on 48 students in kindergarten through 3rd-grade. The research employed the Children's Embedded Figures Tests and The Zimmerman Test of Musical Conservation. Findings indicated that field-independent children are better able to perform the music conservation tasks than are their field-dependent classmates.

Zalanowski (1986) conducted research on the effects of listening instructions and cognitive style on music appreciation. This project tested 60 students using the Torrance, Your Style of Learning and Thinking to determine hemispheric preference and thinking style. She found that cognitive style did interact with instructions. Mental imagery was more beneficial for right hemisphere subjects and analytical programs were of greater use to the left hemisphere subjects.

In the final research effort to be surveyed Moore (1986) studied the relationship between music composition and learning style. Moore developed a research model that

viewed music composition as having a two-fold nature comprising both intuitive and rational musical abilities. He compared this duality with the four learning styles of the Gregorc model. This model, previously reviewed, characterizes learners as being concrete-sequential, concrete-random, abstract-sequential and abstract random. Sixty-four high school students in grades 11 and 12 participated in the study. Significant relationships were found between intuitive musical ability and abstract-random learning style (a negative correlation); and there was a positive correlation between intuitive musical ability and rational musical ability.

Summary

A considerable body of research and opinion has grown up around the concept of learning style. Research efforts have investigated the environmental aspects of learning style and have studied the effects of auditory background, levels of illumination, temperature, and design. Emotional and sociological factors have also been identified as learning style characteristics with work being undertaken on preferences for structure and instructional groupings. Perceptual modality preferences, intake requirements, body rhythms, and mobility have all been researched in attempts to gain insight into the physical aspects of learning style. Finally, cerebral dominance and cognitive style have attracted a great deal of attention in research directed toward an understanding of the psychological nature of learning style.

The learning style research that relates to music has been largely concerned with field-dependence/independence or cognitive style. Relationships have been investigated regarding cognitive style and musical talent, auditory processes, creativity, musical conservation, and music appreciation. Music is only one of the fields of study that has shown an interest in learning style. This review of literature has drawn from areas as diverse as Reading, Mathematics, English, Inservice Education, Biology, and Nutrition. As a result of this broad range of interest in learning style, a wide variety of tests have been

developed to measure various aspects of the concept. Learning style research might be characterized as "eclectic in the extreme."

The task in the following chapter will be to narrow that field and bring into focus one fundamental question regarding learning style and music.

CHAPTER THREE

PROCEDURES

The procedures that will be detailed in this chapter are designed to focus on a specific question regarding learning style. That question concerns the relative stability of an individual's learning style profile when moving from a general or non-musical learning situation into an active musical learning environment. Will this individual's approach be substantially the same or will inconsistencies become evident? If significant differences do emerge, the data should provide information as to those areas of learning style that are unstable. Statistical procedures will necessitate the analysis of data from groups of subjects, however, the reader is reminded that the motivation for this research comes from a concern for the individual. Therefore, additional analysis will be undertaken to look for areas of practical significance that may be of importance in delivering instruction on an individualized basis.

Description of Subjects

In order to obtain valid data on the question of congruity between musical and non-musical learning styles, one must identify a pool of individuals who are able to provide the specific information required. The subjects in this research project have been asked to reflect on their experience in learning both musical and non-musical material. Obviously these subjects need to have recent experience in both categories of learning. With regard to musical learning, the perspective or "mind set" that was required focused on active music making. Therefore, to make reliable judgements, the subjects had to have recent experience in the more practical areas of musical learning. With these concerns in mind, the ideal subject was an individual who is currently engaged in a broad range of studies that includes a practical music area.

Within the student body at the Ballarat College of Advanced Education (Australia) there were several groups that met the above requirements. The undergraduate primary education majors at the college are generalist trained and consequently do a wide cross-

section of non-musical studies. A significant number of these primary education students also have a background in music and choose to pursue a major elective in that area. As a result, their program of studies provides the requisite balance of practical music and general education.

A second group of students that are both generalist and musically trained are those enrolled in the Post-Graduate Diploma in Music Education. These individuals are mature-age students (ranging in age from 23 to 42 years) and hold an existing teaching qualification in Primary Education. They have studied the broad range of general education subjects and are currently involved in an intense program of musical studies. The nature of their program is practically oriented and this, combined with their previous general education experience, would make them good subjects in the context of this research project.

The Ballarat College of Advanced Education also offers elective music courses of a practical nature to students from several other disciplines. These disciplines include Humanities, Visual Arts, Performing Arts (Theatre), and Librarianship. Such students would have that balance of musical and general studies to make them appropriate subjects for this research effort.

It was decided to approach the abovementioned student groups in a call for research subjects with a minimum of 50 volunteer subjects being sought. Announcements were made in all graduate and undergraduate classes where a written letter was distributed that provided information to prospective participants (see Appendix A). Students were advised that they would be asked to take a test entitled the Productivity Environmental Profile Survey. In addition, they were informed that this survey is designed to gauge learning style preference and would be administered on two occasions. The musical and non-musical perspectives were explained, time requirements indicated, and assurances of confidentiality were provided. A detachable form was included that allowed individuals to indicate their willingness to participate.

A follow-up visit was made to the various class groups and 67 prospective subjects indicated a willingness to participate in the research. Times were then organized for the testing procedure with the Productivity Environmental Profile Survey being administered to a total of 61 subjects. A break-down of those subjects who underwent the test procedure is as follows:

- 28 undergraduate Primary Education majors
- 12 Graduate Diploma students
- 3 Performing Arts students
- 7 Visual Arts students
- 5 Librarianship students
- 6 Humanities students

Subjects ranged in age from 17 to 42 years old with 43 being female and 18 male. All subjects had previous musical experience ranging from less than a year to more than 20 years of playing. Twenty-nine of the prospective subjects had achieved formal qualification in instrumental or vocal studies through the Australian Music Examinations Board.

The Research Instrument

The Dunn, Dunn and Price Productivity Environmental Profile Survey (PEPS) was chosen as the data gathering instrument for this research project. The PEPS is a survey tool designed for use with adults and contains 100 statements with a response option consisting of a five-point Likert scale ranging from strongly disagree to strongly agree. All statements and response options are contained on a double-sided page that is designed for machine scoring. Subjects use a soft pencil to mark the appropriate point in the scale for each statement. Scoring is done by Price Systems of Lawrence, Kansas with individual and group profiles being provided. Individual profiles report information on each subject's raw scores, standard scores (mean of 50 and standard deviation of 10), and provide a plot for each score in twenty learning style areas (see Appendix B). The group profile, or

summary, identifies those subjects who have a standard score of 60 or more in any area. A standard score of such magnitude would indicate an area of particular importance to that individual. Standard scores of 40 or below are also reported in the group summary as being of little importance to the individual.

The 20 learning style dimensions that make up the PEPS are based on four broad categories drawn from the Dunn, Dunn and Price model (previously described in chapters 1 and 2). Environmental, emotional, sociological, and physical elements are considered along with recommendations for instructional strategies. Those elements and recommendations are listed below.

1. **Noise Level** - Subjects with a standard score of 60 or more would profit from soft music, conversation, and an open environment. Subjects with a standard score of 40 or less will prefer silence.
2. **Light** - Subjects with a standard score of 60 or more will prefer bright light in the learning environment. Individuals who score 40 or less will function best in subdued or diffused light.
3. **Temperature** - A standard score of 60 or more will indicate a need for warmth in the environment whereas a score of 40 or less could necessitate cooler areas for learning.
4. **Formal Design** - Subjects with a standard score of 60 or more prefer a formal climate with rows of desks, straight chairs, simple designs, and direct lighting. Those individuals scoring 40 or less are inclined toward a more informal approach to the learning environment.
5. **Motivated/Unmotivated** - Self-designed and paced instruction would be appreciated by subjects scoring 60 or more on this dimension. Those scoring 40 or less may need short-range motivators, uncomplicated assignments, and frequent monitoring by the instructor.

6. **Persistent** - With individuals scoring 60 or more, one might provide long-term assignments with supervision only when required. For a score of 40 or less, one could give short-term assignments, check progress frequently, employ a mentor, and have short-range motivators.
7. **Responsible** - With scores of 60 or more, it is recommended that the teacher gradually increase the length and scope of assignments and challenge the individual to excel. For an individual scoring 40 or less, the instructor should give limited assignments with few options and provide interim praise or rewards.
8. **Structure** - For individuals scoring 60 or better, the teacher should be explicit about all aspects of the learning task and only gradually introduce choices. On the other hand, a person with a score of 40 or less would profit from a choice of resources, creative options, and opportunities for growth.
9. **Learning Alone/Peer Oriented** - A score of 60 or more would identify those individuals who are team oriented. The score of 40 or less will identify people who prefer self-pacing, self-designed objectives and individual effort.
Those people with the score of 60 or more prefer working with colleagues and seek group interactions in the learning environment. With a score of 40 or less there is a trend toward isolated achievement.
10. **Authority Figures Present** - The upper level of 60 or more would indicate the need for frequent supervision on the part of an instructor. However, a level of 40 or less may foreshadow an individual with independence of character.
11. **Several Ways** - For a score of 60 or more, provide a variety of learning approaches but with a score of 40 or less permit options on the basis of self-choice.
12. **Auditory Preferences** - With an individual scoring 60 or more one could employ audio and video tapes, records, and precise verbal instructions. Subjects on 40 or less will be inclined toward some other perceptual preference.

13. Visual Preference - Use pictures, film graphs, drawings, books, and computers with individuals having a standard score of 60 or better. If the subject scores 40 or less, look for the other perceptual areas that are strong.
14. Tactile Preferences - Manipulative three-dimensional objects would be appropriate for use with individuals having a standard score of 60 or more. If a score of 40 or less is achieved, look for some other perceptual area of strength.
15. Kinesthetic Preferences - Opportunity for active experience would be beneficial for individuals who are strong in this area. If a standard score of 40 or less is evidenced, investigate other perceptual areas for strengths.
16. Requires Intake - For individuals with a score of 60 or more, provide opportunities for eating and drinking while learning. Those with a standard score of 40 or less will require no special provisions.
17. Evening/Morning - Persons with a standard score of 60 or more have indicated the morning as the strongest part of their time/energy curve. A standard score of 40 or less points to the evening as the optimum time for learning.
18. Late Morning - A standard score of 60 or more would designate this time of day as being within the strongest segment of the individuals' time/energy curve.
19. Afternoon - The standard score of 60 or more on this dimension would identify this part of the day as being optimum for learning.
20. Needs Mobility - A standard score of 60 or more in this area indicates the need to move to different locations while learning. A standard score of 40 or less would suggest the use of a stationary learning position that does not require a great deal of movement.

As can be seen, the Productivity Environmental Preference Survey is an instrument **that** measures a breadth of dimensions. It is this broad-based approach that recommends **the** PEPS for use in this research effort. The investigation being undertaken here is **exploratory** in nature and it is consistent with this strategy to cast as wide a net as is

reasonably possible. The findings that result may then set the stage for more specific research in the future.

The Productivity Environmental Preference Survey is a widely-used instrument with satisfactory reliability figures. The most recent Hoyt reliability coefficients on the PEPS subscales (February 1986) are:

Area		PEPS with an N= 1722	
1.	Sound	.86	Area 1 is called Noise Level in the current form of the survey.
2.	Light	.86	
3.	Warmth	.86	Area 3 is called Temperature in the current form of the survey.
4.	Formal Design	.74	
5.	Motivated/Unmotivated	.70	
6.	Persistent	.67	
7.	Responsible	.75	
8.	Structure	.69	
9.	Learning Alone	.85	Areas 9 and 10 have been restructured in the current form of the survey (see page 41).
10.	Peer-Oriented Learner/ Authority-Oriented Learner	.51	
11.	Several Ways	.16	Area 11 is a highly unstable item.
12.	Auditory Preferences	.78	
13.	Visual Preferences	.79	
14.	Tactile Preferences	.59	
15.	Kinesthetic Preferences	.76	
16.	Requires Intake	.81	
17.	Evening/Morning	.86	
18.	Late Morning	.81	

- | | | |
|-----|----------------|-----|
| 19. | Afternoon | .84 |
| 20. | Needs Mobility | .82 |

Curry (1987) produced an independent analysis regarding the psychometric standards of 22 widely-used learning/cognitive style tests. Only five of these instruments were reported as having good to strong psychometric standards and the PEPS was one of them. It was considered to have demonstrated good evidence on both reliability and validity (p.24). Therefore, the researcher believes that the PEPS is an appropriate broadly-based data gathering tool for the purpose of this project.

