THE EFFECT OF THREE DIFFERENT LEVELS OF SKILL TRAINING IN MUSICAL TIMBRE DISCRIMINATION ON ALPHABET SOUND DISCRIMNATION IN PRE-KINDERGARTEN AND KINDERGARTEN CHILDREN

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The purpose of this study was to investigate the effects of three different levels of skill training in musical timbre discrimination on alphabet sound discrimination in pre-kindergarten and kindergarten children.

The findings of prior investigations indicated similarities between aural music and language perception. Psychoacoustic and neurological findings have reported the discrimination of alphabet quality and musical timbre to be similar perceptual functions and have provided, through imaging technology, physical evidence of music learning simultaneously stimulating non-musical areas of the brain.

This investigator hypothesized that timbre discrimination, the process of differentiating the characteristic quality of one complex sound from another of identical pitch and loudness, may have been a common factor between music and alphabet sound discrimination. Existing studies had not explored this relationship or the effects of directly teaching for transfer on learning generalization between skills used for the discrimination of musical timbre and alphabet sounds.

Variables identified as similar from the literature were the discrimination of same-different musical and alphabet sounds, visual recognition of musical and alphabet

pictures as sound sources, and association of alphabet and musical sounds with matching symbols.

A randomized pre-post test design with intermittent measures was used to implement the study. There were 5 instructional groups. Groups 1, 2,and 3 received one, two and three levels of skill instruction respectively. Groups 4 received three levels of skill training with instruction for transfer; Group 5 traditional timbre instruction. Students were measured at the 5^{th} (Level 1), 10^{th} (Level 2), 14^{th} (Level 3), and 18^{th} (delayed re-test), weeks of instruction.

Results revealed timbre discrimination instruction had a significant impact on alphabet sound-symbol discrimination achievement in pre-kindergarten and kindergarten children. Different levels of timbre instruction had different degrees of effectiveness on alphabet sound discrimination. Students who received three levels of timbre discrimination instruction and were taught to transfer skill similarities from music timbre discrimination to alphabet sound discrimination, were significantly more proficient in alphabet sound symbol discrimination than those who had not received instruction Posttest comparisons indicated skill relationships were strengthened by instruction for transfer. Transfer strategies had a significant impact on the retention of newly learned skills over time.

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CHAPTER ONE

INTRODUCTION, BACKGROUND, NEED FOR THE STUDY, PURPOSE, AND RESEARCH QUESTIONS

Introduction

Recent neurological findings, current educational trends toward interdisciplinary learning and development of art-based curriculums, have indicated that music learning stimulates and facilitates learning in other areas, and have thus compelled music educators to re-examine the possible effects of music skill development on skills in other academic areas (Altenmüller, Gruhn, Parlitz, & Kahrs, 1997; Erickson, 1998; Irwin & Reynolds, 1995; Rauscher, Shaw, & Ky, 1994; Mader, 1998). Of particular interest to this researcher were the proposed similarities between music auditory discrimination skills and the language auditory discrimination skills needed for the identification of sound differences in both areas. The premise for music education research, which explores skill similarities between music and other content areas, has been found in the learning transfer or generalization literature. For the purpose of this study, transfer is defined as the acquisition of new knowledge or skills in one academic area based on their similarity to skills and knowledge in another content area.

Thorndike's theory of learning transfer, espoused in 1901, suggests that learning generalization is possible only when skills between different academic areas share similar elements or common features (Thorndike, 1901). Thorndike's hypothesis was supported by Tunks' review of transfer literature in music education (Tunks, 1991). Tunks concluded that the greater the perceived similarity between skills, the more likely the possibility of transfer. He also argued that direct instruction in the relationship of skills being learned in one content area to skills in another academic area enhanced transfer effects. The implications of Tunks' research propsed that (a) skill similarities must first be established between content areas before a cause and effect relationship could be explored, and (b) students must be taught for transfer.

Of the number of music education studies that reported such similarities, several have explored the relationship between pitch, rhythmic, melodic, and harmonic discrimination and alphabet, or word, discrimination (Goldberg & Bossenmeyer, 1998; Loewy, 1995). Others have investigated the possible effects of music discrimination training on alphabet, word or sentence discrimination (Hughes & Standley, 1997; Madsen, Madsen, & Michel, 1975; Movesian, 1967; Sharman, 1981). A few researchers have examined the effects of timbre discrimination on alphabet sound discrimination (e.g., Wooderson 1981; and Wooderson and Small 1981). Others who examined similarities between musical timbre discrimination and discrimination of alphabet sounds have found supporting documentation in psychoacoustic literature. Saldanha and Corso (1964) and Slawson (1968) reported timbre discrimination in both language and music to depend on the listener's ability to determine contrasts between sounds. Slawson further argued that the complex attributes known as musical timbre were identical to attributes known as vowel quality. The research premise was based on findings which indicated that the color, or timbre, of each instrumental, song, and phoneme sound was primarily determined by its spectral envelope (Clarkston, Clifton, & Perris, 1988). The envelope has been described as the curve connecting the points which represented amplitudes of the fundamental and harmonics, or the stimulus components, in a complex sound (Clarkston et al.; Kuhl, 1979). Since the structure of the spectral envelope was thought to be a critical factor in the discrimination of sound colors in both music and language, an hypothesis was formulated wherein the discrimination of phoneme quality and musical timbre were proposed to be similar perceptual functions (Slawson, 1968).

Despite reviewed psychoacoustic, psychological, and music education research which implied a positive relationship between the timbres of music and alphabet sound, music education studies that have explored the effects of musical timbre discrimination training on alphabet sound discrimination, have not identified specific skills as similar or common to both content areas. Existing investigations also lack findings on the effects of teaching for transfer.

The purpose of this study was to investigate the effects of three different levels of skill training in musical timbre discrimination on alphabet sound discrimination in pre-kindergarten and kindergarten children. Based on the psychoacoustic, psychological and neurological literature reviews, skills thought common to both were identified, their similarities discussed, and possible cause and effect relationships explored. The research questions addressed whether or not the subjects receiving all three levels of musical timbre discrimination training and instruction for transfer would achieve higher scores in alphabet sound discrimination than those who did not.

Background

The hypothesis of this investigation was based on a review of research findings from the music education, learning transfer, non-musical outcomes, psychoacoustics, and psychological and neurological research areas. Each of the areas will be briefly outlined here and discussed in detail in Chapter 2.

Non-Musical Outcomes of Music

Since music education's inception in the United States public school system, it has been evident that constituent groups of school administrators, parents, and other taxpayers, have not considered the aesthetic value of music to be sufficient cause for its inclusion in public school curriculums (Birge, 1966). From its inception therefore, Music educators have stated that music is a critical component in the overall development and education of students. They also have argued however, that the study of music is important in and of itself and that the inclusion of music in curriculums should be justified on its merits alone. In light of the seemingly opposing views on the importance of school music instruction, the founders of public school music education felt the need to create a wide range of justifications for its inclusion in the public school classroom.

In the years that have ensued, a host of nonmusical justifications have surfaced to support the viability of music instruction (Cowell, 1992; Mark, 1986). They have included claims that the study of music increased self-esteem, provided an alternative means of self-expression, and increased academic performance by developing cognitive functions of attention, memory, and higher-order thinking skills (Ables, Hoffer, & Klotman, 1984). Music performance has also been linked to increased lung capacity and the development of well-being, with benefits of improved gross and fine motor skills development (Mason, 1838).

Initially, these claims seemed to placate skeptics who challenged the need for music in schools. Consequently, as Mark (1996) has reported, for many decades, proponents of music education touted both the musical and nonmusical outcomes of music instruction to secure music's place in curriculums, often without adequate supporting data.

Learning Transfer Research in Music Education

To fill the void of supportive documentation and confirmation for their claims, music educators have explored the relationship between music and other types of learning. The premise for non-musical outcomes studies which have explored the relationship of skills of different content areas and their possible impact on one another, lies in the domain of learning transfer. The underlying assumption of transfer research in the field of music education has suggested that learning transfer is based on prior knowledge of verbal and symbolic musical information (Thorndike, 1901; Wolf, 1978). It may be specifically defined as the generalization of a cognitive musical response to another non-musical response in the presence of a similar learning stimulus. In 1978 Wolf provided a summary of these investigations, wherein she documented chronological evidence for each type of survey researched (Wolf, 1978).

Wolf's review outlined the transfer effects or nonmusical results of exposure to music. They included the: (a) development of attention and memory, (b) development of problem-solving and/or critical thinking skills, (c) development of aural and visual perception and discrimination, (d) development of spatial skills, (e) development of oral language skills, and (f) reinforcement of concepts learned in language arts, math, science, and social studies (Wolf, 1978).

Assumptions that emerged from the 1978 review by Wolf were twofold:

1. Music serves as a mental discipline which develops certain cognitive

strategies or habits of the mind, that is, attention, memory, and critical thinking, which may facilitate nonmusical learning .

2. Specific skills and concepts learned in music may be used as perceptual cues to facilitate learning of similar skills and concepts in other academic areas.

The implication of these assumptions was that music may serve as a means of learning how to work or study, or “learning how to learn”. Theorists have hypothesized, on the basis of these assumptions, that specific musical knowledge might provide conceptual cues for other learning, particularly in pre-reading and reading skill areas (Hughes & Standley, 1997; Loewy, 1995; McMahon, 1979; Turnipseed, 1976; Zinar, 1976). Based on Wolfe’s review, this investigator categorized that learning transfer studies in music education as (a) Visual Discrimination Studies, (b) Sequencing/Spatial Discrimination Studies, and (c) Auditory Discrimination Studies.

Visual Discrimination Studies

The variables isolated for comparison between disciplines are student skills required to distinguish shapes, sizes, patterns of shapes, and symbols. Findings for visual discrimination studies have reported that music reading skills such as eye-directional movement (Monroe, 1967), icon and symbol discrimination, recognition of symbol patterns (Sharmon, 1981), and development of sight vocabulary (Kokas, 1968), might be common to music and language learning.

Spatial Discrimination Studies

The variables isolated for comparison between disciplines were skills required to order and rank various elements. Spatial studies have explored the relationship between the sequencing and spatial skills learned in music, and those learned in language and have implied that instruction in the reproduction of rhythmic/melodic sequences, and the discrimination of forms and patterns, might impact development of similar skills in the language area (Hurwitz, Wolff, Bortnick, & Koklas, 1975). Specifically, training in the perception of rhythmic and melodic sequences was thought to facilitate perception of patterns of letters required to form words, or patterns of words, which were necessary to form complete thoughts. These studies have also reported that the introduction of new words and facts, through rhythmic and melodic sequences such as those found in folk songs and rap music, might enhance vocabulary and fact acquisition (Battle & Ramsey, 1990; Hahn, 1972; Hughes & Standley, 1997).

Auditory Discrimination Studies

The variables isolated for comparison between disciplines were student skills required to recognize and discriminate between different sounds. Researchers who have explored the effects of auditory discrimination skills learned in music on aural discrimination skills in language, have highlighted the similarities between aural music and language skills which must be mastered before formal introduction to reading. in both areas. Most commonly, the research findings pointed to the relationship between auditory perception skills such as pitch, melody, and timbre discrimination learned prior to musical note reading and discrimination skills that are required for aural perception of phonetic sounds, or patterns of sounds, and learned prior to reading language (Ciepluch, 1988; Marsh & Fitch, 1970; Movesian, 1967).

Findings of aural discrimination studies have suggested that pitch (Madsen et al., 1975) and timbre (Wooderson, 1981) were factors common to both musical sound (e.g., phoneme/alphabet sound) and word discrimination. Both types of studies have pointed to a positive relationship between music instruction and reading achievement (McMahon, 1979; Turnipseed, 1976). Therefore, the implication has been that training in musical pitch and timbre discrimination might facilitate student differentiation of alphabet and word sounds needed for reading achievement (Hughes & Standley, 1997; Dallman, Rouch, Chang, & DeBoer, 1974; McMahon, 1979; Madsen et al., 1975).