Finally, it should be noted that the PEPS instrument does not generate any data on those areas in the psychological domain. The elements of the Dunn and Dunn model, (Figure 1), relating to Analytic/Global, Cerebral Preference, and Reflective/Impulsive are not surveyed in this research. Nevertheless, Price (1982) does report on research that might indicate a relationship between the cognitive style dimension of field dependence/independence and the PEPS areas of design, mobility, responsibility, peer orientation, and learning alone. In addition, Price presents research evidence that seems to suggest a relationship between cerebral dominance and the PEPS area of learning with peers.

Procedures

The Productivity Environment Preference Survey was administered to groups of subjects drawn from the undergraduate and graduate music classes at the Ballarat College of Advanced Education (Australia). These students were seen as appropriate subjects for this research and had voluntarily agreed to participate in the project. The PEPS instrument was given on a test-retest basis. All subjects were tested twice. On one occasion they were asked to respond from a non-musical (or general) perspective and on another occasion their responses were from an exclusively musical "mind set". The test-retest format was rotated so that about half the subjects responded from a non-musical perspective on their first sitting and from a musical perspective on the retest. The remaining subjects were tested in

the reverse order. This procedure was being adopted to control for the effect of any learning that may have resulted from the initial test sitting.

When the subjects were asked to respond from a musical perspective or "mind-set," the following instructions were given:

You are going to be asked to decide to what extent you would agree or disagree with a statement if you had something new or difficult to learn. On this sitting please restrict your thinking to musical learning. Make your responses only in regard to your experience in active music making. Examples of active music making would include practicing, rehearsing, improvising, or composing on an instrument. Consider only those activities where you are producing actual musical sound. Learning activities that are verbal, even if music is the topic of discussion, are excluded from this study.

Subjects were given these instructions both orally and in written form. They kept the written directions at their desks while taking the survey. This allowed them to refer to the mind-set instructions at any time. The mind-set instructions were read out loud by the test administrator at the start of a test period. The first three sentences of instruction were repeated at 15 minute intervals during the survey. In order to make sense in this context, the first sentence began, "You are being asked to decide....."

When the subjects were asked to respond from a general or non-musical perspective, the following mind-set instructions were given:

You are going to be asked to decide to what extent you would agree or disagree with a statement if you had something new or difficult to learn. On this sitting please exclude from your consideration any active music making activities. Base your responses only on those general learning tasks where musical sound is not being produced.

As previously outlined, these mind-set instructions were given to the subjects in written form and announced orally at the beginning of the test period and at 15 minute

intervals during the survey. To preserve contextual sense, the word being was substituted for the words "going to be" on those repeats.

The Testing Regimen

Keeping the above information in mind, the procedural steps for administering either sitting of the survey were:

1. Have subjects seated at an appropriate writing surface with a soft lead pencil and an eraser.
2. Give out the survey and have subjects fill in only their major or occupation, birthdate, sex, and the special code (01 - when the non-musical mind-set is being used, 10 - when the musical mind-set is to be employed).
3. In order to protect the anonymity of subjects, a personal identification number will be used instead of a name. Subjects will be instructed as follows:
 - 3.1 Do not fill in the area of the form where your name is required.
 - 3.2 Instead of using your name, you are going to be provided with an identification number.
 - 3.3 A booklet of numbered tickets will be passed around the group and each person will remove one ticket from any part of the booklet.
 - 3.4 The number on that ticket will be your personal identification number and you will write that number in the place on the survey labelled identification number.
 - 3.5 Keep this numbered ticket in a safe place as it is the only way that your personal profile can be returned to you. Use this personal identification number also on the supplementary information form.
 - 3.6 Under no circumstances should you place your name on any of the forms associated with this research.
4. Give out and have subjects complete the "supplementary information form" (see Appendix C).

5. Collect the supplementary information forms.
 6. Have subjects read the published survey directions.
 7. Give out the written "mind-set" instructions that are appropriate to the particular test sitting and have the test administrator read them aloud while subjects follow the written page.
 8. Test administrator should ask for and answer any questions.
 9. Test administrator and subjects should reread the "mind-set" instructions.
 10. Proceed with the survey.
 11. Verbally remind the subjects of the particular "mind-set" orientation for this sitting at 15 minute intervals.
 12. Collect survey materials from each subject as they finish.
- Repeat the above twelve procedural steps in the retest sitting but with alternate "mind-set" instructions.

After testing all the subject groups, the completed answer sheets were sent to Price Systems Inc., Lawrence, Kansas, for scoring.

Data Analysis

Price Systems reports the results of the survey in three forms (a) an individual profile for each subject, (b) a group summary and, (c) an area summary. For the purpose of this research project, only the information contained on the individual profiles was used. These individual profiles supply the subject's identification number, sex, date of birth (year and month only), group identification (Australia), and any special codes. Data are summarized in the form of a raw score for each area in the survey, a standard score for each area, and a graph showing the relative location of each individual's standard score in each area. The standard score is calculated on the scores of all adults who have taken the PEPS and is reported with a mean of 50 and a standard deviation of 10.

Using the raw score data, the following pair of null-hypotheses will be tested:

1. There will be no significant differences in the mean scores of the subject groups when comparing their responses to the PEPS instrument under the two mind-set conditions.
2. There will be no significant difference in the mean scores of the subject groups on any of the 20 area subscores of the PEPS instrument when comparing their responses under the two mind-set conditions.

The statistical tool employed in the analysis of the raw score data was Hotelling's T^2 . Tabachnick and Fidell (1983) describe this statistic as follows:

When the independent variable consists of only two groups, Hotelling's T^2 can be used to discover whether the groups differ on a set of dependent variables.....Since these dependent measures involve multiple testing and might be intercorrelated as well, it would not be legitimate to test each of them using separate t tests. Instead, Hotelling's T^2 is available to test the hypothesis that groups differ on the composite set of measures (p.56).

Harris (1985) also discusses Hotelling's T^2 in the context of multivariate statistics and indicates that the T^2 value and its sampling distribution is the same shape as that of the F distributions. Therefore the T^2 can be employed to test the null hypothesis of identical profiles in the two sample populations (p.17).

If the Hotelling's T^2 procedure were to show that the set of mean scores is significantly different beyond the .05 level, the next step would be to look at the ranges and differences associated with the separate areas in the PEPS instrument. Once again a .05 level of confidence would be set as the criterion for rejecting the null hypothesis in regard to any of the 20 areas that may be partly responsible for an overall significant difference.

Another level of analysis was undertaken to refocus on the individuals who have participated in the research. The point has been stressed earlier that the principal motivation for the investigation has come from a concern to provide the best fit between student and instruction. Learning style information should, therefore, contribute to the

individualization of instruction. Assessment through statistical means (where individual scores are aggregated) may not be entirely satisfactory.

R.W. Witkin (1974) points out this problem when he writes,
 Assessment itself implies a summation, a stock-taking operation.....The individual's behaviour is transmuted into a scale of value in which all its particularity is deliberately lost.....The individual is given a place relative to others in a structure (p.51-52).

In an attempt to get back to individual particularities, a close examination was made of each subject's two profiles (one each under the musical and non-musical "mind-sets"). The 20 subscores from the non-musical responses were subtracted from the corresponding musical responses and those differences were expressed as units of standard deviation. Where an individual's subscore on a given dimension differed by plus or minus one standard deviation, it might indicate an item of practical significance to the music educator. To the extent that such a difference signifies internal inconsistency when operating in a musical or non-music mode, the teacher may be reluctant to implement individualized instruction in music unless a music-specific survey instrument is employed. If a large number of subjects differ by more than one unit of standard deviation over several areas (even if no single area proves to be statistically significant within the group context), the music educator may want to approach the individual profiles with a modicum of caution.

In light of the above discussion it was decided that the data on all subjects would be scanned, those areas where a difference of plus or minus one standard deviation was evident would be tabulated, and such information would be shared with the reader. On the basis of that information, the practitioner might be in a better position to make judgements.

In summary, the PEPS instrument was administered to groups of subjects who had experience in both music and general education. These subjects were tested twice, once from a musical perspective and once from a non-musical or general point of view. The

survey results were compared to see if there were any statistically significant differences between the responses in the musical mind-set as opposed to the non-musical perspective. The possibility of some practical significance emerging from a look at the differences in the individual's profiles was also explored.

The results of these procedures are detailed in Chapter Four.

CHAPTER FOUR

RESULTS

Upon completion of the scoring process, Price Systems provided the survey data in the form of 122 individual profiles. These consisted of 61 reports on the musical mind-set condition and an additional 61 returns from the non-musical perspective. The information contained in the 20 subscores on each profile was analyzed through the computing services at the Ballarat College of Advanced Education. Statistical procedures were carried out on the College's Hewlett Packard 3000/950 system using programs devised by Minitab, Inc. (1986). The results of these analyses are detailed below.

Hypothesis Testing

Hypothesis number one stated that:

There will be no significant difference in the mean scores of the subject groups when comparing their responses to the PEPS instrument under the music versus the non-music mind-set conditions.

Using the Hotelling's T^2 multivariate test for repeated measures, an F value of 7.902 was calculated. A value of this magnitude, with 20 and 41 degrees of freedom, indicates that the difference in mean scores between the two test sittings is greater than that which could be expected by chance. This difference is significant beyond the .01 level.

Such a significant finding suggests a considerable amount of individual variability when the subjects moved from a musical to a non-musical mind-set. This result would allow for the rejection of the null hypothesis, as stated in number one, and the acceptance of the alternative position that a real difference in learning style does exist when individuals are dealing with musical as opposed to non-musical material.

A second stage of analysis was then undertaken to assess whether any of the 20 separate areas contained within the survey contributed significantly to the overall result. The second hypothesis explored this possibility by postulating that:

There will be no significant difference in the mean scores of the subject groups on any of the 20 area subscores of the PEPS instrument when comparing their responses under the music versus the non-music mind-set conditions.

In analyzing the data from the 20 subscores under the two mind-set conditions, the mean difference was calculated by subtracting the non-musical from the musical data. With this calculation, any area that was more important in a musical leaning context appears as a positive value whereas those areas of greater importance in a non-musical setting are reflected in the negative. Using a t confidence interval with 60 degrees of freedom, these mean differences were evaluated and seven areas emerged as significantly different from zero beyond the .05 level. The areas that proved significant in the direction of musical learning style included: Area 9-Learning Alone/Peer Oriented, Area 10-Authority Figures Present, Area 12-Auditory Preferences, and Area 17-Evening/Morning. Three additional areas were significantly different in the direction of a non-musical learning style, they were: Area 13-Visual Preference, Area 16-Intake, and Area 20-Mobility.

Statistical Information for Each Area

The statistical information on each of the areas is reported below. The terms used to outline this data are as follows:

Mean - The arithmetic average of the raw scores in each area.

Median - The mid point in the range of scores in each area.

Standard Deviation - A standard measurement of the variation of the raw scores around the mean.

Skewness - A measure of the extent to which this distribution of raw scores differs from a normal distribution. To be skewed a distribution must have a greater number of cases clustered toward one end or the other of that distribution. If a

cluster of cases is centered around scores of a higher value, the distribution is positively skewed. If that cluster of cases is centered around scores of a lower value, the distribution is negatively skewed. A skewness coefficient of zero indicates a perfect normal distribution. Positive values indicate a positive skew, negative values indicate a negative skew, and the higher the coefficient the greater the skewness in either direction.

Range - The difference between the largest raw score and the smallest raw score.

Confidence Interval: Upper and Lower Bound - The area between which one can say with 95% certainty that the real difference would lie. If a difference of zero is included within the boundaries of a given confidence interval, it means there is the possibility that no real difference exists. In such cases it is not possible to assert with 95% confidence that there is a significant difference. Where the confidence interval does not include zero within its boundaries, one can assert with 95% certainty that a real non-zero difference does exist and falls somewhere within those boundary limits.

Mean Difference - The difference in raw score means between the two test sittings. In the current research one test sitting was done from a musical perspective and the other from a non-musical perspective.

t Statistic - A number formulated by dividing the sample mean difference minus the population mean difference by the standard error of the differences. The resultant value is compared to a *t* table and, in the current research project, plus or minus 2.00 is required to achieve significance.

A dot plot is included in every area to provide a graphic display of each subject's position in terms of raw score. In the PEPS instrument, the various areas are sampled with differing numbers of test items. This means that the possible total raw score can differ

from one area to another and the raw score range can vary from area to area. Therefore, raw score comparisons can be made within a given area but not across different areas. In the figures that follow, the dot plots are intended to facilitate those comparisons between the musical and non-musical test sittings within each separate area.

Area 1 Noise Level

Non-Musical Perspective

Mean	14.20	Median	14.00	Standard Deviation	4.40
Skewness	-.16	Range	18.00		

Musical Perspective

Mean	14.36	Median	15.00	Standard Deviation	3.99
Skewness	.05	Range	17.00		

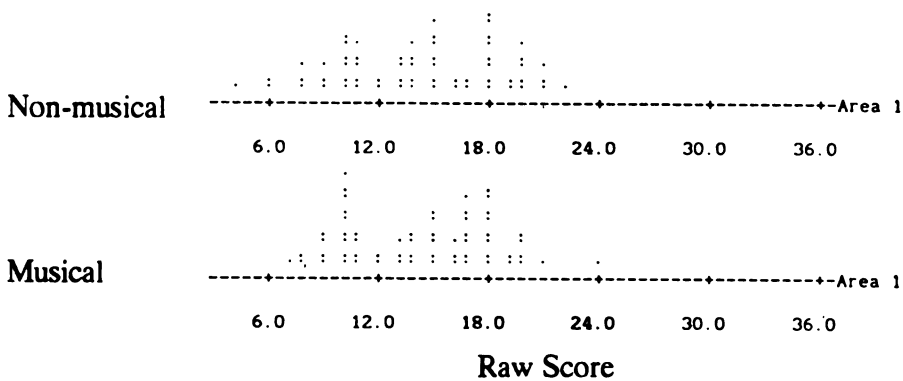


Figure 2. Distribution of Individuals, (Noise Level)

Confidence Interval; Upper Bound 1.10, Lower Bound -0.78

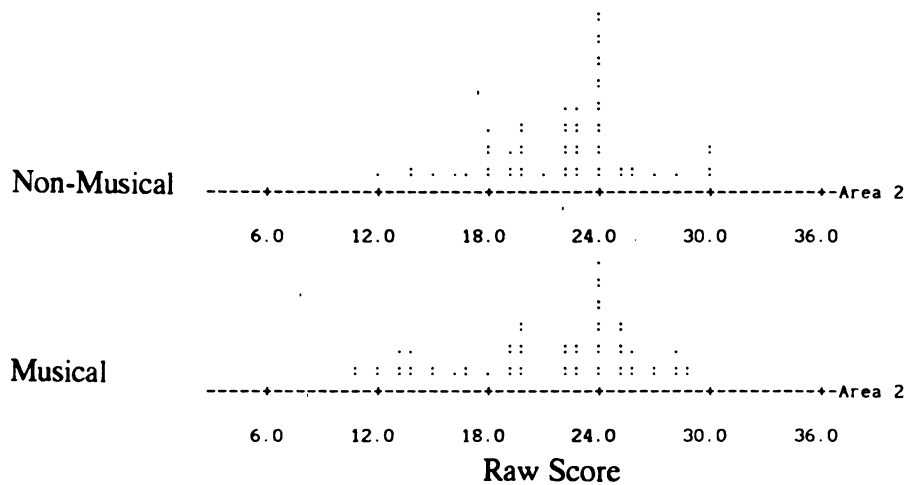
Mean Difference 0.16, $t = 0.35$ (not significantly different from zero)

Area 2 LightNon-Musical Perspective

Mean	22.16	Median	23.00	Standard Deviation	3.89
Skewness	-.26	Range	18.00		

Musical Perspective

Mean	21.13	Median	23.00	Standard Deviation	4.99
Skewness	-.52	Range	18.00		

**Figure 3.** Distribution of Individuals, (Light)

Confidence Interval; Upper Bound 0.02, Lower Bound -2.08

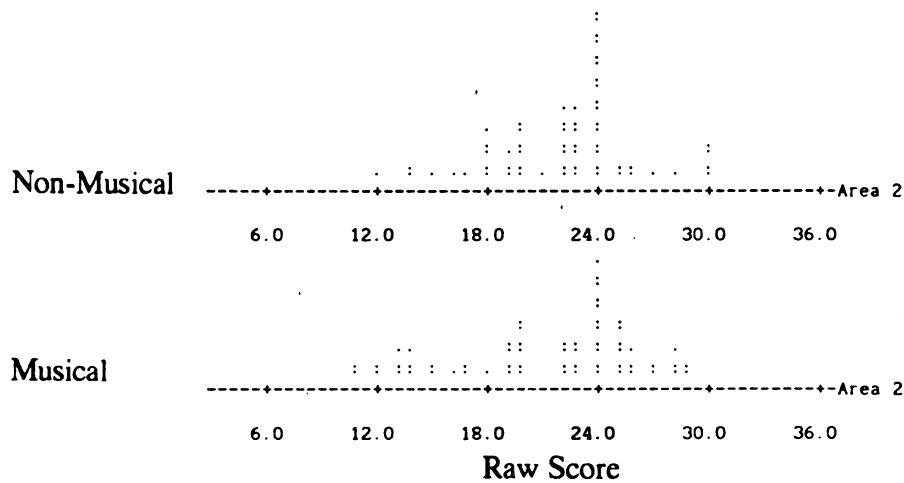
Mean Difference -1.03, $t = 1.96$ (not significantly different from zero)

Area 2 LightNon-Musical Perspective

Mean	22.16	Median	23.00	Standard Deviation	3.89
Skewness	-.26	Range	18.00		

Musical Perspective

Mean	21.13	Median	23.00	Standard Deviation	4.99
Skewness	-.52	Range	18.00		

**Figure 3.** Distribution of Individuals, (Light)

Confidence Interval; Upper Bound 0.02, Lower Bound -2.08

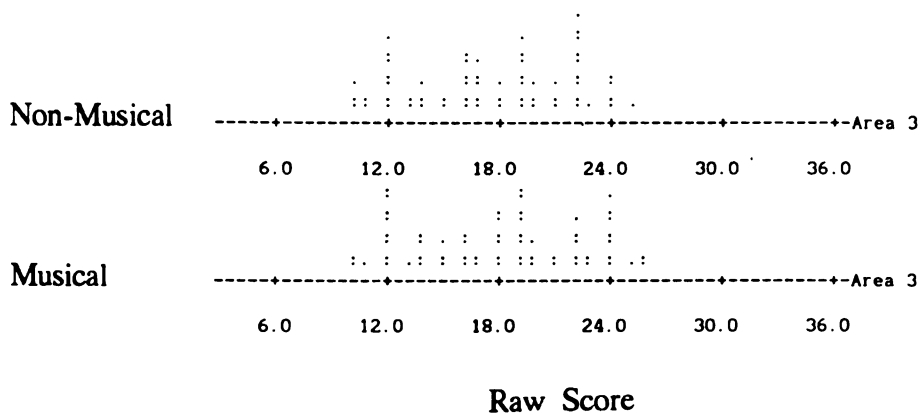
Mean Difference -1.03, $t = 1.96$ (not significantly different from zero)

Area 3 TemperatureNon-Musical Perspective

Mean	17.49	Median	18.00	Standard Deviation	4.24
Skewness	-.14	Range	15.00		

Musical Perspective

Mean	18.07	Median	18.00	Standard Deviation	4.46
Skewness	-.06	Range	16.00		

Figure 4. Distribution of Individuals, (Temperature)

Confidence Interval; Upper Bound 1.43, Lower Bound -0.29

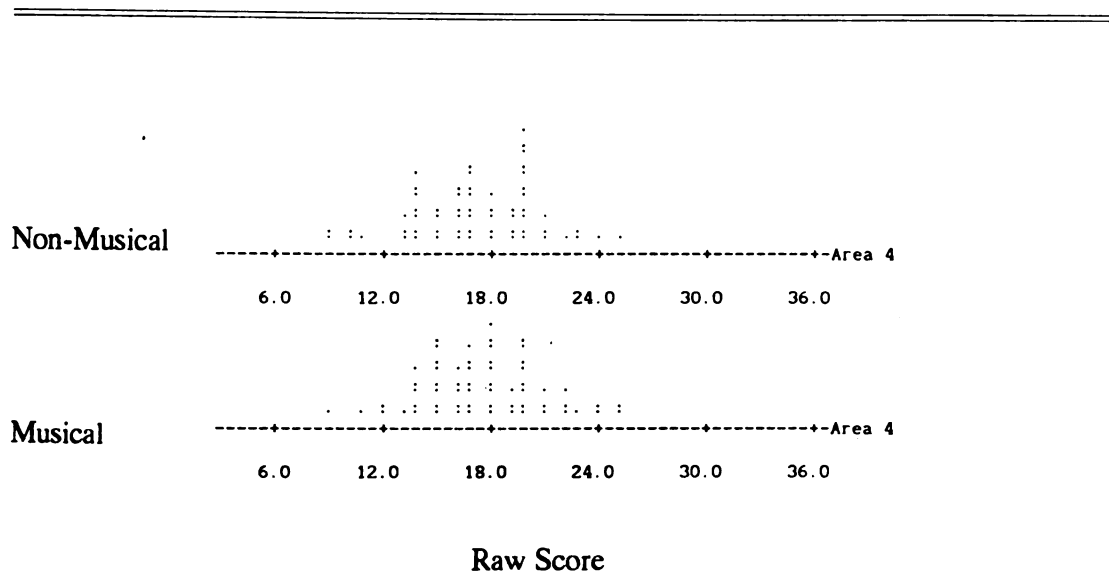
Mean Difference 0.58, $t = 1.33$ (not significantly different from zero)

Area 4 Formal DesignNon-Musical Perspective

Mean	17.11	Median	17.00	Standard Deviation	3.59
Skewness	-.25	Range	16.00		

Musical Perspective

Mean	17.62	Median	18.00	Standard Deviation	3.42
Skewness	.07	Range	16.00		

Figure 5. Distribution of Individuals, (Formal Design)

Confidence Interval; Upper Bound 1.20, Lower Bound - 0.19

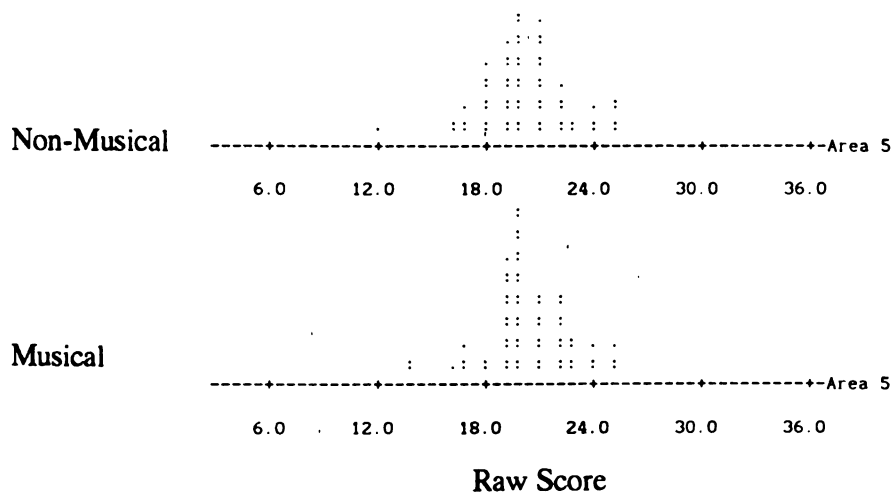
Mean Difference 0.51, $t = 1.46$ (not significantly different from zero)