Despite positive implications of research in this area, few studies have isolated, compared, and explored possible cause and effect relationship between skills thought to be common to both disciplines. Beyond that, limited replications of the few studies that do exist have weakened the reliability and validity of the reported findings on nonmusical outcomes (transfer effects) of music instruction.

Wolf's findings are echoed in a review by Tunks (1992) who has also reported mixed results from studies which explored the transfer of musical learning to other skill areas. Tunks highlights the negative findings of studies by Lauder (1976) and Sharman (1981). Results of both studies suggested limited transfer effects between music and reading discrimination skills. He has however reported positive transfer effects between the two areas as investigated by Aten, Smith and Tunks (1984); Hurwitz, Wolff, Bortnick, and Koklas (1975); Pirtle and Seaton (1975) and Siedes (1976). Based on his survey findings, Tunks concluded that positive transfer resulted between music and other content areas were primarily facilitated by a highly structured instructional plan designed specifically for transfer (Tunks, 1992).

Neurological Research

Opponents of nonmusical outcomes research have pointed to neurological research which has reported separate and independent brain centers for different types of learning (Brust, 1980; Luria, 1974). According to Cowell, 1992 and Wolf, 1978, the connection between music and other academic areas is difficult to make because of the faulty assumption that music in some way neurologically connected to other learning Such research was based on autopsy results and behavioral activities of subjects who suffered from strokes or other trauma to certain brain areas (Brust, 1980).

However, medical advances in neuro-imaging such as Potron Emission Topography (PET) and Magnetic Resonance Imaging (MRI) have allowed researchers to view images of a brain as it is stimulated during musical activities. The images have provided physical, rather than theoretical, evidence of the impact of music on other brain areas (Sargeant, 1992). Specifically, studies have indicated that musical activities stimulate more than one cognitive area in both hemispheres (Altenmüller et al., 1997). The type of musical activity and the level of training of the subject involved, determine which hemisphere becomes more actively engaged in perception (Altenmüller, 1989; Bernsteiner, Altenmüller, Lang, Lindinger, & Deiche, 1994; Segalowitz, Bebout, & Lederman, 1979; Peretz, 1990). The images have revealed that the analytical music and language centers are located in the left hemisphere and are in close proximity to one another. Sargeant (1992) reported that subjects involved in the process of note reading, experienced simultaneous stimulation of their music and language centers, and thereby raised the possibility of neural networking between the two centers. PET technology revealed a general symbol-processing area in the frontal region of the brain. Music performance appeared to stimulate functioning in this region, and thus indicated an apparent impact on symbol processing needed for reading languages (alphabets), math (numbers), and music (notes) (Altenmüller et al.; Oddliefson, 1990).

Neurological images of simultaneous stimulation, via music, of the language and symbol-processing areas have offered physiological support to earlier psychological and educational theorists. Their findings have revealed evidence that (a) music leaning may in some way impact other non-music learning, and (b) music may serve as an inherent pre-language for young children (Davidson, 1985; Davidson, McKernon, & Gardner, 1981; Graham, 1985; Holahan, 1985; Loewy, 1995; Trehub, 1972). Although their suitability for replication has been challenged in the public media, the results of more recent neurological studies have reported that music when used as an environmental stimulus, could enhance the development of children's cognitive abilities, and prepare their minds for learning (Leng & Shaw, 1991; Loewy; Rauscher, Shaw and Ky, 1995).

Interdisciplinary Learning

Current manefestations of neurological research have been observed in psychological and educational communities with the development of new learning theories, curricular policies, and educational programs. These developments have sparked a decade of curricular and classroom reform. All seem to reflect the premise that learning in one academic area somehow generalize to and reinforce learning in another (Checkley, 1997). Howard Gardner (1983) theorized the brain to be composed of seven, individually-functioning, but loosely-related intelligences which include (a) linguistic, (b) musical, (c) logical-mathematical, (d) spatial, (e) kinesthetic, (f) interpersonal, and (g) intrapersonal. Gardner's more recent work published in 1993 also included the naturalist intelligence as the eighth intelligence. In an interview with Checkly (1997), Gardner recommended the importance of recognizing each intelligence in its own right.

Curriculum, Gardner argued, should be designed to address each intelligence, with emphasis placed on the interrelationships among the intelligences.

Gardner's theories may have influenced recent curricular restructuring in public schools, nationwide. Curriculum guides no longer recommend the teaching of skills and concepts in isolation, but have mandated integration or generalization of similar skills and concepts, from various academic areas, to form a complete learning picture (Campbell, 1997). This practice of drawing on all disciplines to teach a concept has been called "interdisciplinary learning" (Irwin & Reynolds, 1995, p. 14), which has been described as "a conceptual place without boundaries" (Irwin & Reynolds, p. 14). In interdisciplinary curriculum, each subject is taught in light of its relationship to the others (Campbell, 1989, 1997; Chapman, 1998; Kagan, 1998).

Evidence of the trend toward interdisciplinary learning has been found in music education, in curricular policies such as Discipline-Based Arts Education, sponsored by the Getty Foundation (Eisner, 1987). There is evidence that the Getty format, although originally designed for visual arts, was also has been used in some states to design curriculums in music, dance, and theatre (e.g. Louisiana State Department of Education, 1998). Teaching of the arts is not limited to performance, but is intertwined with historical perspectives, inspiration for the work's aesthetic philosophy, and critical analysis of the creation. Therefore, each artwork, play, movie, musical composition, and similar areas of study, has incorporated the disciplines of performance, social studies, philosophy, and critical thinking skills, as they relate to the work (Cowell, 1992).

The implementation of the arts, as core subjects, has received national support in The Goals 2000 (1998), legislation. As a result, national standards were compiled by the

Consortium of National Arts Education Association (1994), and published by Music Educators' National Conference (1994). These standards are now used nationwide to design and integrate curriculum in music, dance, theatre, and visual arts, at the state and local district levels. Examples of interdisciplinary programs including, or based on, the arts, are (a) Artworks for Schools, (b) The Key School in Indianapolis, IN, (c) Maryville Elementary School in Maryville, WI, (d) Partnership Assessment Project in Dallas, TX, (e) Preschool Arts Enrichment Program, 1994, and (f) Project Spectrum (Campbell, 1989, 1997).

Need for the Study

Schools that design their curriculums around the arts have reported gains in student achievement, as supported by the statistical findings of The College Boards (1996). Results from the agency suggest the overall test performance of pre-college students with musical training is 49% better on college entrance exams than those without musical involvement. These findings, along with neurological images which provided physical evidence of music's impact on other cognitive areas (Altenmüller et al., 1997), warranted an investigation of the possible effects of skills learned in music on those learned in other disciplines.

Analysis of music and language literature has produced evidence that auditory discrimination in both areas was partially based on the differentiation of acoustical cues. The cues were defined as sounds providing a signal, or hint, of what is being heard or perceived (Gordon, Eberhardt, & Rueckl, 1993).

Compton's Interactive Encyclopedia (1996) defines a musical tone as the smallest unit of sound that distinguishes one pitch from another. Similarly, Dallman et al. (1974)

defined a phoneme as the smallest unit of speech that serves to distinguish one utterance from another. Pitch and phoneme have served as auditory cues to alert listeners to what they are about to perceive. Both elements have served as a basis for more complex sounds in music and language.

In music and speech, tones and phonemes have been distinguished by pitch (frequency), timbre (color), loudness (amplitude), and duration (length of sound) (Fry, 1977). Auditory discrimination studies of speech and music development have reported that infants and young children can distinguish pitch and timbre variables long before they can distinguish the spoken word (Chang & Trehub, 1977a, 1977b; Clarkston et al., 1988; Kuhl, 1979; Shahidullah & Hepper, 1994; Trehub, Endman, & Thorpe, 1990). Additional evidence for infant timbre discrimination has been provided by research which indicated that infants were able to categorize sounds based on quality of vocal sound, or speaker's sex and quality of speech sound, or vowel/consonant identity (Brown, 1979; Kessen, Levine, & Wendrich, 1979; Kuhl; Trehub et al. 1990). Since discrimination skills in pitch and timbre appeared to develop prior to, and were implied prerequisites for, the development of certain language discrimination skills, it has been hypothesized that the cultivation of pitch and timbre skills in music might have some impact on language development.

Researchers who explored the effects of music training on language development have suggested that similarities might be more precisely ascertained by attempting to isolate possibly related music and language skills. Studies that explored this hypothesis are based on learning transfer research which presents evidence that training in specific music discrimination skills may tap into similar language skills and thus may provide a more specific reinforcement for language sound discrimination (Skinner, 1954; Tunks, 1992). Supporting evidence holds that the greater the perceived similarities between skills the more likely learning generalization will occur. Findings also exist that allowed the researchers to conclude that direct instruction in the application of similar skills from one content area to another enhanced transfer effects (Aten, Smith and Tunks, 1984; Tunks, 1992). Musical skills explored were (a) pitch discrimination (Madsen et al., 1975), (b) harmonic discrimination (Hurwitz et al., 1975; McMahon, 1979), and (c) discrimination of rhythmic and melodic sequences and patterns (Hahn, 1972; McMahon).

Although pitch, rhythm, melody, and harmony have been identified as the variables in song which may provide additional cognitive cues for discrimination of alphabet sound blends and new words, an analysis of literature reveals few studies which have explored the possible relationship of training in the musical skill of timbre discrimination to the language skill of alphabet sound discrimination (Wooderson, 1981). There was therefore a need to determine whether or not the perceptual skills needed for timbre discrimination could provide a possible link between music and language discrimination.

Psychoacoustic literature has provided supporting documentation of timbre discrimination as a possible common factor between music and alphabet sound discrimination. Timbre has been defined as the distinctive quality that differentiates one complex sound from another if pitch and loudness are identical (Clarkston et al., 1988; Preis, 1984). It is further defined as a complex, multidimensional, musical attribute which is perceived in terms of its (a) prefix or attack: the onset of sound, (b) temporal envelope: the duration of the onset rise and decay of the sound, and (c) the spectrum: the unique combination of the fundamental and overtones which make up the characteristic quality of a sound (Erickson, 1975).

Researchers have identified the spectral envelope as the primary determinant in discrimination of the timbre, or color, of phoneme and musical sounds (Grey, 1977; Slawson, 1968, 1985). The envelope has been described as a curvilinear outline that connects the points of amplitude, thereby defining the unique organization of the fundamental, and its overtone series, which are responsible for producing the characteristic timbre of each musical or language sound (Clarkston et al., 1988). Numerous studies have indicated the spectral envelope to be the single-most important cue for timbre perception in either sound medium (Clarkston et al.; Kuhl, 1979; Preis, 1984; Slawson, 1968, 1985). In experiments with synthesized sounds, alterations to the spectral envelope, particularly to the fundamental and lower two formants, created a significant difference in the timbres of musical and phoneme sounds (Plomp, 1970, 1976; Voigt, Sachs, & Young, 1981). Research findings have revealed timbre similarities in the steady state, or sustained sound, portions of vowel and musical sounds. These sounds are so similar that musicians and nonmusicans were reported to identify them accurately only when heard in their appropriate context (Slawson, 1968).

Other research in this area reports that many musical instruments are distinguished by rapidly changing acoustical cues, which were associated with the onset of sound. This initial attack of musical sound, and partial determinant of musical timbre, is said to be “consonant like,” and bore a similarity to the initiation of consonant sounds (Saldanha & Corso, 1964). Uniqueness of spectral structure and sound initiation were thought to be critical factors common to the discrimination of timbre in music and language. Therefore, it has been hypothesized that discrimination of phoneme (timbre) quality, and musical timbre, may be similar perceptual functions (Helmholtz, 1954; Plomp, 1976; Slawson, 1985).