Area 5 Motivated/UnmotivatedNon-Musical Perspective

Mean	20.18	Median	20.00	Standard Deviation	2.43
Skewness	-.22	Range	13.00		

Musical Perspective

Mean	20.38	Median	20.00	Standard Deviation	2.32
Skewness	-.31	Range	11.00		

Figure 6. Distribution of Individuals, (Motivated/Unmotivated)

Confidence Interval; Upper Bound 0.73, Lower Bound - 0.33

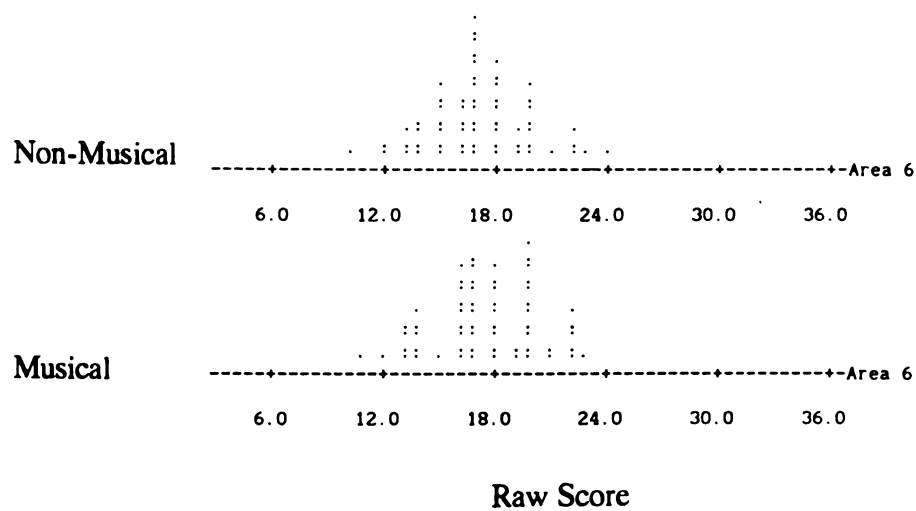
Mean Difference 0.20, $t = 0.74$ (not significantly different from zero)

Area 6 PersistentNon-Musical Perspective

Mean	17.11	Median	17.00	Standard Deviation	2.82
Skewness	.08	Range	14.00		

Musical Perspective

Mean	17.52	Median	17.00	Standard Deviation	2.81
Skewness	-.17	Range	12.00		

Figure 7. Distribution of Individuals, (Persistent)

Confidence Interval; Upper Bound 1.12, Lower Bound -0.30

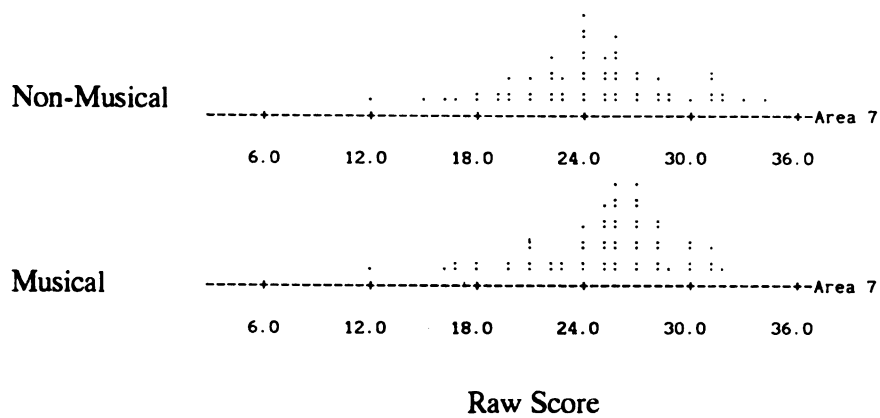
Mean Difference 0.41, $t = 1.16$ (not significantly different from zero)

Area 7 ResponsibleNon-Musical Perspective

Mean	24.49	Median	24.00	Standard Deviation	4.57
Skewness	-.22	Range	22.00		

Musical Perspective

Mean	25.02	Median	26.00	Standard Deviation	4.07
Skewness	-.89	Range	20.00		

**Figure 8.** Distribution of Individuals, (Responsible)

Confidence Interval; Upper Bound 1.58, Lower Bound -0.53

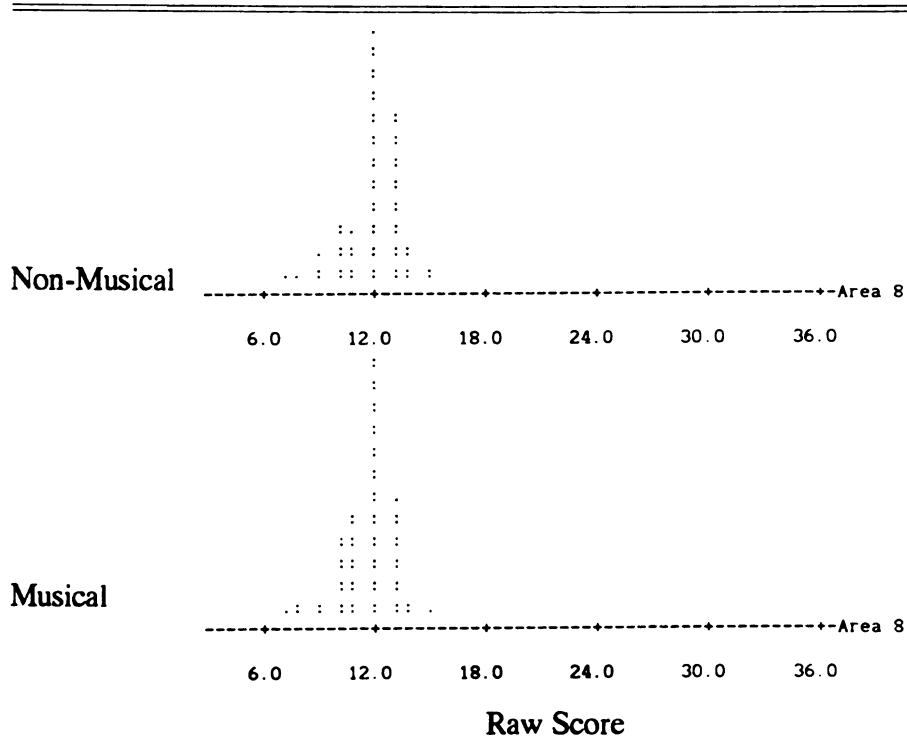
Mean Difference 0.53, $t = 0.99$ (not significantly different from zero)

Area 8 StructureNon-Musical Perspective

Mean	11.92	Median	12.00	Standard Deviation	1.56
Skewness	-.83	Range	8.00		

Musical Perspective

Mean	11.56	Median	12.00	Standard Deviation	1.49
Skewness	-.76	Range	8.00		

Figure 9. Distribution of Individuals, (Structure)

Confidence Interval; Upper Bound 0.14, Lower Bound -0.86

Mean Difference -0.36, $t = -1.44$ (not significantly different from zero)

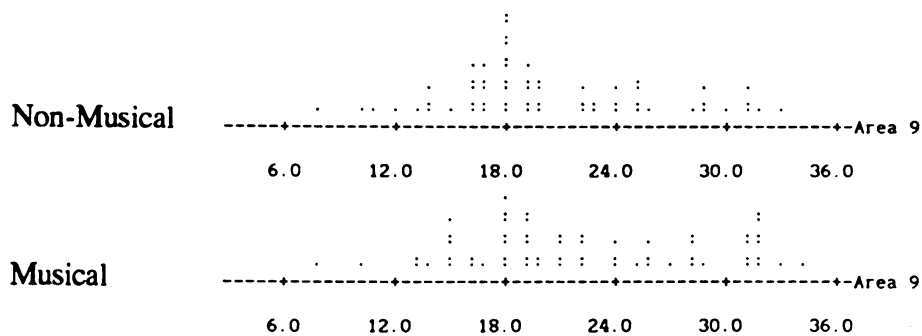
Area 9 Learning Alone/Peer Oriented

Non-Musical Perspective

Mean	20.39	Median	19.00	Standard Deviation	5.81
Skewness	.40	Range	25.00		

Musical Perspective

Mean	22.29	Median	21.00	Standard Deviation	6.53
Skewness	.12	Range	26.00		



Raw Score

Figure 10. Distribution of Individuals, (Learning Alone/Peer Oriented)

Confidence Interval; Upper Bound 3.60, Lower Bound 0.20

Mean Difference 1.90, $t = 2.25$ (This is significantly different from zero
beyond the .05 level)

Area 10 Authority Figures Present

Non-Musical Perspective

Mean	13.56	Median	14.00	Standard Deviation	2.50
Skewness	-.31	Range	11.00		

Musical Perspective

Mean	14.46	Median	14.00	Standard Deviation	2.07
Skewness	-.32	Range	9.00		

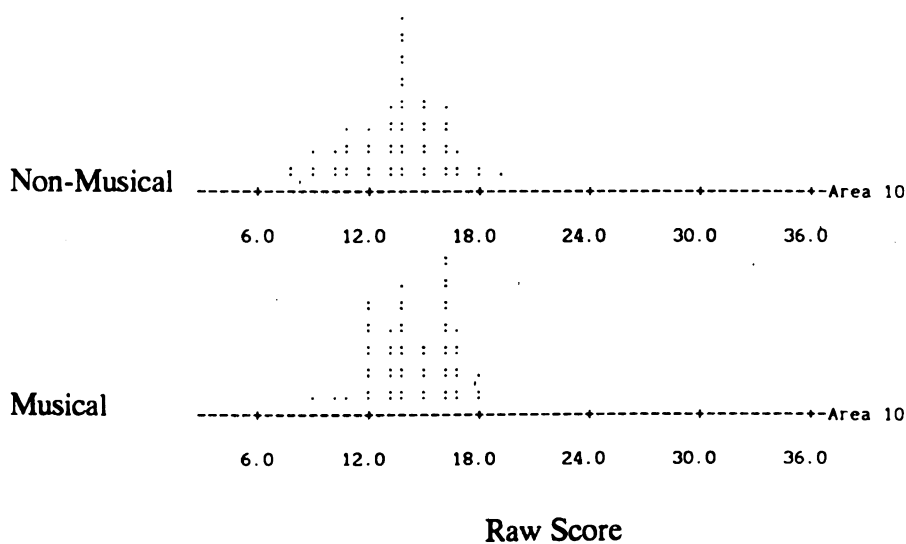


Figure 11. Distribution of Individuals, (Authority Figures Present)

Confidence Interval; Upper Bound 1.55, Lower Bound 0.25

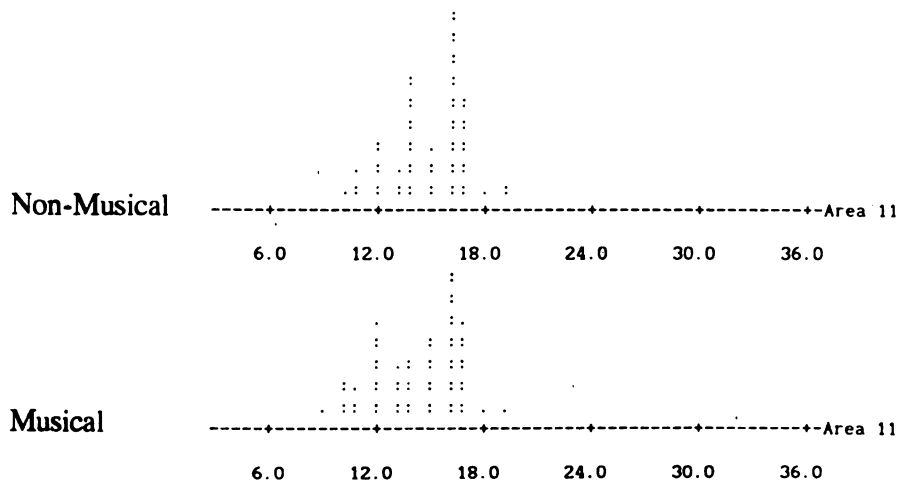
Mean Difference 0.90, $t = 2.77$ (This is significantly different from zero
beyond the .05 level)

Area 11 Several WaysNon-Musical Perspective

Mean	14.93	Median	16.00	Standard Deviation	2.04
Skewness	-.43	Range	9.00		

Musical Perspective

Mean	14.31	Median	15.00	Standard Deviation	2.37
Skewness	-.39	Range	10.00		



Raw Score

Figure 12. Distribution of Individuals, (Several Ways)

Confidence Interval; Upper Bound 0.05, Lower Bound -1.29

Mean Difference -0.62, $t = -1.86$ (not significantly different from zero)

Area 12 Auditory Preferences

Non-Musical Perspective

Mean	12.10	Median	12.00	Standard Deviation	2.75
Skewness	-.28	Range	11.00		

Musical Perspective

Mean	14.28	Median	16.00	Standard Deviation	3.03
Skewness	-.43	Range	12.00		

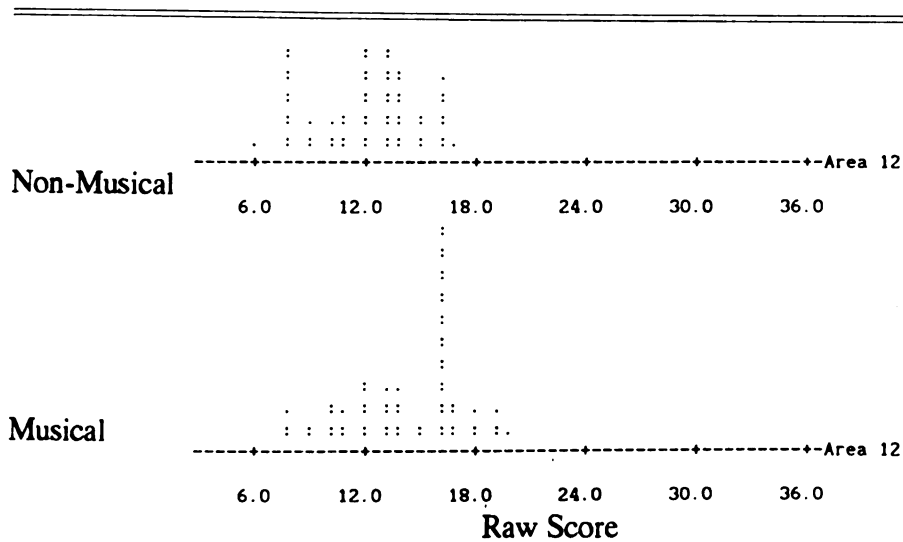


Figure 13. Distribution of Individuals, (Auditory Preference)

Confidence Interval; Upper Bound 3.09, Lower Bound 1.27

Mean Difference 2.18, $t = 4.81$ (This is significantly different from zero
beyond the .05 level)

Area 13 Visual Preferences

Non-Musical Perspective

Mean	19.59	Median	20.00	Standard Deviation	3.11
Skewness	.36	Range	15.00		

Musical Perspective

Mean	16.84	Median	17.00	Standard Deviation	3.48
Skewness	.03	Range	16.00		

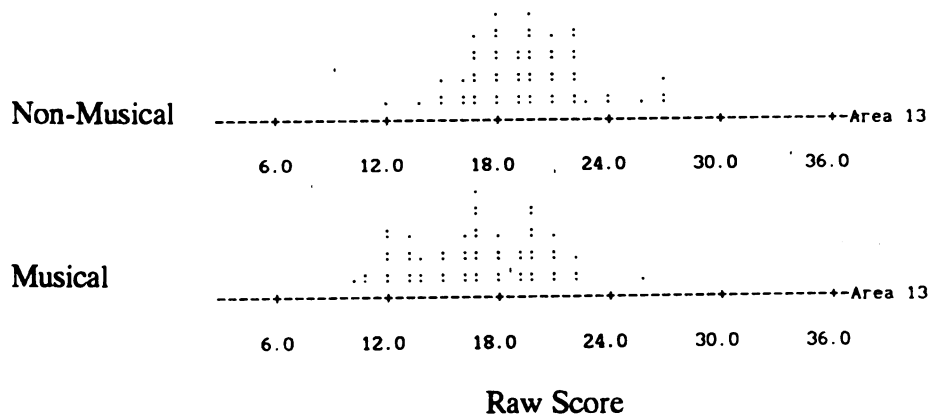


Figure 14. Distribution of Individuals, (Visual Preference)

Confidence Interval; Upper Bound -1.84, Lower Bound -3.66

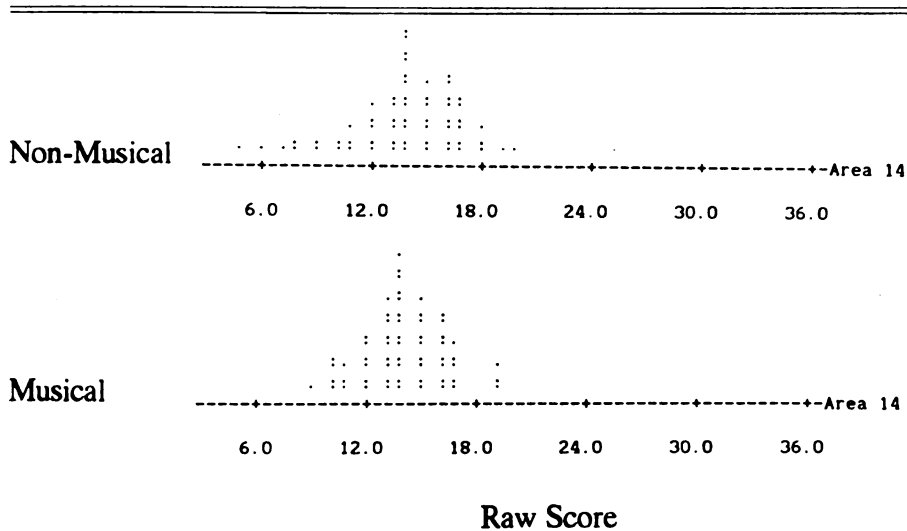
Mean Difference -2.75, $t = -6.05$ (This is significantly different from zero
beyond the .05 level)

Area 14 Tactile PreferencesNon-Musical Perspective

Mean	13.75	Median	14.00	Standard Deviation	3.16
Skewness	-.72	Range	15.00		

Musical Perspective

Mean	14.07	Median	14.00	Standard Deviation	2.27
Skewness	.00	Range	10.00		

Figure 15. Distribution of Individuals, (Tactile Preferences)

Confidence Interval; Upper Bound 0.93, Lower Bound -0.30

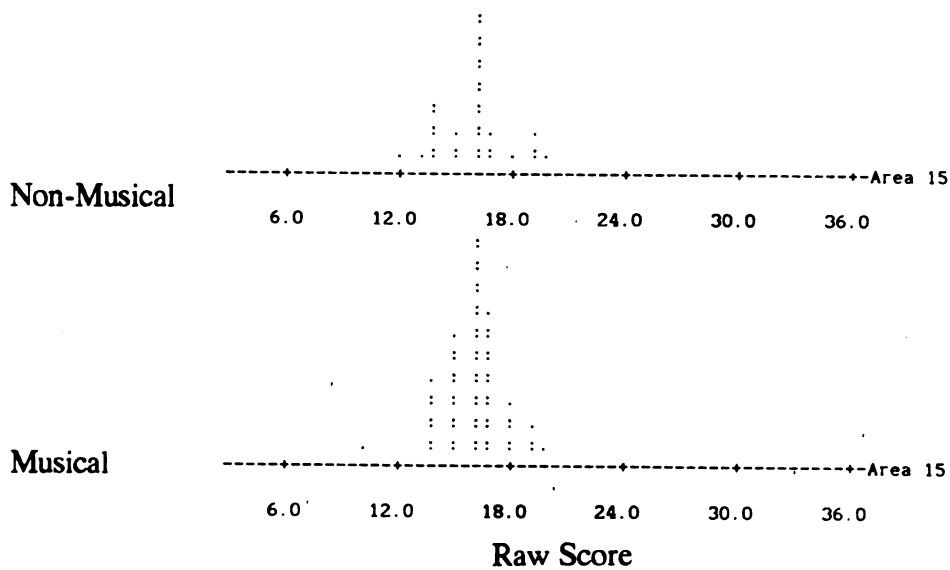
Mean Difference 0.32, $t = 1.01$ (not significantly different from zero)

Area 15 Kinesthetic PreferencesNon-Musical Perspective

Mean	15.82	Median	16.00	Standard Deviation	1.75
Skewness	.32	Range	8.00		

Musical Perspective

Mean	16.08	Median	16.00	Standard Deviation	1.58
Skewness	-.53	Range	10.00		

Figure 16. Distribution of Individuals, (Kinesthetic Preferences)

Confidence Interval; Upper Bound 0.75, Lower Bound -0.23

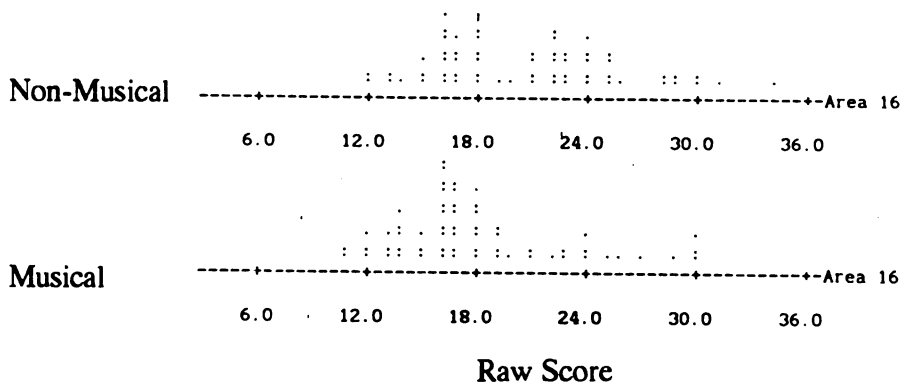
Mean Difference 0.26, $t = 1.08$ (not significantly different from zero)

Area 16 Requires IntakeNon-Musical Perspective

Mean	20.72	Median	21.00	Standard Deviation	5.13
Skewness	.43	Range	22.00		

Musical Perspective

Mean	18.18	Median	17.00	Standard Deviation	4.80
Skewness	.96	Range	19.00		

Figure 17. Distribution of Individuals, (Intake)

Confidence Interval; Upper Bound -1.55, Lower Bound -3.53

Mean Difference -2.54, $t = -5.13$ (This is significantly different from zero beyond the .05 level).