It has further been hypothesized, based on this and related evidence, that timbre perception is critical to sound identification in all mediums. Consequently, questions have been asked about how the development of timbrediscrimination skills in one sound medium (music) is related to the development of student skills that are needed to differentiate timbre or quality of sounds in another medium(language). Specifically, can training in timbre discrimination of music soundsfacilitate the pre-reading student's discrimination of phoneme, or alphabet sounds?

Further support for timbre discrimination as a common factor between music and language, can be found in developmental literature of both music and language. Analysis of existing music and language developmental research indicates that the development of timbre discrimination skills possibly paralleles the development of skills needed for phoneme quality discrimination (Davidson, 1985; Davidson & Scripp, 1988; Kessen et al., 1979; Loewy, 1995).

In developmental speech literature, Brown (1979) reported that infants demonstrated the ability to differentiate their parents' voices when compared to strangers of the same gender. Kuhl (1979) observed infants' ability to discriminate the quality of vowel sounds despite variations in pitch contour. Four-month-old infants also detected changes in vowel sounds when they were preceded by a common consonant (Trehub, 1972). It has been further noted that infants can discriminate consonants based on the complexity of sound (Hillenbrand, 1983).

Developmental literature has emphasized the importance of accurately labeling both phoneme (alphabet) and musical sounds (Piaget 1950; Pflederer, 1964). Studies by Fullard (1967) and Jetter (1978) reported that that four-year-old subjects possessed the skills to identify the timbres of isolated musical instruments. They could also visually discriminate instrument pictures and match an instrument sound with its corresponding picture. In addition, children of this age demonstrated the ability to visually identify different alphabets in isolation (Ilg & Ames, 1949, 1970; Snider, 1977; Wagner, Torgensen, Laughton, Simmons, & Rashotte, 1993). Naslund and Snider (1996) reported about children's ability to associate phoneme sounds with corresponding alphabetic symbols.

Literature in both areas seemed to indicate a period of intense, discrimination skill development between the ages of four and seven. Rapid gains appeared in the ability to discriminate timbres of instrument pairs and to associate them with correct visual representations (Byrne & Fielding-Bainsley, 1989; Chall, 1983; Ilg & Ames, 1949, 1970; Loucks, 1974; Wooderson & Small, 1981). Similarly, there was quick development of student skills in the discrimination between alphabet sounds and their corresponding symbols (Chall; Ilg & Ames, 1949; Snider, 1997). According to writings, the ability to perform these tasks steadily improved with age (Byrne & Fielding-Bainsley, 1991; Hufstader, 1976, 1977; Jetter, 1978; Petzold, 1966; Pflederer, 1964). In music and language, aptitude development appeared to stabilize between the ages of seven and eight, and approximate its adult form around age nine (Davidson, 1985; Petzold 1966; Snider, 1997).

Reviews of nonmusical outcomes research, learning transfer, neurological, psychological, as well as psychoacoustics research have implied a possible relationship between musical timbre discrimination skills and alphabet sound discrimination skills. Existing studies have not clearly identified specific similar skills for comparison, nor had a cause and effect relationship between these skills been established. There were none known to this investigator where the effects of teaching alphabet sound discrimination by means of timbre discrimination have been examined. Neither is there evidence of studies that have compared the effects of specific timbre discrimination skill training to traditional timbre (instruments of the orchestra) instruction on alphabet sound discrimination.

In summary, this comparative survey of developmental literature in both timbre and alphabet sound discrimination led this researcher to include the following language and music variables in the study:

1. Musical timbre discrimination skills.
    a. Identification of same and different musical timbres
    b. Visual recognition of musical sound sources.
    c. Association of musical timbres with their matching pictures.
2. Alphabet sound discrimination skills.
    a. Identification of same and different alphabet sounds.
    b. Visual recognition of (phoneme) alphabet symbols.
    c. Association of alphabet sounds with their matching symbols

Purpose and Research Questions

Purpose

The purpose of this study was to investigate the effects of three different levels of skill training in musical timbre discrimination on alphabet sound/symbol discrimination in pre-kindergarten and kindergarten children. Based on the psychoacoustic, psychological and neurological literature reviews, skills thought common to both were identified and possible cause and effect relationships were explored.

<u>Research Questions</u>

1. Was there a significant difference between the group who received instruction in all three levels of timbre discrimination skills (sound/symbol discrimination, visual recognition of a sound source and same/different sound discrimination) and transfer instruction and the groups who did not?

2. Was there a significant difference between the group who received one level of skill instruction (same/different sound discrimination) and the group who received two levels of instruction (same different sound discrimination and visual recognition of a sound source)?

3. Was there a significant difference between the group who received instruction in one skill level (same/different discrimination) and the group who received instruction in three skill levels (sound/symbol discrimination, visual recognition of a sound source and same/different sound discrimination)?

4. Was there a significant difference between the group who received instruction in two skill levels (same/different discrimination and visual recognition of a sound source) and the group who received instruction in three skill levels (same/different sound discrimination, visual recognition of a sound source and sound/symbol discrimination)?

4. Was there a significant difference between the group who received instruction

in one skills level (same/different sound discrimination) traditional timbre discrimination instruction.

6. Was there a significant difference between the group who received two levels of skill instruction (same/different discrimination and visual recognition of a sound source) and the group who received traditional timbre instruction?

7. Was there a significant difference between the group who received instruction in three skill levels (same/different sound discrimination, visual recognition of a sound source and sound/symbol discrimination) and the group who received traditional timbre discrimination instruction?

Limitations of the Study

1. The study was limited to pre-reading, English-speaking students.
2. The study was conducted with a predominantly African-American and Vietnamese-American population.
3. The study was conducted in an urban school district.

CHAPTER TWO

RELATED LITERATURE

Introduction

The purpose of this study was to investigate the effects of three different levels of skill training in musical timbre discrimination on alphabet sound/symbol discrimination in pre-kindergarten and kindergarten children. The investigation was based on the hypothesis that the skills learned in musical timbre are, in some way, related to the skills needed to discriminate alphabet sounds. This hypothesis was based on the assumption that skills and concepts learned in one discipline may generalize to the acquisition of skills and concepts in another area.

The purpose of this chapter is to review and discuss literature from various disciplines, as it may apply to the possible relationship between musical timbre and phoneme discrimination skills. Therefore, the literature analyzed includes: (a) learning transfer, as it relates to the nonmusical outcomes of music; (b) neurological findings, which may provide physical evidence of a possible cognitive relationship between music and language processes; (c) psychoacoustic findings relating perceptual and structural similarities in language and music sounds; (d) auditory perception literature, as it relates to musical timbre discrimination in preschool children; and (e) auditory perception literature, as it correlates to phonetic discrimination in pre-reading children.

Learning Transfer in Music Education

Learning transfer has been defined as the acquisition of new knowledge in one academic area, based on the similarity of skills and concepts in a related content area (Thorndike, 1901). A survey of music education research from 1961 to 1998 yielded a number of studies which suggested that new concepts, or skills, in a given academic area, are based on their similarities to skills and concepts learned in music.

The underlying assumption of transfer research, in the field of music education, is that learning transfer is based on prior knowledge of verbal and symbolic musical information (Wolf, 1978). It may be specifically defined as a generalization of a cognitive musical response to another (nonmusical) response in the presence of a similar learning stimulus.

This subheading discusses the concept of learning generalization, as it has been used in music education research for the past 30 years. The research studies have been divided into two categories: (a) general learning transfer, and (b) specific learning transfer.

General Transfer

A commonly expressed viewpoint was the study of music serves as a mental discipline which makes learning other subjects more efficient (Bruner, 1961). General music transfer implied music learning develops certain cognitive strategies, or habits, of the mind (e.g., attention, problem solving, memory, critical thinking) which can be transferred to nonmusical learning situations (Gagne, 1985). In this sense, music study was thought to serve as a means of learning how to work, study, or as Bruner (1961, p. 63) describes it, "Learning how to learn." The task of researchers who explore general learning transfer in music is to investigate the impact of cognitive strategies used in music on overall academic performance. In an article outlining perceived similarities in music and reading processes, Zinar (1976) defended the impact of music instruction on cognitive strategies of attention and memory. She specifically addressed the importance of these processes in the development of reading skills, particularly those of the slow learner.

Attending ability was the similar focus of Nicholson's (1972) work. She explored the extent to which music was useful in increasing the attention span of slow learners. Instruction for the experimental group encompassed certain melodic, rhythmic, and metric aspects of music. The study ran for 15 weeks. The measurement for treatment success constituted the number of minutes the students were able to attend and participate in the music activity. The Metropolitan Readiness Test [MRT] (Nurss & McGuavran, 1986); and the Botel Test of Reading Achievement (Botel, 1987) served as the pre-/post-tests which were administered at the beginning and end of the school year. A significant difference ($^{***}p < .001$) in the mean participation scores between the experimental and control groups emerged. Findings indicated students in the experimental group, who initially scored in the poor-risk category, earned a rating of average on the post-test. The control group remained at risk.

Michel (1973) addressed many methodological problems which, in his opinion, rendered Nicholson's findings invalid. According to the critique, the study lacked bias control because Nicholson instructed both the experimental and control groups. In addition, the reader was provided with only a set of classroom objectives instead of an explanation of control group procedures. A final criticism was based on IQ scores being the only criteria used to classify students as slow learners. Michel pointed out standard procedure, in most school districts, required (a) individual diagnosis, (b) a number of tests, and (c) teacher/parent evaluations, before a remedial program could be implemented.

The Dallas Independent School District's Special Music Program curriculum implemented in 1972 suggested general learning transfer of attention, memory, and problem solving. Music for Little People, and Learning to Learn Through Music, were results of joint support from the federal Title One Program, and the district. The programs' creators sought to provide music instruction for preschool and elementary-aged children from culturally and economically-deprived areas. Development of attention and memory in music is expected to generalize to language arts and mathematics. Standardized test results indicated a significant improvement in music and academic achievement. When considering the validity of the results, the reader should be aware of the absence of a pre-assessment instrument, and the voluntary nature of the program.

The results of a similar program, conducted by Seides (1967) in the Bedford-Stuyvesant sector of New York, indicated the impact of music instruction on slow learners' thinking ability. Students identified as musically talented, slow learners (IQ = 75-90), were randomly assigned to a talent class. The experimental groups participated in the talent classes with enriched music instruction. Those in the control group worked in a talent class without an enriched program. After one year of treatment, students were evaluated with (a) the Metropolitan Achievement Test (The Psychological Corporation, 1993); (b) the California Test of Personality (Tiegs, Willis, & Thorpe, 1953); and (c) the Minnesota Test of Creative Thinking (Aldgren, 1987). Significant differences were apparent between the academic and musical achievement of those who had received enriched musical instruction, and those who had not. Seides concluded the identification of musical ability in the slow-learner had a generalized learning effect that influenced thinking ability and achievement in other content areas. It was difficult to judge the validity of these results because of the omission of pre-test information.

Other studies on general learning transfer are not as well defined, in terms of the cognitive strategies they employed. This lack of focus made it difficult to attribute learning gains to specific strategies learned in music.

Project IMPACT (Interdisciplinary Model Program in the Arts for Children and Teachers) resulted from the Education Professions Development Act, which provided financial support for teacher training. Rather than divide their funding, representatives from five professional education organizations decided to combine their resources to reach the common goal of helping the arts play a more important role in overall school curriculum (Boyle & Lanthrop, 1973). The representative organizations were: The American Theater Association, The Dance Division of the American Association of Health, Physical Education and Recreation, The Music Educators' National Conference, and The National Arts Education Association,

Project IMPACT began in 1970, in Columbus, Ohio (Boyle & Lanthrop, 1973). The experiment started in two elementary schools, later expanding to Alabama, California, Oregon, and Pennsylvania. The program's purpose centered on infusing music into every aspect of the curriculum. According to Boyle and Lanthrop, the program did show a promising relationship between arts education and cognitive achievement.