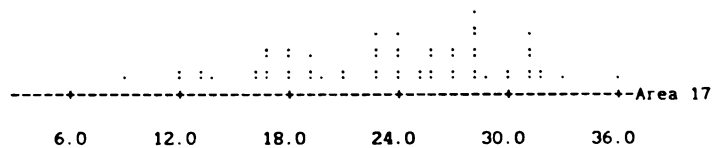
Area 17 Evening/MorningNon-Musical Perspective

Mean	23.51	Median	24.00	Standard Deviation	6.17
Skewness	-.33	Range	27.00		

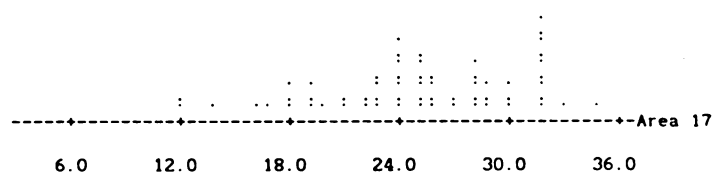
Musical Perspective

Mean	25.07	Median	25.00	Standard Deviation	5.39
Skewness	-.44	Range	23.00		

Non-Musical



Musical



Raw Score

Figure 18. Distribution of Individuals, (Evening/Morning)

Confidence Interval; Upper Bound 2.76, Lower Bound 0.35

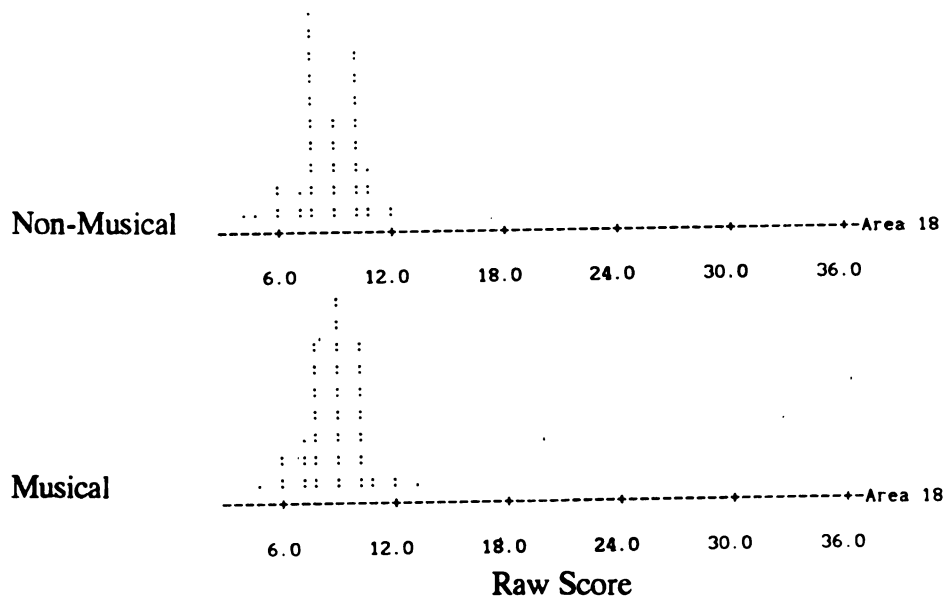
Mean Difference 1.56, $t = 2.59$ (This is significantly different from zero
beyond the .05 level)

Area 18 Late MorningNon-Musical Perspective

Mean	8.77	Median	9.00	Standard Deviation	1.63
Skewness	-.48	Range	8.00		

Musical Perspective

Mean	8.80	Median	9.00	Standard Deviation	1.53
Skewness	.02	Range	8.00		

**Figure 19.** Distribution of Individuals, (Late Morning)

Confidence Interval; Upper Bound 0.50, Lower Bound -0.44

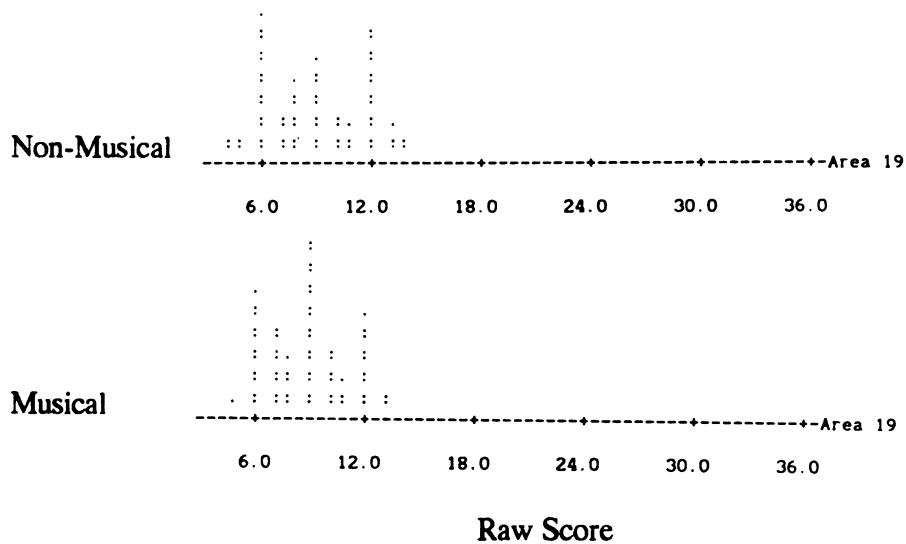
Mean Difference 0.03, $t = 0.14$ (not significantly different from zero)

Area 19 AfternoonNon-Musical Perspective

Mean	8.93	Median	9.00	Standard Deviation	2.72
Skewness	.10	Range	10.00		

Musical Perspective

Mean	8.82	Median	9.00	Standard Deviation	2.16
Skewness	.21	Range	8.00		

**Figure 20.** Distribution of Individuals, (Afternoon)

Confidence Interval; Upper Bound 0.45, Lower Bound -0.68

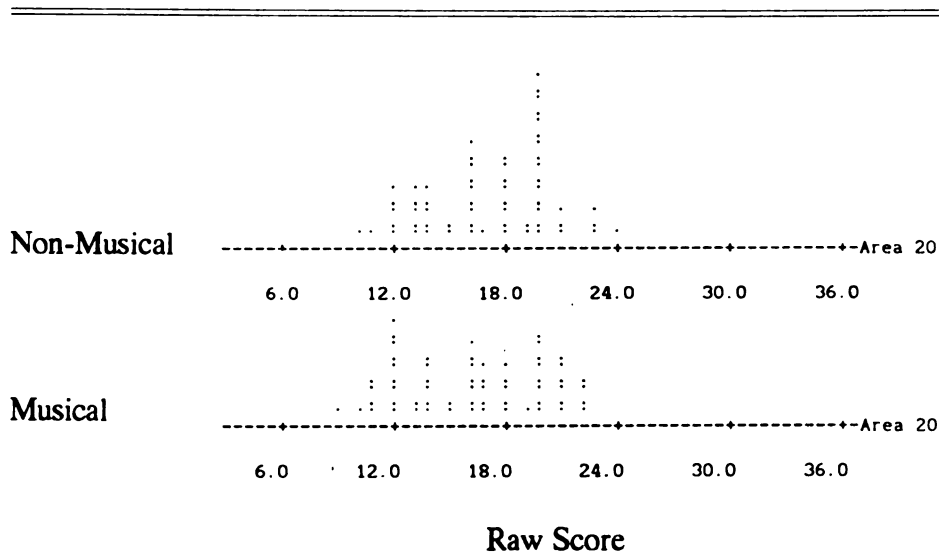
Mean Difference -0.11, $t = -0.41$ (not significantly different from zero)

Area 20 MobilityNon-Musical Perspective

Mean	17.13	Median	18.00	Standard Deviation	3.43
Skewness	-.14	Range	14.00		

Musical Perspective

Mean	16.25	Median	16.00	Standard Deviation	3.71
Skewness	-.05	Range	13.00		

Figure 21. Distribution of Individuals, (Mobility)

Confidence Interval; Upper Bound -0.14, Lower Bound -1.63

Mean Difference -0.88, $t = -2.39$ (This is significantly different from zero
beyond the .05 level)

Discussion

With seven areas (Learning Alone/Peer Oriented, Authority Figure Present, Auditory Preferences, Visual Preference, Intake, Evening/Morning, and Mobility) achieving a significant difference, the second null-hypothesis can be rejected in those particular instances. However, it should be noted that with 20 subscores being considered there is a possibility of at least one significant difference arising simply by chance. The three areas that present the strongest evidence for a real difference are Visual Preference and Intake (both non-musical learning style preference) along with Auditory Preferences (a musical learning style preference). In each of these cases the mean difference is sufficiently large and the confidence interval range is sufficiently narrow to provide reasonable support for the existence of a real difference. The presence of significant differences in those three areas is also consistent with what might be expected.

A plausible explanation for the emergence of a significant finding with regard to Intake could be that the act of eating or drinking is incompatible with much of the music making process (the various Octoberfests notwithstanding). The direction of that difference would also lend support to such an explanation because the subjects identified Intake as being more important in their non-musical learning styles.

The significant findings related to Auditory and Visual Preferences also conform to that which might have been expected. The subjects showed a tendency to prefer an auditory approach to musical instruction while opting for greater visual input when dealing with non-musical material. Music is an aural art and its information is conveyed through sound. Therefore, a preference for an auditory approach to music instruction can be seen as quite compatible with the nature of the discipline. Music educators have been open to criticism when they place emphasis on visual explanations at the expense of musical example. This present research finding provides some support for that criticism.

The identification of significant differences in seven areas can represent only a partial explanation for the overall variability in the subjects' responses. From the evidence

thus far it may be reasonable to conclude that much of this variability is a factor of individual differences. It would seem to be the result of an array of internal inconsistencies that are largely peculiar to each person. Once again the path of investigation leads back to the individual.

With this concern in mind, it is proposed to present some of the data relating to individual differences. In each case these differences will not be between individuals but, rather, within the same individual. An examination of every subject's two profiles was undertaken with the 20 subscores from the non-musical responses being subtracted from the corresponding musical responses. The differences are expressed in units of standard deviation and, where these differences exceed plus or minus one standard deviation, the information has been tabulated below.

For the purpose of this report, a difference of plus or minus one standard deviation is considered an item that could be of practical significance in dealing with an individual. Every subject showed evidence of this kind of internal inconsistency when moving from a musical to a non-musical mind-set. The majority of individuals (43) differed by more than one standard deviation on five to seven dimensions. The areas of Auditory Preference, Several Ways, Learning Alone, Intake and Visual Preferences appeared most frequently. Table 1 summarizes those findings (a complete listing of the data can be found in Appendix D).

Table 1. Subjects differing by plus or minus one standard deviation

<u>Area</u>	<u>Number of subjects</u>
Auditory Preference	33
Several Ways	30
Learning Alone/Peer Oriented	28
Intake	27
Visual Preference	25
Late Morning	21
Authority-Figure Present	20
Afternoon	18
Noise Level	17
Light	17
Persistent	16
Responsible	14
Structure	12
Mobility	12
Kinesthetic	11
Evening/Morning	11
Tactile	10
Design	8
Motivation	8
Temperature	8

Conclusions

The data analysis presented in this chapter supports the following conclusions:

1. Individuals can differ significantly in their learning style approaches when they move from musical to non-musical studies.
 2. Of the 20 separate dimensions that were covered in the PEPS instrument, seven areas can be identified as being significantly different under the two mind-set perspectives. In particular, the area of Auditory Preference would be most closely identified with musical activity while Visual Preference is a notable feature of non-musical learning styles.
 3. It would appear that much of the significant difference identified in point one above is the product of internal inconsistencies which are particular to the individual.
 4. Learning style information that has been collected in a general testing program (either at grade level or system-wide) may not be applicable to the music program.
- The music educator who wants to serve the learning style interests of his or her students should, as a minimum, insist that the information be generated from a musical perspective.

The implications for further research and the possibilities for the development of models to guide that research will be the subject of the final chapter.

CHAPTER FIVE

IMPLICATIONS FOR FUTURE RESEARCH

The conclusions stated in the previous chapter are based on the data generated by this particular research design. To clarify the questions that have emerged, both new research and different designs will be required.