However, as Wolf (1978) pointed out, there were many weaknesses in the data. For example, program reports indicated after four years of implementation, the Eastgate School saw a 65% increase in sixth-grade vocabulary scores, a 56% rise in math computation, a 63% increase in reading comprehension, and a 25% increase in arithmetic application. However, the findings did not include the actual number of students represented by the increases. Nor did the researcher identify cognitive strategies learned in music, which might be responsible for gains in other content areas. The failure of researchers to report the presence of new school integration plans in, at least, two states (Alabama and Ohio) deprived the reader of explanatory information for students' low scores at the program's outset. After the students adjusted to their new school situations, stabilization probably explained the dramatic rise in scores.

A similar, but much smaller study, the Musical Utilization Program, sponsored by the US Office of Education, conducted experiments in four New York City junior high schools (Olanoff & Kirshner, 1969). The purpose of the program centered on determining the nature and extent of academic change in low-achieving students who were given musical instruction. The program identified and selected musically talented students for the study. Treatment for the experimental groups consisted of group and individual music instruction four times per week, using the program's curriculum guide. The results indicated no significant differences in reading, math, or language usage between treatment and control groups. Like the conclusions of Project IMPACT, results were marred by a number of uncontrollable variables. For example, one control group received an enriched arts program, while another received remedial reading instruction. Both occurrences would affect the study's outcome.

In an attempt to address the impact of teacher differences on learning generalization, Babbitt (1976) compared the transfer effects of music on other content learning when taught by music specialists as opposed to classroom teachers. Fifteen second-grades classes were involved. The classes were split into nine experimental groups taught by a specialist, and six control groups taught by a classroom teacher. The experiment ran one year. The Metropolitan Achievement Tests (The Psychological Corporation, 1997), Primary I and II, were administered as pre- and post-tests. The experimental students improved in reading ability in only one case. However, it was difficult to accept the implication of a cause-and-effect relationship between music and reading because the strategies for transfer were not clearly defined.

In an attempt to determine specific characteristics common to music and reading, Maze (1975) used the Seashore Measures of Musical Talent (Seashore, Lewis, & Saetvert, 1960) to identify certain constructs of musical ability as predictors of reading achievement. The correlation between the Seashore subtest, and reading, were significant *($p < .01$ level).* It should be noted that the criterion for reading achievement was not discussed. The parallels between the Seashore subtest, and reading areas, were not explained. The researchers' decision to use a music-ability test to predict achievement appeared to be rather arbitrary.

Scott (1991) conducted a study to determine the impact of Suzuki violin instruction, creative movement activities, and preschool attendance on attention and perseverance behaviors in preschool children. The subjects were ages three through five ($N = 80$). They were selected from five area preschools, representing diverse districts of the city. The students were divided into five groups ($n = 16$). The study's premise suggested early music education and instruction might accelerate and improve their cognitive and psychomotor skills.

In Experimental Group One, subjects studied Suzuki privately for four months, and attended preschool. Experimental Group Two consisted of students who attended both private and group Suzuki instruction. In Experimental Group Three, students were given 45 minutes of creative movement per week. Experimental Group Four just had preschool instruction during the day, and did not receive any music instruction. Control Group students remained at home and had neither preschool nor musical experience.

Groups One through Four were observed during their instructional periods. The teachers' behaviors were also observed. Observations were videotaped and analyzed by the researcher at a later date. Students were asked to perform attention and perseverance tasks.

For the attention tasks, students were asked to respond to unpredictable signals in the form of colored light cues. Each colored light signaled the student to stack colored rings on a particular dowel. The time span gradually decreased between light cues, as the session progressed. The students' responses were recorded on an observation form.
For the perseverance tasks, students were asked to replicate a block model. Children were videotaped during this task, and observations were recorded from the tapes. The children's scores were based on the likeness of their block reproductions to the model.

Results indicated a significant difference between task behavior in the Suzuki groups and the creative movement groups. No difference occurred in task behavior in the creative movement and preschool groups. A difference in attention tasks appeared between the Suzuki group and the home group.

For the perseverance tasks, a significant difference took place between the second Suzuki group and the other groups, in amount of time spent completing the tasks. Also, there was a notable impact of teacher approval on attending behaviors surfaced. Based on these results, the researcher suggested that the Suzuki approach to teaching might provide a pedagogy and philosophy, which had a positive impact on attending, perseverance, and other learning behaviors. The approach used techniques in modeling, parental involvement, sequencing and mastery of each learning step.

This investigator's review of the general transfer literature indicated recurring methodological problems: (a) careless reporting of data because of inadequate descriptions of procedures and instructional content; (b) lack of specification of which broad cognitive strategies learned in music are to be considered for transfer; (c) poor bias control, including uncontrolled variables, and failure to pre-assess students' abilities; and (d) the use of inappropriate research designs.

There were two final observations in this area. According to Wolf (1978), the general transfer of music learning appears to be based on the assumption that the mind is composed of separate cognitive areas (i.e., attention, memory, and reasoning) which can be exercised and developed. Recent neurological findings challenged this assumption by suggesting certain cognitive centers, although independent, might be related in a way not apparent to present technology (Sargeant, 1992). Also, one must consider the fact that general music transfer did not specify specific skills and concepts, which might be generalized from one area to another. This made it very difficult to embrace the idea of a cause-and-effect relationship between music learning and other areas.

Specific Skills Transfer

Researchers have also been concerned with transfer of specific skills and concepts to other academic areas. Most specific transfer studies explore similarities and differences between the skills and concepts used in music and language arts. Researchers have considered the possibility that specific musical knowledge might provide conceptual cues for other learning (Tunks, 1992). Skills and concepts believed to transfer from music to language arts are:

1. Aural perception and discrimination.

   The ability to recognize and distinguish different sounds

2. Visual perception and discrimination.

The ability to distinguish shapes, sizes, patterns of shapes and symbols, and a basic sight vocabulary based on patterns of symbols

3. Sequencing skills.

   The ability to order, rank, and arrange elements

4. Oral skills.

Experiences with a great variety of spoken words and meanings prior to reading, the ability to articulate spoken words, and the ability to communicate feeling through vocal stress and inflection, and facial expression (Fry, 1977).

The following discussion highlights skills and concepts learned in music, which are thought to generalize to the language area. In addition, insight is provided concerning methodological problems encountered in the investigation of specific music transfer.

Aural Discrimination Transfer

Aural discrimination has been described as the ability to distinguish different sounds (Trehub, Endman, & Thorpe, 1990). Most aural discrimination tasks require students to detect differences between two sequentially-presented stimuli (Boyle & Radocy, 1987). Aural discrimination transfer assumes the processes used to discriminate sounds in music are similar to those used in discrimination of sounds in language arts (Slawson, 1968, 1985; Wolf, 1978). Studies have been conducted which explore these commonalties.

The possibility of skills similarity between the two content areas was the focus of McDonald's (1975) article suggesting skills common to both areas were aural discrimination and listening. Auditory skills were defined as (a) the differentiation of letter sounds, and (b) the recognition and pronunciation of words. Listening skills include (a) the ability to follow instructions, (b) repeat the main idea, and (c) follow the sequence of a song or story.

A phoneme is defined as the unit of significant sound in a language, which forms the basis for alphabet, sounds (Dallman et al., 1974; Fry, 1977; McMahon, 1979). McMahon suggested pitch was the basis for phoneme discrimination. Word recognition may depend on auditory discrimination of slight differences in phonemes, or acoustic cues, thereby suggesting a relationship between discrimination of language sounds and ability to match pitch.

The experiment focused on two intact classes. Sample size was not given. All participants were trained to discriminate major-minor chord changes in the 26 sessions which took place over 13 weeks. Each training period lasted two to four minutes, and occurred twice daily. Students were expected to transfer their ability to discriminate chord changes to language discrimination skills, such as auditory sequential memory, discrimination of sound blends, speech, and word recognition. Students were subsequently tested in these areas. Results suggested specific transfer might have occurred from differentiating chords in music, to the language ability to differentiate sound blends and words. No transfer to speech emerged.

McMahon acknowledged weaknesses in her research design, and problems of different teaching styles among the trainers and test administrators. Also, she accounted for the bias created by word and sound discrimination training, by suggesting it may have been part of the regular first-grade curriculum.

Madsen et al. (1975) were in agreement with the premise that pitch discrimination skills could be helpful in acquisition of auditory discrimination skills. They suggested through systematic application of music to stories, tonal pairs, homonyms, or words similar in sound, that a student's ability to discriminate between similar-sounding words, and ability to remember details of a story, would be enhanced. Additionally, the researchers reported discrimination ability for tones and melodies might develop prior to language, and could serve as a building block for language discrimination.

In addition, to the sample size *($\underline{n}$ = 216)*, a contact control group was documented. According to the authors, the contact control group received listening skill instruction but no other incorporated treatment. Several replications were reported. Independent variables were: (a) word repetition, (b) words paired with tones, (c) words used in a story, (d) words set to music in a story, and (e) a Distar SRA Program (Thurston, Givens, & Thurstone, 1973). Treatment implementation spanned 12 minutes a day, for 5 days. All participants were placed on a reinforcement schedule, which began, on the first day, with five *M&M's*® for paying attention. Reinforcement was progressively reduced by one candy each day, until the end of the procedure.

Results indicated tonal pairing significantly increased students' ability to discriminate words similar in sound. Other findings concluded the traditional method, defined as repetition of words, appeared inadequate when compared to the song method. However, the limited time of the Madsen et al. study, called forth uncertainties about any lasting changes. Introduction of reinforcement, as another variable in the study, also raised doubts about the direct cause-and-effect relationship between treatment and outcome.

Turnipseed (1976) based her study on the assumption that auditory acuity was the leading factor in reading readiness. To test this assumption, the researcher created a classical music listening experience. The experimental group encountered a series of classical listening experiences, while the control group did not. Results suggested those students participating in the program scored higher on standardized tests of reading and language arts, as well as improved their classroom grades in reading and mathematics. Although Turnipseed claimed the transfer effect, no specific music skills were identified as the source of transfer.

The Pelletier (1963) study investigated the impact of pre-fiddle instruction on students' ability to discriminate phonetic sounds. Although no significant differences were found between treatment and non-treatment groups, Pelletier suggested the data supported the notion of pre-fiddle instruction having a greater impact on low-achieving students. It was not evident from the report if any student pre-testing took place. The impact of music instruction on phonetic discrimination and articulation skills of African-American, inner-city children, was the focus of a study by Marsh and Fitch (1970).

Results suggested music aided development of the auditory discrimination skills needed for phonetic discrimination. Educational implications implied music might be used as an effective tool to teach standard English phonetic discrimination and articulation skills to inner city, African-American children.

Wagley (1978) explored adding music to a pre-reading program in order to aid in the learning of sound-symbol (alphabet sounds) among preschool children. The four and five-year-olds were enrolled in two different day-care centers. They were divided into two groups. While the control group had no music instruction, the experimental group had music instruction embedded into the reading program. The Creative Action Reading Program became the curriculum for both schools.

The Spache Diagnostic Reading Scales (Spache & Spache, 1981) were listed as the pretest and posttest instruments which, purportedly, measured students' understanding of sound-symbol relationships. The Kuhn Response Figures Test (Kuhn, 1978) measured students' enjoyment of the learning procedure. The experimental group performed slightly better than the control group in understanding alphabet sounds on the post-test. Student response on the Kuhn test indicated a higher level of instruction-with-music enjoyment, as compared to instruction without music.

Methodological problems evident in this study of auditory discrimination, included (a) the inadequate length of the studies, (b) lack of pre-test data, and (c) lack of clarity in defining specific musical skills to be tested.

<u>Visual Discrimination Transfer</u>

The belief that common elements existed between visual discrimination in music and language also formed the core opinion in the transfer of visual discrimination skills and concepts. Skills perceived to transfer between the two disciplines, included (a) left/right eye directional movement, (b) icon and symbol discrimination, (c) recognition of patterns and sequences of letters, and (d) development of a sight vocabulary.

Monroe (1967) and Stern (1972) have written curriculum guides based on perceived commonalties between music and language visual processing. Monroe explored the generalizability of left-to-right eye movement, and sight vocabulary skills. Stern investigated how generally accepted concepts, developmental steps, and the philosophy of reading programs could relate to music. No evidence of implementation and evaluation of either curriculum surfaced in reports.

Sharman (1981) explored types of activities used in music learning, which could assist in reading skills. The author identified the use of (a) note reading charts, (b) flash cards with rhythmic sequences, and (c) flash cards containing pitch representation, as the type of music learning activities which train eye-directional skills, and symbol and pattern recognition. No transfer is reported to have occurred

In a Hungarian study with preschool and kindergarten children, Kokas (1968) tested the impact of Kodaly Method instruction on visual perception. The Test of Observation (Kokas) required students to perform tasks of picture matching and picture reproduction with tiny magnetic pieces. The first experiment was reported to be statistically significant, while the second was not. Accuracy of these results were suspect, as there was record of no pre-test information, nor validity or reliability figures provided for the researcher-designed test.

Kalmar (1969) conducted a more recent study with Hungarian preschool children. She investigated the impact of musical training on primary, secondary, and tertiary adjectival meaning in preschool children. Kalmar reasoned the skill of verbal labeling, used in music and involving understanding of a secondary or metaphorical meaning of certain adjectives, should generalize to adjectival learning in reading. For example, a student learns ‘high’ can mean an elevation in physical distance from the ground, or elevation of pitch. She further suggested symbolic rhythmic movements and gestures used in music would also assist in understanding of descriptive terms.

Forty students, ages three to four, were given a pre-test in which they were expected to select pictures which matched adjectives used by the test administrator. Adjectives were used to define dimensions in length, depth, loudness, and weight. The adjectives were also used to describe certain concepts in music. Then, students were divided into (a) an experimental group who received special music instruction and (b) a control group who only received standard nursery singing activities.

Results of the two and one-half year study indicated the experimental group made considerable progress in their ability to select pictures describing adjectives. The control group made no progress. According to Kalmar, the experimental group exhibited acquisition of secondary and tertiary meanings of adjectives. The author concluded structured activity, based on integration of singing, rhythm, movement, and symbolic play, between the ages of three and six, might foster semantic conceptual development in language. The small size of the group ($\underline{n} = 40$), and the researcher’s failure to report controlling for maturity and outside classroom instruction, weakened the generalizability of the results.

Wolf (1978) questioned the need to use music to develop visual discrimination skills. She suggested such training could be developed by focusing children’s attention on any type of detail. She identified the casual factor for the discrimination gains as attention to visual detail in general, and not, necessarily, to music.

Sequencing Skills Transfer

The sequencing skills presumed to transfer between music and language are those associated with the ability to reproduce melodic and rhythmic sequences, and discriminate forms. Generalization of sequencing skills addressed in a study by Hurwitz, Wolff, Bortnick, and Kokas (1975) explored the impact of the Kodaly Method on development of temporal abilities, spatial abilities, and academic achievement. The hypothesis tested proposed that early music training, which placed an emphasis on rhythmic motor activities, had a positive influence on sequencing behavior. Researchers further suggested the impact of this training would be demonstrated, not only, in music but in other academic areas as well.

The subjects were 40 first-graders of normal intelligence, without known learning disabilities, who were matched for IQ, social class, and rank in family. The experimental group received 40 minutes of Kodaly Method instruction per day. There was no description of the control group's activities.

Motor sequencing ability tests involved having the child tap a steady beat on two mechanical keys. Two other tests involved (a) tapping to a metronome, and (b) tapping with increased speed. Determination of verbal perceptual sequencing ensued from testing repetitive tasks which had become automatic through training. A sequencing task involved naming repeated objects by identifying three familiar pictures (fly, tree, and cup), presented 100 times in random order, on 8 1/2 by 11-inch index cards.

Results indicated a significant difference in spatial-temporal skills between the experimental and control groups. For two years, reading achievement in the experimental group remained higher than that of the control group. Researchers concluded the rhythmic tonal and visual sequencing activities used in Kodaly Method instruction generalized to the reading area. Problems with the methodology included (a) small sample size, and (b) poor reporting of control group instructional procedures.

Hahn (1972) studied sequencing ability by exploring the impact of melodic and rhythmic sequences in a folk song on language acquisition of older children. The students were divided into two groups and instructed differently. One group received isolated German vocabulary words in dialogue, while the other group received the new words in the song. Analysis of their test scores suggested the students who learned the words within the sequential content of the folk song performed better than the other group of students.

The impact of repetitive rhythmic sequences on learning social studies facts was the focus of a study by Battle and Ramsey (1990). Two classes of sixth-grade students ($\underline{n} = 60$) were divided into two treatment groups. Researchers used an experimental pre-test/post-test design.

The control group received instruction in social studies lessons according to curriculum guidelines and traditional teaching methods. They were required to read the text, memorize facts, and be tested at the end of the study. The experimental group, also, were required to read the text, but were taught the facts in the form of a rhythmic rap.

After three treatment sessions, the students were re-tested. Students who learned the facts in the rap style, scored significantly higher ($\underline{p} < .001$) on the post-test than those who did not learn in the rap style. Small sample size (n = 40) and inadequate time frame were problems evident in the study.

Oral Skills Transfer

Some studies explore transfer effects of oral skills learned in music, on oral language development. Several discuss the impact of music instruction on the correction of developmental speech and articulation delays.

Blanton's (1962) study explored the relationship of music to spoken language. Blanton suggests language and music were learned through imitation and, therefore, required similar skills. The researcher identified first and second-grade students with articulation defects through pre-testing. Two control groups underwent the speech correction process. A substantial percentage of the treatment consisted of music. Results suggested music instruction was in part, responsible for speech improvement.

Kelly's (1981) study focused on the impact of Orff-based instruction on oral reading skills. Sixty-two first-graders were divided into three groups. The control group did not receive music instruction. Experimental Group One obtained visual instruction three times per week. Experimental Group Two received Orff-based music instruction for the same amount of time. Upon completion of the study, the students were administered the oral and silent reading sections of the Botel Reading Milestones Test (Botel, 1987). A positive correlation appeared between the music treatment and the oral reading sections of the test. However, no specific music skill could be identified as having an impact on a specific oral reading skill.

Hoskins (1985) investigated the impact of singing on development of expressive spoken language in language-delayed preschoolers. Sixteen preschoolers with language difficulties were given 30 minutes of singing instruction 3 days per week. Instruction emphasized antiphonal expressive singing. The pre-post-test design utilized measures of word expression, melodic imitation, and rhythmic imitation. Results indicated that melodic development increased, as did spoken expression, thus implying a strong relationship between spoken and melodic development.

The Movesian study conducted in (1967) investigated aural, visual, and oral skills learned in music, which might impact reading vocabulary, comprehension, and oral language. First, second, and third-grade students were study subjects. Two standardized achievement tests, and a researcher-developed music test, were used to assess pre-test abilities. The experimental groups were taught using the Movesian Classroom Music Reading Method. This method, designed by the researcher, employed the use of resonator bells and large charts with step-by-step procedures for learning to read music. Results of the experiment indicated a significant ($p < .001$) gain for third-graders on the standardized reading test. All other experimental groups gained more on the test than the control groups did.

Groff (1977) criticized the Movesian study because of apparent weaknesses in procedures and designs. The description of procedures used to train the control group teachers suggested they did not receive the same amount of material and training as the experimental teachers. Groff also pointed out the omission of a report on the size of the sample, and no reliability scores for the researcher-designed tests.

In 1981, Wooderson compared the effect of musical and nonmusical media on word reading skills. The subjects were 261 first-graders. Five intact classes were randomly-assigned to one of five treatment groups. No significant difference existed between groups, according to pre-test results, which were determined by an analysis of variance.

All of the groups were given a word list. There were five levels of treatment:

1. Experimental Group One received 7 seconds of oral word instruction, 8 seconds of the word presented in a sung jingle, and a 15-second visual presentation of the word printed on a slide.

2. Experimental Group Two received 7 seconds of oral word instruction, 8 seconds of the word in a spoken jingle, and a 15-second presentation of the word printed on a slide.

3. Experimental Group Three experienced a 3-second instrumental cue, 7 seconds of oral word instruction, 5 seconds of an instrumental melody, 10 seconds of the word on a slide, and 5 more seconds of musical instrument cues.

4. Experimental Group Four received 7 seconds of oral word instruction, 7 seconds of silence, 7 seconds of a kaleidoscopic written word on a slide, and 8 seconds of silence.

5. Experimental Group Five became a no-contact control.

Results of the study showed a significant difference between groups ($p < .001$). The Neuman Keuls Multiple Range Comparison results showed the test performance of students in Experimental Group Three, the instrumental cue group, ranking highest in both schools. Wooderson (1981) reported Group Three had the least exposure to words, but ranked higher than the other groups in test performance. A significant difference resulted between the four treatment groups, and the control group. Wooderson concluded music, musical instrument cues in particular, can act as a facilitator of new word knowledge.

Standley and Hughes (1997) identified preschool students, ages four and five; to participate in a study seeking to demonstrate the impact of concentrated music instruction on pre-reading and writing skills. The design of both The Early Intervention Program (Leon County School District, 1997), and Exceptional Student Education Program (Leon County School District, 1997), specifically addressed the needs of the diverse educational population commonly found in US preschools. The researchers cite studies which used music to teach early childhood skills to a culturally-diverse preschool population. Included skills were (a) social interaction and communication skills (Standley & Hughes, 1996), (b) academic knowledge (Harp, 1988), and (c) reading skills (Culietta, 1995).

Two classes, (n = 15) and (n = 17), of pre-kindergarten children served as subjects for the study. The children were described as economically disadvantaged, and victims of substance exposure. Some were subjected to emotional and physical neglect and displayed hyperactivity and speech disorders. Others were children of migrant workers.

The subjects were pre-tested using (a) Print Awareness for Logos (Freeman & Whitesell, 1992), (b) Print Concept Checklist (Clay, 1988), (c) the children's book, What's Up in the Attic? (Alexander, 1987), and (d) the Developmental Writing and Language Skills Checklist (Rhinehart, Thomas, & Wumpher, 1992). The tests assessed student recognition of fast food logos, knowledge of procedures for reading a book, and abilities with written communication. Students were tested individually by trained assessors.

During the fall semester of the school year, pre-reading and writing skills were taught through music to one group. Songs and specific activities were used to introduce each skill, which included (a) the recognition of alphabet sounds; (b) writing, using innovative spelling; (c) visual awareness; (d) directionality; (e) phonemic awareness; and (f) reading and book handling. The lessons were 30 minutes in length, of which 20 minutes were devoted to development of language skills, and 10 minutes were designated for music therapy activities. Group B became the control group, and received regular preschool instruction. Group B received neither music activities nor instruction through music.

During the spring semester, the experimental group did not receive treatment. The control Group B received treatment. However, by spring semester, the children had already been instructed in alphabet sounds. Therefore, book handling, writing skills, and reading awareness was the primary focus.