Some initial questions arise from the extent to which the two null-hypotheses were rejected. The statistical analysis identifies a significant amount of learning style difference when the subjects move from a musical to a non-musical mind-set. However, when the 20 separate areas of learning style are compared, it becomes apparent that only a few of them are contributing significantly to the overall result. Therefore, it is possible to accept that individuals can evidence a significant difference between their musical and non-musical learning styles but that there is only a modest amount of pattern in that difference. These considerations lead to the conclusion that the significant difference associated with the group of subjects as a whole is largely a reflection of an array of individual traits which combine in each learner to form two uniquely personal learning styles. If there is something special about music that mandates a different learning style approach, people appear to be interacting with it in a variety of individualistic ways. The notable exception to this situation is Auditory Preference, which seems to be a particularly salient feature of musical learning style.

As noted in the previous chapter, the most significant patterns of difference were in the learning style areas of Auditory/Visual Preferences and Intake. Explanations are advanced that center on the extent to which these learning style preferences are either compatible or incompatible with musical activities. One might expect other learning style areas to show similar differences on that same basis. The most likely area to fit into this compatible/incompatible category is sound (Area 1 Noise Level).

Concerns Regarding Sound

The PEPS instrument measures student attitude toward sound when it is in the background of a learning environment. Background music, conversation, and general ambient sound falls into this Noise Level category. Some learners find such sounds stimulating while others are distracted or annoyed. In this context, sound is not integral to any learning that is being undertaken nor is it a product of that learning. However, with music the situation is quite the reverse. Musical activity produces sound that is directly associated with the learning and, as such, is both integral to and a product of that learning.

The distinction between sound as an integral part of a learning process and sound as background may have been expected to show in the data. One can suspect that many students would choose to turn on a radio or stereo when studying non-musical material but refrain from this sort of action when making music. In the musical instance, such a competing sound source would be considered incompatible with the musical efforts. If true, a difference could have been anticipated between the subjects' attitudes toward background sound in the non-musical as opposed to the musical setting. The data did not reveal any such expected difference. In fact, Noise Level was one of the most stable areas across the two test conditions. Although this may be a true reflection of the subjects' preferences, it is sufficiently unexpected to cause some concern. This concern is twofold; either the PEPS instrument was not sensitive enough with regard to sound, or the mind-set procedures caused ambiguities and confusion.

Initial Steps in Future Research

With sound being such an integral part of music, it is advisable to re-examine this area as a first step in future research. To help meet those concerns involving the sensitivity of the test and possible confusion in the mind-set procedures, it could be useful to redesign the survey instrument to incorporate the musical and non-musical perspectives into the wording of each test item. The revised instrument might also be limited to statements

involving only sound. This combination of a clearly articulated instrument with a much more narrow focus could serve to clarify some of the questions outlined above.

With such an instrument one could again consider differences between musical and non-musical learning style in relation to environmental sounds. It may be interesting to see if music students do make a conscious distinction between sound as part-and-product and sound as background. It could also be useful to determine if music students have a general preference for a sound-rich learning environment. On the other hand, music students may have a preference for sound only as part of a structured musical activity. Future investigations might seek to determine whether music students are particularly adept at blocking out extraneous noise while simultaneously concentrating on their own sound material. Given a properly developed tool, it would seem that these questions are eminently researchable and could contribute to a better understanding of this fundamental aspect of music and musical learning.

Development of a Music-Specific Test of Learning Style

If the above research directions are taken, those test items with a built-in musical perspective could form the basis of a test instrument for musical learning style. Given the significant differences that were found between individuals' musical and non-musical learning styles, the development of a music-specific test instrument appears to be a necessary component in any continuing research strategy. Initially, this test might be only concerned with the areas of Auditory/Visual and Sound preferences, however, the experience gained in its construction could serve as the springboard for future developments. Such an instrument could be systematically expanded to include other learning style areas of interest for the music educator. For example, the area of Learning Alone/Peer Oriented may be seen as having particular relevance to musical study. If a test of music specific learning style were developed to include this area, some interesting research might be possible. It would be intriguing to see if students who choose to study the more solitary instruments (such as the piano) are oriented to learning alone. It would be

equally interesting to determine if successful band and orchestral players are peer oriented learners. If positive relationships were found in the above instances, the information could be used to counsel students in their choice of instrumental study or to assist students with divergent learning styles to come to terms with the demands of their particular instrument.

The investigation of learning style and its possible relationship to various instrumental choices could be the subject of some intriguing future research. The work of Kemp (1981) might serve as a useful model in this regard. Kemp has identified differences in the personality profiles between groups of players on string, woodwind, brass, percussion, and vocal instruments. Similar differences may also exist between the learning style profiles of those instrumentalists. Information of this type could be helpful to the music educator who has to work with homogeneous and heterogeneous instrumental groups as well as with individuals.

Time of Day might also be a learning style trait of some interest to the music educator. Its inclusion in a music-specific test of learning style may provide valuable information to the teacher on the most productive hours for practice, teaching and/or rehearsing. It could also be useful, from the student's point of view, to be aware of the ebb and flow of his or her own energy cycle and organize activities accordingly.

Another area that could be incorporated into a test of musical learning style is that of Authority Figures Present. With so much of musical instruction being done under the direct guidance of a teacher, one suspects that a successful music student would need to be positively disposed to the presence and intervention of an authority figure. It would be interesting to see if such a supposition could be supported by research evidence.

Persistence is a learning style trait that many music educators may feel is crucial to success. The measurement of this aspect of an individual's profile could also be incorporated into a music-specific test of learning style. With knowledge of a person's level of Persistence, both the instructor and student may be in a position to recognize related difficulties and take appropriate measures.

To this growing list of learning style areas for inclusion in a music-specific test instrument, one might also add Responsible and Degree of Structure. These would be of particular interest to any teacher who wishes to individualize instruction. With an individualized approach, it is important to recognize the students who require careful monitoring and those who do not. It is also imperative to know the extent to which the degree of structure facilitates or frustrates an individual's learning progress.

In Chapter 1, the link between a concern for individualizing instruction and the current interest in learning style was outlined. The development of a music-specific test of learning style would be consistent with that previous chain of research and development efforts. The various areas suggested here for inclusion in such a test (Auditory/Visual Preferences, Sound, Learning Alone/Peers, Time of Day, Authority Figures Present, Persistence, Responsible, and Degree of Structure) can provide information of direct assistance to the individualization of instruction.

Does Learning Style Make a Difference?

By focusing on one learning style area at a time, it should be possible to build a valid and reliable research tool and generate some baseline data on each of the separate traits. However, if music educators are going to use either the tool or the data, they would need to be convinced that it is worth the effort. The practitioner would want evidence showing that the meeting of individual learning style preferences will translate into improved music education outcomes.

After the development of a reliable diagnostic tool, research efforts could be directed toward those questions of improved outcomes. Some of these questions may be partially answered as a by-product of the test's development. However, direct investigation would be needed to address specific aspects of learning style and their relationship to desirable or undesirable consequences. To this end, the music education researcher could look at the literature of past research for productive models.

Much of the past research employs an experimental model that requires the matching and mismatching of student characteristics with instructional delivery. The effect of this matching and mismatching is then assessed against a criterion variable. Such a model could be used to explore any musical learning style characteristic and its relationship to a particular outcome (such as improved performance or attitudinal changes).

Another research model studies the successful and/or talented students and compares them on the basis of some learning style characteristic(s) with other less successful individuals. Information generated through this approach could be of interest to music educators who want to identify and counsel potentially successful musicians, or to those who may see possibilities for assisting the less successful individual by changing his or her learning style approach.

A third model that might be of interest to the music education researcher involves the comparison of learning style characteristics over time. By comparing the same students at different stages of development, or by looking at similar students in different age/grade categories, information can be gained about the relative stability of musical learning style. This could be valuable to those teachers who are working with adults or who must teach across a broad range of age groups.

A final class of research models that should be brought to the attention of music education researchers are those associated with the psychological aspects of learning/cognitive style. Some individuals have already ventured into this area (see Chapter 2 - Research on Learning Style and Cognitive Style in Music). Most of this work sought to uncover relationships between field dependence/independence or left/right brain dominance and various musical attributes. However, recent theory building in the field of intelligence may point toward new paths of investigation.

In particular, the writing of Gardner (1983) could be of interest to the music educator. Gardner postulates seven core intelligences. He includes in this theory of multiple intelligences areas that are linguistic, musical, logical-mathematical, spatial, body-

kinesthetic, intra-personal, and inter-personal. He further suggests that these seven intelligences may serve as both the capacity to learn and the means through which that learning can occur. (p. 334).

If the above hypothesis is tenable, one might expect an individual's preferred learning style to be closely aligned with his or her own intellectual strengths. With the development of valid and reliable diagnostic tools, it should be possible to research this hypothesis and, perhaps, uncover links that may exist between the individual's psychological characteristics and the most effective instructional designs.

Summary

The recommendations for future research and development presented in this chapter are directed along two lines. The first priority would be the systematic construction of a music-specific test of learning style. This test could build on the previous work in learning style but use the vocabulary and unique perspectives of music education. It might include (but not be limited to) items that seek information on areas such as Intake, Auditory/Visual Preferences, Sound, Learning Alone/Peers, Time of Day, Authority Figures Present, Persistence, Responsible, and Degree of Structure. The development of such a tool (either as the result of a single unified project or through the efforts of several researchers investigating selective learning style parameters) is seen as an important prerequisite to further research in musical learning style. Such a tool could then be used to further investigate those aspects of learning style that might contribute to improved educational outcomes.

Finally, this project and any future research into musical learning style will contribute to a continuum of work that has its roots in a concern for the individual. As the knowledge of individual characteristics increases and as instructional design becomes more sophisticated, it should be possible to serve the individual with greater effectiveness. Education could be seen as the premier service industry and in this context an individual orientation may be central to its mission.

APPENDICES

APPENDIX A

APPENDIX A

Information to Prospective Participants

Thank you for your interest in the research project in Learning Styles. If selected to participate, you will be asked to sit a test called the Productivity Environmental Profile Survey, (PEPS). This survey is a questionnaire-type instrument that seeks to ascertain your preferences when engaged in learning. You will be asked to take the same test on two occasions. On one of those occasions you will be instructed to indicate your preferences when learning musical material. On the other test sitting you will be requested to indicate your preferences when learning non-musical material.

There are no hidden tricks or deceptive statements on the test, you are only required to make the most honest responses possible. The test takes about 40 min. per sitting. Therefore, the two sittings will require about an hour and twenty minutes. Your results will be kept confidential and be shared with you on an individual basis. In the reporting of the data, all material will be treated anonymously and no information will be able to be identified with any individual. Furthermore, neither the test results nor your participation will have any bearing on the assessment of an academic unit or course.

If you are willing to participate in the project, please fill in the form below, detach it and return.

to.....

at.....

or to Mr. R.Warren Tiller C/- Ballarat College of Advanced Education,
Gear Avenue, Mt. Helen 3350

I am willing to participate in the research project entitled "An Investigation into the Extent of Congruency Between General and Music-Specific Learning Style Preferences". I understand what I will be asked to do and that I can withdraw from participation at any time without penalty. In addition, I am aware that all results will be treated in the strictest confidence and that my test results will be available to me on an individual basis.

Name:.....
please print

Address:.....

Phone: Home.....

Work.....