Researchers reported a significant difference between the experimental and control groups in the fall measurement for writing and language skills ($p < 05$). The group that received treatment in the spring also made significant gains compared to the pre-test. After instruction ceased, no significant gains were made in either group. Researchers concluded music significantly enhanced pre-reading and writing skills of preschool children. Students were reported to exhibit a joy for learning not apparent during traditional instruction. Researchers strongly suggested further research be performed to determine the potential of music as a facilitator of learning in other academic areas. Based on findings in the literature reviewed, Table 1 illustrates skills which are possibly common to learning in music and learning in the language arts.

Summary of Methodological Problems Evident in the Learning Transfer Literature

Many of the studies had design flaws, and some were acknowledged by the researchers. Flaws were not surprising. The nature of educational research presents pre-established classrooms and an endless number of variables which cannot be controlled.

The most obvious design flaw surfaced as a lack of clearly-defined variables. Most studies did not present a clear description of which cognitive strategies, concepts, or skills learned in music possibly generalized to other content areas. In some instances, lack of control for bias existed. Several investigators served as teachers for both the experimental and control groups. Others did not include pre-testing as part of their procedure, thus withholding baseline conditions to which treatment effects could be compared.

Many of the studies did not consider factors, such as maturity, change in student population, and impact of outside instruction. Small samples and inadequate time frames were additional problems limiting generalizability of the studies. Several studies were carelessly reported. The most frequently omitted data, was any description of the control group's activities.

Incomplete descriptions of methods used in the research, and omissions of sample size data, were detrimental to the credibility of many findings. Table 2 is a summary of methodological problems found in the non-musical outcomes literature from 1961-1998.

Table 1

Possible Skill Similarities Between Music and Language Arts

Music	Language
Aural perception	
The ability to distinguish different sounds: pitches, harmonies, timbres, duration, and amplitude.	The ability to distinguish different sounds: initial, final, and medial rhythms, vowels and qualities of consonant sounds, blends, and words.
Visual perception	
The ability to distinguish shapes and sizes, iconic representations of form, sound, and notation. The ability to recognize patterns of icons.	The ability to distinguish shapes and and sizes. The ability to recognize language symbols, and patterns of letters.
Sequencing skills	
The ability to order, rank, and arrange symbols into rhythmic and melodic patterns, phrases and, eventually, forms.	The ability to order, rank, and arrange language symbols into words and phrases, sentences, and paragraphs.
Listening skills	
The ability to hear a composition, identify musical themes, motives, and describe the style and forms.	The ability to hear a story, relate details, themes, plots, and identify literary styles and forms.

Table 1 continued

Music	Language
Oral skills	
Students must experience and perform a variety of music and understand its meaning before attempting to read and write it. The ability to articulate musical sounds in logical patterns and thoughts. The ability to communicate feeling through musical stress, tone colors, dynamics, and inflection.	Students must have a great deal of experience with the spoken word and understand its meaning before attempting to read and write it. The ability to articulate the spoken word in logical phrase and thoughts. The ability to communicate feeling through vocal stress, vocal color, and inflection.

Table 2

Methodological Problems in Nonmusical Outcomes of Music Literature From 1961 to 1998

Problems	Number of times occurred	Percentage
Variables not clearly-defined	16	50%
Lack of bias control	13	44%
Faulty or incomplete data reporting	9	26%
Small sample size	5	15%
Inadequate time frame	22	69%

Note: Total Studies Reviewed 32.

Neurological Evidence of the Nonmusical Outcomes Research

For years, opponents of nonmusical outcomes research have referred to neurological studies suggesting separate brain centers for different types of learning (Luria, 1974). These researchers have further argued there was no physical evidence of music's impact on other learning (Tunks, 1992).

Brust (1980) suggested conclusions reached by earlier researchers were due to their tendency to minimize the complexity of music processing. He based this opinion on his historical survey of the literature and his qualitative research in this area. Brust investigated behaviors of patients with aphasia and amusia. He defined aphasia as the loss of speech and writing functions and amusia as the loss of music functions.

However, his patients did not simultaneously experience the loss of analytical music functions, such as pitch, rhythm, note reading, and writing, along with what Brust considered to be similar speech functions. Patients, who had lost speech and language-related reading and writing functions, could, often, still read, write, and perform musically. Based on these findings, Brust concludes although the processing of music and language may occur in fairly well-defined areas, the research is not conclusive as to their possible impact on one another.

Recent medical developments in the field of neuro-imaging may offer physiological evidence of Brust's (1980) theories regarding complexities of musical processing in the brain. PET and MRI scanning technology produce images of the brain suggesting physical evidence of music learning simultaneously stimulating nonmusical areas involved in higher-order thinking, spatial perception, and some aspects of language (Barwick, Valentine, West, & Wilding, 1989; Rauscher et al., 1995; Sargeant, 1992). Developments may also support nonmusical outcomes research by providing a possible physiological basis for theories of transfer, and curriculum trends toward interdisciplinary learning.

Sargeant (1992) conducted an experiment to determine areas of the brain involved in sight-reading, as done by trained keyboard musicians. Through the use of an MRI, she determined when pianists translated notations visually and auditorially into movement patterns on a keyboard, activation resulted of cortical areas distinct from, but adjacent to, those underlying similar visual and auditory verbal operations.

The images of separate, but adjacent, processing areas, offered support to Brust's (1980) findings which revealed brain damage in musicians can effect analytical language, but not analytical music functions. The findings also supported results of research studies suggesting left-brain dominance of notation processing by trained musicians (Preis, 1984). Additionally, the images revealed simultaneous stimulation of both verbal and analytical music areas with music. Also, the close proximity of one area to another became evident. Results of Sargeant's (1992) experiment prompted her to hypothesize that the analytical musical and verbal areas might be connected to an underlying neural network, thereby suggesting the possible impact of one on another.

Rauscher et al. (1995) conducted a behavioral study exploring impact of listening to different types of music on higher-order thinking skills. In neurological background information, the researchers suggested the cortical column is the basic neural network of the cortex. The cortical column has been reported to be comprised of mini-columns, or trions. Each trion has been said to consist of hundreds of neurons which encode the parameter of the stimuli. Each network has been reported to have large repertoire of inherent, some-what stable, spatial-temporal firing patterns which can be excited. These inherent patterns have been thought to form the common neural language of the cortex.

In an earlier, but related study, Leng and Shaw (1991) proposed musical stimuli could, at an early age, access these inherent spatial patterns, and enhance the cortex's ability to accomplish further pattern development. Enhancement of these inherent spatial-temporal patterns were thought to improve higher brain function and, possibly, provide long-term enhancement of nonverbal cognitive activities (Rauscher et al., 1995).

The authors performed a behavioral experiment, based on these theories, to determine if short-term musical stimuli could enhance pattern development. The Stanford Benet Intelligence Test (Delaney, Hagen, Hopkins, Sattler, & Thorndike, 1986) was the source of 16 paper folding, and cutting tasks used for 79 college students. They used the subtest because it suited the researchers' concept of behaviors indicative of spatial development. Students were divided into three groups. Experimental Group One listened to a 10-minute excerpt of Mozart Sonata K488. Experimental Group Two listened to 10 minutes of different compositions, ranging from compositions by Phillip Glass to an audiotaped story, daily. The control group sat in silence. After four days of treatment, all of the students were asked to repeat the paper folding and cutting tasks.

There was a 62% increase in task performance from day one to day two for Experimental Group One ($p < 0.0001$). The increase for the silence and mixed composition groups registered at ($p < 0.01$), significantly less. The researchers also reported EEG analysis showed different music was processed in different cortical areas. For example, Mozart is processed in a very different way than Schoenberg.

The experiment results led Rauscher et al. (1995) to conclude:

1. Listening to certain types of music helps organize the cortical firing patterns, thereby enhancing the process of spatial-temporal performance.

2. Music acts as an exercise for exciting the cortical firing patterns responsible for higher brain function.

3. The cortical operations, among the inherent spatial-temporal patterns, are enhanced by music.

4. Early music training may provide long-term enhancement of children's cognitive abilities. The researchers also speculated that music, perhaps, was the key to the code, or internal language, of higher brain function.

In a study by Altenmüller et al. (1997), the impact of musical stimulus on cortical activation patterns was also explored. The researchers reported prior findings indicated trained musicians processed music analytically, primarily using the left hemisphere, while untrained listeners processed sounds more globally, with a right hemispheric preference (Bernsteiner et al., 1994; Peretz, 1990). The study attempted to determine, through EEG measurement, if the cortical activation patterns of a learner taught musical concepts verbally would differ from those of a learner taught musical concepts musically. Their hypothesis suggested different ways of impacting musical learning would cause different mental representations in the memory of the learner. Those representations would be manifested on the EEGs as different cortical activation patterns.

Subjects for the study were nine right-handed students from seventh and eighth grade. There were 4 males, 5 females, with a mean age of 13.8. All subjects had the same general level of education. Musical aptitude tests were conducted with Gordon Advanced Measures of Music Audiation (Gordon, 1989), and all subjects were found to be comparable. A highly reliable EEG technique assessed subjects' brain activity, details of which may be found in Altenmüller (1993).

The task of each subject centered on increasing his or her ability to accurately identify a properly structured musical period. The musical period was defined as a short symmetrical melody with rhythmically and melodically corresponding parts. Characteristically, the musical period contained an antecedent and consequent phase.

Subjects were divided into three groups of A, B, and C; (n = 3) for each group. The pre-test consisted of 60 short melodies, 8 bars each. There were 30 correct melodies, and 30 incorrect ones. Subjects were asked to consider whether the tunes sounded well-balanced and closed. Correct responses were A (n = 40), B (n = 41), and C (n = 41), During the treatment phase, subjects in Group A were verbally instructed on the structure of a musical period. They were required to give their answers verbally. Group B's musical instruction on the structure of a musical period transpired through clapping, singing, and improvising. They were required to give their answers in the form of a musical response. Group B did not utilize any isolated verbal communication. Control Group C received no instruction. At the end of five weeks, subjects were post-tested with the same instrument. Response improvement occurred in Groups A and B, but not in Group C. Results were: Group A (n = 50), Group B (n = 51), Group C (n = 41.6).

As subjects responded to questions, they were monitored on the same EEG instrument. Although no significant difference appeared in test scores of Groups A and B, the cortical activation patterns, as measured by the EEG, clearly differed.

In the pre-test measurement, EEG reports indicated melody processing of all three groups produced widespread activation of all brain areas, especially in the frontal lobes. The images revealed no hemispheric dominance. During post-test measurement, activation patterns clearly differed between groups at the ($p < .001$) level. In Groups A and B, there were great activity increases over the left and right frontal cortex. Group A showed a pronounced increase over the left frontal region. Group B showed a noticeable increase over the right frontal region. Group C showed an overall decline in cortical activity. Results led researchers to suggest (a) music learning procedures produce changes in cortical activation patterns, and (b) different teaching procedures produce different mental representations of music which are reflected, through EEG readings, in distinct cortical activation patterns.

In a test administered one year later, Group B subjects showed better retention of knowledge than Group A subjects. These results indicate knowledge processed using both hemispheres is, possibly, more lasting than knowledge incorporated with only one hemisphere. The researchers define implications of the research as follows:

1. There is a need to explore the use of musical learning, not just for its own sake but as a powerful tool to develop numerous neuronal networks and, ultimately, facilitate other learning.

2. Verbal knowledge, processed with the aid of music, lasted longer than verbal knowledge processed alone.

Neurological studies, although costly and limited in widespread applicability due to small sample sizes have provided a critical avenue for exploration by those involved in nonmusical outcomes research. The implications of neurological findings for nonmusical outcomes of music research were:

1. Further research must be done to determine the relationship, if any, between the verbal and analytical music skills processing centers because of their close proximity.

2. EEG patterns, MRI, and PET images reveal stimulation of nonmusical brain areas by music. These findings may provide physical evidence of nonmusical outcomes research. Further studies must be done to determine the nature of the possible impact of music on other learning.

3. The theory that music acts as a preconditioning stimulus for all learning, suggests a critical need for early music learning.

4. If learning verbal information through music creates different (cortical) patterns of learning, then teaching through music must be explored as an alternative

teaching method for children with learning difficulties.

Acoustical Similarities Between Phoneme Quality and Musical Timbre

The purpose of this section is to explore the possible acoustical similarities between musical timbre and phoneme quality. Psychoacoustic research findings for potential structural similarities between musical and phoneme sounds, have yielded more concrete evidence of perceptual skills similarities.

Clarkston et al. (1988) defined timbre as the distinctive quality differentiating one complex sound from another of equal pitch, duration, and loudness. Slawson (1968) reported that the characteristic quality of each instrument and phoneme sound was due to certain invariances in the harmonic structure of the sound. Timbre has also been described as a complex multidimensional quality of sound (Plomp, 1976; Slawson, 1985). Numerous adjectives have been used to describe the quality of sounds. Most of these adjectives have been determined by multidimensional scaling studies, designed to filter out specific attributes of instrument and phoneme sounds (Bismark, 1974; Grey, 1978, 1978; Klein, Plomp, & Pals, 1970; Miller & Cardette, 1995; Plomp, 1976; Shepard, 1974). Dimensions used included brightness, sharpness, openness, roughness, acuteness, and a plethora of others.

In addition to the dimensions of sounds, there were five parameters defined by psychoacoustic studies, which seemed to have emerged as the determinants of timbre, or quality of sound. They were (a) the range between tonal and noise-like character of a sound; (b) the spectral envelope (the arrangement of the fundamental and harmonics in a sound); (c) the temporal envelope (the rise, duration, and decay of the sound); (d) changes in the spectral envelope (modifications to the fundamental and harmonics in a sound); and (e) the prefix (the initiation, or attack, associated with the onset of sound).

Studies in musical timbre discrimination were initially patterned after speech perception studies of vowel sound (Erickson, 1975). In an attempt to justify use of speech studies as paradigms for their studies, musical acoustics researchers offered the following rationale: (a) The steady state, or sustained sounds of vowel and music sounds, were similar; and (b) although perceived in different contexts, both music and vowel sound were perceived in a similar manner (Helmholtz, 1954; Plomp, 1976; Slawson, 1968, 1985).

Slawson (1968) conducted auditory studies on the perception of vowel and musical sounds with musicians and non-musicians. Subjects were asked to discriminate differences between sustained synthetic vowel, and musical sounds. They were assigned the task of rating sound quality differences between pairs of vowel and instrument sounds. Experimental Group One rated the pair differences in terms of vowel sound. Experimental Group Two rated the pair differences in terms of musical instrument sound. At the conclusion of the tasks, both groups were polled, and asked if they heard sounds other than those they were told to listen for. All, with the exception of one, responded negatively.

Results of the study suggested (a) the discrimination of vowel quality and musical timbre were similar perceptual functions, and (b) perception of sound was a function of the context in which they are heard. Slawson (1968) concluded the complex auditory attributes, known as musical timbre, were identical to the complex attributes known as vowel quality. Slawson (1981) supported the argument that musical timbre and vowel quality were similarly perceived, and suggested the perception of timbres of the steady states of vowels, phoneme, and instrumental sounds were so similar, they should be classified by the all-inclusive term of sound color.

Attempts have been made by researchers, based on the findings of suggested similarities in perception, to determine which acoustic parameter, common to both musical timbre and vowel quality was the most critical to accurate identification of vowel and instrument sound. Results of the Clarkston et al. (1988), Plomp (1976), and Slawson (1968) studies, wherein they modified certain harmonic components of sound, suggested the most important determinant of instrumental timbre, and vowel quality was the spectral envelope.

The spectral envelope of a sound has been described as the result of interaction of acoustic energy from an energy source, usually a glottal attack, or attack of an instrumental sound, with some type of passive acoustical system or filter. The passive system was usually an instrumental or vocal resonator. Each passive system, in conjunction with its stimulus (source), produced a kind of harmonic template, or stamp, which it imposed on the energy reaching it from its source. This template was described by Slawson (1968) as the spectrum of the sound, and was identified as a primary determinant of the distinctive timbre, or quality, of each instrumental, sung vocal, or phoneme sound. Fundamentals and peaks were contained in this template, which were caused by resonances in the passive system. Peaks produced by the system were called formants. The line outlining and connecting these peaks, formed the visual representation of the spectral envelope (Clarkston, 1988).

Evidence from additional studies determined modifications in the spectral envelope changed the identifiable or characteristic quality, of vowel and instrument sounds. Slawson (1968) conducted a study to determine the invariance in sound qualities despite modifications to their spectral envelopes. The procedure presented the subjects with successive pairs of sounds which differed in their fundamental frequency, or formant structure. Each series of pairs had eight sounds corresponding to the vowels: [i], [ae], [a], [o], and [u]. The sounds were presented by tape. Volume and duration were kept constant. Subjects were instructed to numerically rate differences between pairs of sounds. Each pair's first sound had been unaltered; the second sound had been modified. Sound variations included (a) increases in the frequencies of higher formants, (b) shifting of frequencies of lower formants, and (c) modification or (d) exclusion of the fundamental frequency.

Results indicated changes in the lower two formants and removal of the fundamental frequency, resulted in the greatest amount of timbral, or quality, change in the sound. Changes in the higher formants did not have significant impact on the timbre or quality of sound. Slawson (1968) concluded the timbre of both instrumental and vowel sounds were a function of components of the spectral envelope.

Slawson's (1968) conclusions are supported by Preis (1984) who conducted research indicating the unique combination of fundamental and overtones found in the spectral envelope, is the single-most important cue for timbre. They suggest the spectral envelopes produced by phoneme and musical sounds, provide critical auditory information about the vocal tract, or musical instrument, producing the sound.

A study by Clarkston et al. (1998) partially focused on the function of the spectral envelope in determining timbre of vowel and musical sound. Earlier studies by Plomp

(1970) and Grey (1977) provided the foundation for research. Plomp and Grey's findings also suggested the spectral envelope might be the most important cue for discrimination of musical and vowel sounds.

In Clarkston et al.'s study, infants became conditioned to give head-turning responses when they heard differences in the quality of a series of complex tones. The differences in tonal structures were attributed to each synthesized complex sound, in terms of its fundamental frequency and formant content. Most often, alteration occurred in the two lower formants, or three highest formants, of fundamental frequency. Upon playing taped stimuli, each infant demonstrated the ability to hear changes in the quality, or timbre, of the sounds.

Researchers concluded alterations of fundamental frequency, and lower formants, caused the most-significant changes in sound quality. Also, their findings concurred with earlier studies indicating the spectral envelope being a strong determinant of timbre common to phoneme and musical sounds.

The prefix, or attack, associated with the onset of sound has, also, been identified as a significant cue for timbre discrimination in both areas. Since initiation of sound on a musical instrument, and initiation of consonant sound are similar in their production, Saldanha and Corso (1964) suggested the attack produced similar results, and may be discriminated with similar perceptual mechanisms.

Despite similarities between synthesized instrumental and vowel timbre, found in these carefully controlled experiments, it is important to note there are significant differences in the acoustical structure of natural vocal and instrumental sounds, which may impact discrimination. The vocal mechanism has been described as a weakly-coupled system. The source of sound, or stimulus, in this type of acoustical system reacts without resistance on the filter, or resonator. Since the resonator offers little resistance, changes in the stimulus changed the amplitude, but little else. Phoneme sounds, and sung sounds, are products of a weakly-coupled system. Also, vowel and consonant sounds are not sustained sounds when spoken normally. However, when they are learned by children in a classroom, they are often sustained, and may approximate sustained musical sounds (Erickson, 1975).

Instrumental mechanisms are strongly-coupled systems. The source of the sound sets the filter, or resonator, in motion, as with vocal mechanisms. However, the filter offers resistance to stimulus, and changes its impact through fingering, or bow changes, unlike the weakly-coupled system (Erickson, 1975). Yet, it is reported, certain double-reed instruments have resonances which are not impacted by their systems and approximate vowel sounds (Jannison, 1966).

In light of these differences between synthesized and natural/acoustical sounds, researchers explored the impact of synthesized timbre versus acoustical timbre on the aural discrimination of children. Student performance in melodic discrimination tasks, suggested no difference in melodic perception when students were presented with real, or synthesized, vocal and instrumental timbres. According to reports, students preferred the synthesized sounds. However, these studies explored impact of various timbres on melodic perception, and did not address possible impact of acoustic, or synthesized, timbres on phoneme quality discrimination (Falconer, 1993; Grice, 1996; Houlton, 1990).

Findings of psychoacoustic research on similarities between musical timbre and phoneme quality, were:

1. Perception of both alphabet quality and musical timbre, are based on discrimination of the structure of the spectral envelope.

2. Changes in structure of the envelope alters the timbre of both instrumental and phoneme sounds.

3. The prefix, or attack, of sounds in phoneme and music perception, provides a cue for discrimination on both areas.

4. Despite the differences in coupling systems for natural, or non-synthesized, vocal and instrumental sounds, there are instances when the steady-state portions of sound may approximate, or mimic, each other.

In view of the similarities noted between the two types of sound, implications of this research, are: (a) Musical timbre and phoneme quality may be discriminated using similar perceptual skills in language and music, and (b) since findings of perceptual similarity were based on synthesized phoneme/alphabet sounds, research using natural vocal and instrumental sounds, is needed.

Table 3 illustrates suggested structural similarities between musical timbre and phoneme quality sounds.

Developmental Similarities Between Musical Timbre and Phoneme Quality Discrimination

Recurrent research findings establish the spectral envelope and the prefix, or initial attack, of a sound as common elements critical to perception of sound qualities determining instrumental and phoneme sound color. The quality, or timbre, of both types of sound, it has been suggested, may be perceived using similar auditory processes. Proposed use of similar mechanisms to perceive vowel and musical timbre (Slawson, 1985), have suggested that both processes would require development of similar skills to assure accurate discrimination in both.

Selected literature explores development of cognitive skills necessary for musical timbre and phoneme quality discrimination. Since the focus of the studies incorporates pre-reading children, the literature survey only explores skill development in infants up through seven year-old children.

Musical Timbre Discrimination

Developmental studies of auditory music perception findings suggested involvement in musical experiences, before formal instruction, played an important role in acquisition of musical knowledge (Davidson, 1985; Davidson & Scripp, 1988 Pflederer, 1964; Zimmerman, 1993; Zimmerman & Schrest, 1967). Implications of this research were numerous aural activities, including (a) rote singing of songs, (b) differentiation of instrumental and vocal sounds, and (c) solfege and rhythmic response activities which should precede formal music reading instruction.

Research data suggested the amount and quality of musical activities experienced by the young child, had a direct impact on later musical achievement (Koklas, 1968). Due to regular exposure to music of our culture, studies indicated most preschool children had the sensitivity to perceive and interpret regularities in music, tonality, and changes in timbres (Smith & Cuddy, 1989).

An investigation by Cheour-Luthanen et al. (1996) explored responses of human fetus to sounds outside of the womb. Their discoveries suggested a fetus could discriminate sounds at 25 gestational weeks-of-age. The treatment used in the study presented a sequence of repetitive sounds, periodically varied with a different sound, to

Table 3

Psychoacoustic Sound Similarities Between Musical Timbre and Phoneme Quality

Musical timbre	Phoneme quality
Perception of the sound based on the discrimination of the characteristic quality produced by the structure of the spectral envelope.	Perception of the sound based on the discrimination of the characteristic quality produced by the structure of the spectral envelope.
Changes in the structure of the spectral envelope alters the timbre.	Changes in the structure of the spectral envelope alters the timbre.
The prefix, or initiation, of the sound provides a significant cue for accurate perception.	The prefix or initiation of the sound provides a significant cue for accurate perception.
There are instances when the steady-state portions of the sound mimic each other.	There are instances when the steady state portions of the sound mimic each other.
Research implies the use of similar perceptual skills, akin to those used in language to discriminate sound.	Research implies the use of similar perceptual skills, akin to those used in music to discriminate sound.