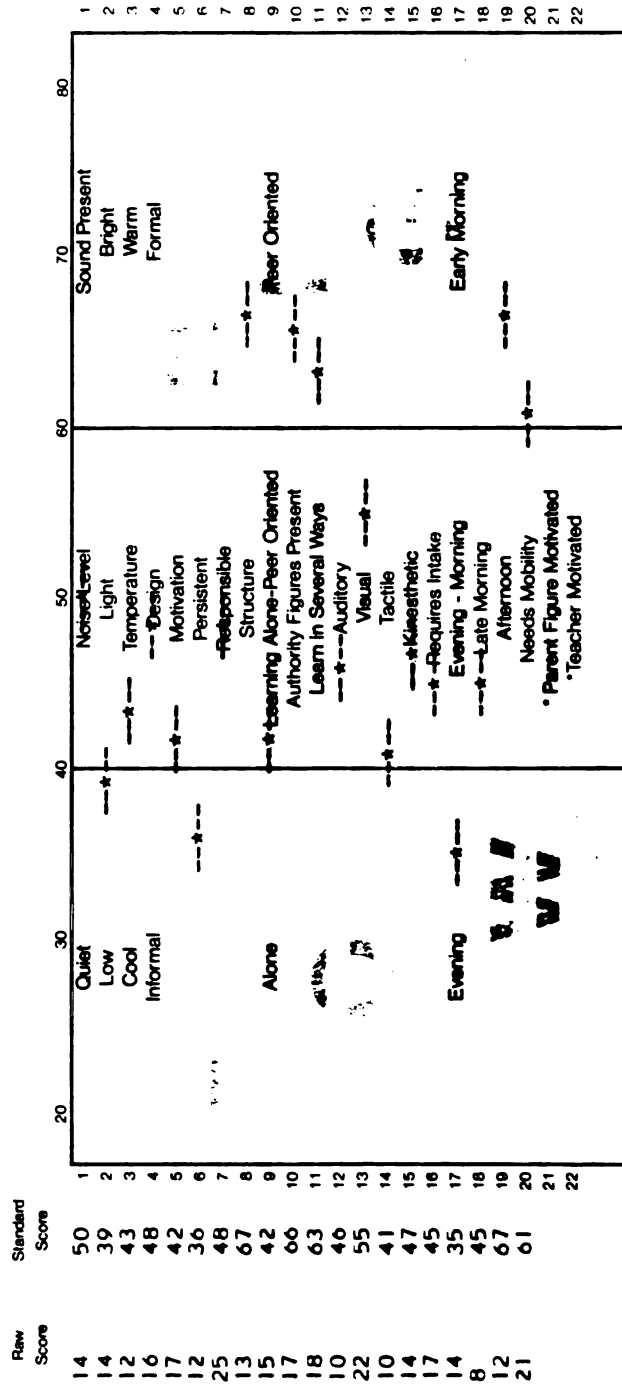
Signature:.....

APPENDIX B

INDIVIDUAL PROFILE PRODUCTIVITY ENVIRONMENTAL PREFERENCE SURVEY

Name: **AUSTRALIA** Sex: **F** Year in School: **67 / 08** I.D. No.: **12**
 Group Identification: **B** Special Code: **10** Date: **08-23-1988** Group No.: **127**

PREFERENCE SUMMARY



PROFILE NO.: 11

APPENDIX C

APPENDIX C
Supplementary Information Form

Identification Number.....

Course (i.e. Primary Ed, Humanities, Grad Dip.).....

Main Instrument.....

Years played.....

Highest AMEB Grade (if any).....

Secondary Instrument.....

Years Played.....

Highest AMEB Grade (if any).....

APPENDIX D

APPENDIX D

Subject number	Areas Showing a Difference Exceeding One Standard Deviation
1	Responsible +1.01, Learning Alone -2.57, Several Ways +1.26, Auditory Preference +1.39 Late Morning +1.52, Afternoon -1.67
2	Temperature +1.07, Formal Design -1.80, Learning Alone +1.78, Several Ways -1.62 Auditory Preference 1.26, Kinesthetic Preferences +1.78, Late Morning -1.08
3	Noise Level +1.50, Light -2.82, Several Ways -1.50, Late Morning -1.13, Mobility +1.13
4	Temperature -1.34, Persistent -1.20, Several Ways +1.15, Auditory Preference -1.20, Tactile Preference +1.70, Evening/Morning +1.01, Late Morning +2.11, Afternoon -1.06
5	Persistent -1.24, Visual Preferences -2.03, Requires Intake -2.66, Evening/Morning +1.08
6	Light -1.39, Persistent +1.40, Responsible +1.11, Learning Alone +1.69, Visual Preferences -1.68, Tactile Preference

- 1.39, Requires Intake -1.09
- 7 Authority Present -2.29, Several Ways -1.33,
Tactile Preferences -1.52, Kinesthetic Preferences
+1.33, Late Morning +1.14, Afternoon -1.33.
- 8 Light -1.44, Structure +1.63, Learning Alone
+1.42, Several Ways +2.24, Afternoon -1.85
- 9 Persistent +1.07, Authority Present +1.54,
Tactile +1.54, Late Morning -2.19, Afternoon,
+1.85.
- 10 Motivation -1.12, Authority Present -1.03,
Auditory +2.33, Visual -2.21, Late Morning
+1.51, Mobility +1.06.
- 11 Structure +1.05, Several Ways +1.05, Intake
-3.74.
- 12 Noise Level - 2.16, Light -1.40, Motivation +1.14,
Persistent +1.40, Auditory Preference +1.40,
Evening/Morning +1.65.
- 13 Design +1.58, Learning Alone -1.28, Authority
Present +1.10, Auditory +3.01, Visual -1.44.

- 14 Noise Level +1.60, Motivation +1.01, Persistent
+1.85, Responsible +2.01, Structure -1.24,
Kinesthetic -1.41.
- 15 Light -2.65, Structure +1.35, Authority Present
+1.35, Several Ways +1.60, Mobility -2.00
- 16 Motivation 1-.11, Responsible +1.40, Intake ,
-3.19
- 17 Light -1.21, Temperature +1.40, Auditory,
+3.17, Late Morning -1.21.
- 18 Light -1.73, Temperature +1.00, Design -1.49,
Several Ways +1.60, Auditory +2.67.
- 19 Visual -1.90, Tactile +3.29, Intake -1.25
- 20 Learning Alone -2.25, Several Ways +1.60,
Auditory +1.97, Intake -1.43, Afternoon -1.61
- 21 Light +1.41, Structure -2.58, Learning Alone
+1.41, Kinesthetic -1.58, Intake +1.41.
- 22 Learning Alone +3.29, Several Ways -1.95
- 23 Noise Level -1.18, Light +1.76, Design +1.03,

- Structure -1.35, Authority Present +1.03,
Auditory +2.17, Visual -1.51.
- 24 Noise Level -1.00, Light -1.06, Motivation +1.12,
Learning Alone +1.00, Auditory +1.12,
Visual -2.52, Late Morning -2.15,
Afternoon +1.00.
- 25 Authority Present +1.20, Visual -2.27,
Late Morning -2.15, Afternoon +1.89
- 26 Light -1.11, Persistent -1.34, Several Ways
-2.02, Auditory +1.16, Visual +1.33,
Kinesthetic +2.06
- 27 Persistent +1.12, Learning Alone -1.03,
Authority Present +1.33, Visual -1.36,
Intake -2.86, Evening/Morning -1.44,
Mobility -1.03.
- 28 Noise Level -1.71, Responsible +1.48, Structure
+1.19, Learning Alone +1.48, Several Ways
+1.48, Auditory, -2.29.
- 29 Temperature +1.53, Learning Alone +1.39, Authority
Present +1.53, Several Ways -1.32, Intake -1.11
Late Morning -1.60, Afternoon +1.32.

- 30 Responsible -1.34, Learning Alone +2.36,
Authority Present +2.03, Auditory +1.07,
Visual -1.18, Intake -1.02, Mobility -1.34.
- 31 Noise Level -1.02, Light -1.02, Responsible -1.20,
Learning Alone +2.80, Kinesthetic +1.89.
- 32 Noise Level +1.66, Temperature -1.05, Responsible -1.41,
Authority Present -1.48, Several Ways -1.41,
Visual +1.12, Intake -2.13.
- 33 Responsible -1.29, Learning Alone +2.81,
Several Ways -1.29, Auditory +1.38, Visual -1.56,
Intake -1.02.
- 34 Design +1.50, Authority Present -1.73, Visual
+2.47, Tactile +1.83.
- 35 Learning Alone +1.77, Several Ways -2.63,
Auditory +1.69, Visual -1.57.
- 36 Learning Alone +1.98, Several ways -1.63,
Auditory +1.68, Visual -1.19, Intake -2.22,
Afternoon +1.02.
- 37 Learning Alone +2.64, Authority Present +1.89,
Several Ways -1.63, Visual -1.45.

- 38 Structure -1.91, Auditory +2.80, Visual -1.91.
- 39 Temperature -1.20, Authority Present +1.35,
Auditory +1.75, Late Morning +1.94,
Afternoon -2.37, Mobility -1.20
- 40 Temperature -1.08, Learning Alone -1.33,
Several Ways +2.36, Auditory +1.01 Visual
-1.20, Intake -1.57, Mobility +1.37.
- 41 Temperature +1.01, Structure -1.47, Authority
Present +1.13, Several Ways -1.35, Visual
+2.19, Kinesthetic +1.01, Intake -1.23,
Late Morning -1.11, Afternoon +1.01,
Mobility -1.11.
- 42 Persistent -1.44, Responsible +1.21, Structure
+1.80, Several Ways -1.44, Intake -1.80,
Evening/Morning +1.80, Late Morning +1.08.
- 43 Noise Level +1.26, Persistent -1.46, Structure -2.06
Learning Alone +1.11, Authority Present +1.11,
Auditory +2.02, Visual -1.07, Mobility -1.61.
- 44 Noise Level +1.05, Several Ways -1.35, Auditory +1.71
Visual -1.35, Intake -1.11, Late Morning +2.46,
Mobility -1.02.

- 45 Design -1.94, Several Ways -1.78, Auditory +2.00
Tactile +1.53, Mobility -1.15.
- 46 Temperature +1.26, Motivation +1.26, Auditory +1.43
Visual -1.85 Kinesthetic +1.26, Intake -1.20
Evening/Morning -1.04, Late Morning -1.69.
- 47 Noise Level -1.14, Responsible +1.12, Auditory +1.71,
Intake -2.61, Evening/Morning +1.41.
- 48 Noise Level +1.29, Motivation +1.08, Persistent +1.29
Learning Alone +1.71, Several Ways -1.13,
Auditory -1.76, Visual -1.23, Tactile -1.44,
Mobility -1.55
- 49 Design +1.26, Authority Present +2.33
Auditory -1.26, Visual -1.66, Tactile -1.26
Evening/Morning +1.53.
- 50 Responsible +1.41, Several ways -1.98,
Auditory +1.15, Visual -1.07, Afternoon -1.98,
Mobility +1.15.
- 51 Light -1.25, Persistent +2.16, Responsible +1.69
Authority Present +1.23, Several Ways +1.08,
Kinesthetic -1.09, Intake -1.56

- 52 Noise Level -2.05, Persistent -1.55, Authority Present +2.11, Kinesthetic +1.45, Intake -1.55.
- 53 Persistent +1.24, Learning Alone +2.39, Authority Present +1.24, Several Ways -1.44 Visual -1.05 Intake -2.20.
- 54 Noise Level -1.01 Persistent +2.49, Intake -1.96, Late Morning -1.28, Afternoon +1.96.
- 55 Structure -1.97, Learning Alone +1.35, Several Ways - 2.07, Tactile -1.75, Evening/Morning +1.03, Afternoon +1.25.
- 56 Noise Level +1.33, Light -2.65, Learning Alone +1.17, Intake -2.02, Evening/Morning +1.33
- 57 Design +1.02, Learning Alone -1.18, Auditory +1.93818, Kinesthetic -1.00, Intake -2.10, Late Morning -1.18, Afternoon +1.20.
- 58 Motivation +1.20, Learning Alone -2.12, Several Ways +2.38, Intake -1.53, Late Morning -1.17.
- 59 Noise Level -1.11, Learning Alone +1.29, Authority Present +2.09, Auditory +1.49,

	Intake -2.11, Late Morning -1.31
60	Noise Level +1.22, Persistent +1.99, Auditory +1.11, Afternoon -1.54
61	Temperature +1.60, Responsible -2.17, Evening/ Morning +1.84, Late Morning +1.49, Afternoon -1.48.

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