Studies (Kamora, 1991; Shahidullah & Hepper, 1994) reported fetal ability to respond to, and discriminate, musical sounds before birth. Kamora's study compared the effect music, as a fibroacoustic stimulation, had on fetal heart rate and movement. The experiment administered fetal fibroacoustic stimulation to 30 pregnant women at 26 gestational weeks-of-age, or greater. Based on indications of fetal heartbeat and movement acceleration, Kamora found music to be an effective stimulus for provoking fetal response.

Shahidullah and Hepper (1994) conducted four experiments to determine if 104 11 pre-term infants, at 25 to 34 gestational weeks-of-age. Recorded Auditory Event-Related Potentials (ERPs) indicated fetal brain response to sound changes.
pre-term infants, 27 to 35 gestational weeks-of-age, could discriminate between different pure tone frequencies (250 Hz and 500 Hz), and contrasting speech sounds. Subjects discriminated both pitch and speech sounds better at 35 gestational weeks-of-age, than those at 27 weeks-of-age.

The auditory perception process of timbre discrimination is evident in infants as young as two to three months old (Kuhl, 1979; Swoboda, Morse, & Leavitt, 1976). Evidence of timbre discrimination in infants were found in the Kuhl study, which suggested babies could discriminate changes in vowel sounds. Infants responded to changes in timbre with eye-blinking responses.

Clarkston et al. (1988) sought to determine when infants were first able to discriminate the timbre of complex sounds of identical pitch, and the acoustic information used to discriminate these sounds. Earlier findings (Grey, 1977), indicating the spectral envelope was the most-important acoustical cue for timbre, provided the basis for their study.

The 22 infant subjects (12 females; 10 males) had a mean age of 7 1/2 months. Synthesized-sound tonal complexes were tape-recorded for presentation to the subjects, and included six tonal complexes. Each complex differed in its fundamental frequencies, and number of formants. Modifications to the complexes encompassed removal of the fundamental frequency and/or selected formants.

Toy reinforcement conditioned the infants to turn their heads in response to different timbres. Lights appeared in darkened Plexiglas boxes in which the toys were housed when the infant gave the appropriate response. Two observers noted, then recorded, the infants' responses. Results indicated seven-month-old infants successfully discriminated timbres of sounds. Researchers concluded infants discriminate timbres of complex sounds based on the spectral, or harmonic, content cues from each sound.

Differences in quality, or timbre, of a sound depends on the complexity of its sound waves (Bernier & Stafford, 1972). A flute produces a relatively simple sound wave pattern, while an oboe produces a more complex pattern. In a study by Trehub et al. (1990), infants one to fifteen-months-old were tested for their ability to discriminate the timbres of different complex tones. The researchers, also, sought to explore infants' ability to use timbre as a basis for categorizing complex tones.

There were 40, full-term, Anglo, middle-income infant subjects who had a mean age of 7 months, 21 days, at the beginning of the study. Probe trials were conducted to determine if the infants had adequate attention spans. Babies were eliminated from the study if they were fussy, crying, or responding to less than four of the six practice trials.

Each infant received an assignment to one, of four conditions: (a) frequency variation 100 to 400 Hz, (b) duration variation 100 to 500 ms, (c) intensity variation 56 to 74 db, or (e) no treatment (the control group). The equipment consisted of a Commodore microcomputer and tone generator. The stimuli produced were complex tones. Audiotapes were prepared, with contrasting sounds on 1, of 2, channels. Stimuli were presented at the rate of one per second. Testing focused on infants' detection of tones that contrasted in complexity of structure, but were similar in other respects.

Research results indicated infants 7 to 8 months-of-age differentiated timbres of complex tones. They did so despite variations in frequency, duration, and intensity. The researchers pointed out the tones were presented arbitrarily, hence, results were not due to memorization.

Researchers suggested the study's findings indicated infants' ability to categorize static single tones by their timbre or shape of the spectral structure, may have implications for language learning. They suggested a possible parallel to the categorization of speech sounds, on the basis of their timbre (Kuhl & Hillenbrand, 1979). They further speculated since the processes may be similar, pre-linguistic listeners could use timbre as a basis for learning to process speech, music, and other auditory input.

Research in both music and language highlighted the importance of babble in language and music development. Babble, thought to be a spontaneous and hereditary activity, begins at about five months of age, and is thought to be indicative of the child's ability to respond to, and imitate, timbre, pitch, stress, and intonation in music (Davidson et al., 1981; Holahan, 1985; Loewy, 1995; Zimmerman, 1985).

During the developmental period, from 15 months through 3 years of age, infants begin to match aural sounds with picture representation. They demonstrate musical timbre skills by naming instruments in a picture book, or hearing the sound of an instrument and giving it the appropriate label (Davidson, 1985; Davidson et al., 1981; Davidson & Scripp, 1988; Holahan, 1985).

The Petzold (1966) produced one of the most significant studies on the auditory perception of children. The researcher investigated the melodic, harmonic, rhythmic, and timbre perception of children in the first through the sixth grades. The subjects ($\underline{n}$ = 509) were tested over a 5-year period, using 45 pitch patterns. In the timbre study, the contrasting sounds were piano, flute, violin, and voice. Responses to each evaluation indicated students' timbre skills increased at two-year intervals. This study indicated timbre perception is subject to developmental changes over time.

A developmental study by Hufstader (1976) explored existence of an auditory-discrimination-skills learning sequence in music. Examination focused on the development of timbre, rhythmic, melodic, and harmonic discrimination skills. Hufstader, also, sought to determine when the skills were acquired, in terms of grade level. The researcher assumed the rank order of mean scores would reflect the order in which the skills were acquired. Subjects were selected from four Midwestern school districts. There were 569 first, third, fifth, and seventh-graders. Classroom teachers served as test administrators, under the supervision of Hufstader (1976).

The author designed the Test of Aural Discrimination (TAPS) specifically for the study. TAPS measured a subject's ability to identify timbre, harmonic, rhythmic, and melodic alterations in pairs of musical sounds. Short musical excerpts were presented in pairs, and vary in terms of timbre, harmony, rhythm, and melody.

The students took the TAPS. The mean scores were ranked and, thereby, determined the learning sequence. Test results suggested the learning sequence began with (a) timbre discrimination, then progressed to (b) discrimination of rhythmic and melodic patterns, and on to (c) harmonic discrimination. Descriptive statistical findings led Hufstader (1976) to report this sequence occurred in 12 of 16 possible occasions.

Results gathered from inferential statistics indicated skills grew stronger at successively higher grade levels. Hufstader (1976) concluded timbre discrimination became established by the first grade, rhythmic and melodic discrimination by the fifth grade, and harmonic discrimination by the seventh grade. Implications of the research were that timbre discrimination skills developed during preschool years, and were appropriate skills to address with the proposed sample for this study.

Other developmental research in this area suggested preschool through first grade was a critical time for the development of timbre discrimination skills, and these skills improved with age. Loucks (1974) found five-year-olds discriminated sounds better than four-year-olds. However, four-year-olds were capable of identifying and discriminating timbres of different instruments.

Fullard (1967) trained preschool children to identify various orchestral instruments and categories of instruments. The study's focus investigated discrimination capabilities of preschool children. Fullard also sought to determine whether special techniques could be used to teach identification of complex aural stimuli, or timbre discrimination of musical instruments. There were two hypotheses for the study:

1. Programmed techniques could be used to teach preschool children to identify complex musical stimuli, specifically, orchestral instruments.

2. The identification of a second set of instrumental sounds (similar stimuli) would be facilitated by earlier training acquired in the discrimination of the first group of instruments.

The subjects were 10 preschool children, 4 females and 6 males, with a mean age of 51 months. All children were from middle-income, professional families, and one-half of the subjects had some prior musical contact. Students were randomly divided into experimental and control groups.

Researchers used the stimulus/reward method (Skinner, 1954) to conduct the experiment. The stimuli consisted of orchestral instruments divided into two groups: (a) violin, violoncello, and clarinet, (b) flute, viola, and French horn. Audiotaped solo, or group, performances demonstrated the instrument sounds.

In both the pretests and posttests, the children were directed to respond to sound by touching the appropriate instrumental picture, then naming it correctly. Instruments were presented in random order. To achieve a correct score, upon presentation of each instrument, students were required to verbally name it. Test results indicated a significant impact ($\underline{p} < .001$) of programmed instruction on children's instrument identification skills

To test the hypothesis of learning transfer, the six instrument sounds were divided into two groups of three each. Students were taught to identify the instruments in the first group, then the second group. They were asked to verbally identify the instruments. Correct responses were rewarded with *M&M's*®. Results indicated the acquisition of knowledge of one set of instruments sounds, facilitated learning a second set of instrument sounds. In addition, behavior modification techniques were implied to facilitate the learning of different timbres.

A similar study (Wooderson & Small, 1981) investigated how knowledge of musical instruments, at the beginning of formal music training, might be related to timbre perception of first and second-grade children. Also, the authors wanted to establish age-appropriate timbre discrimination tasks for elementary children.

The subjects were first and second-grade students ($n = 789$). They were from a small rural or small adjacent urban, community. All subjects attended public school, and received instruction from the music specialist.

For their identification task, children had to accurately discriminate between pairs of instruments from similar families. Instrument pairs were presented on 35 millimeter slides, and accompanied by a tape-recorded musical example. The student had to select the instrument which most accurately matched the recorded sound, from each pair. The test contained 20 items. Students were tested at two-month intervals, and their performances were recorded.

Study results showed second-graders scored significantly higher ($p < .001$) on the audiovisual instrument associations, than first-graders. Researchers concluded seven-year-olds were better able to associate the sound of an instrument with its visual representation, than five or six-year-olds. This finding supported other developmental music research, which suggested musical discrimination skills improve with age. Also supported by the results of this study, is the hypothesis that children's musical learning is impacted by prior musical experiences.

Jetter (1978) tested an instrumental model designed to facilitate student's discrimination of clarinet, trombone, and cello sounds. The study is described as an attempt to develop a hierarchy of musical learning preschool children can master. Jetter proposed her Aural-Visual Identification Model (AVII) would be an effective means of providing timbre discrimination instruction.

The instructional steps of the AVII are:

1. Select the content to be learned.
2. State student behavior indicating mastery of the concept.
3. Provide examples of the concept.
4. Provide negative examples, so students will eliminate attributes that are not a part of the concept.
5. Require active responses from the group of students, and provide immediate feedback using mixed examples.
6. Provide an individual response drill, using the final evaluation's response mode.
7. Provide results and corrections for incorrect responses.
8. Evaluate students' performances.

The subjects were four-year-olds from economically diverse day-care centers. They encompassed (a) a low-socioeconomic inner-city center, (b) a low-socioeconomic urban center, (c) an upper-socioeconomic urban preschool, and (d) an upper-socioeconomic suburban day-care center. The study lasted six months.

Students were asked to perform five musical identification tasks, which included identification of trombone, clarinet, and cello timbres; exact melodic repetition; and recognition of the half-step. Introduction of each new concept began at the start of each new grading period. Two groups were taught by the classroom teachers, and two by the researcher.

Results of the treatment indicated 57% of the children scored four, or more, correct answers on the post-test task. Treatment resulted in significant impact *(p < .05).* Jetter (1978) concluded that the AVII model successfully helped four-year-old students identify timbres and melodic repetition. Several factors had notable impact ($p < .05$) on achievement: socioeconomic status, age, and time lapse between learning the concepts and testing. Students were not instructed in half-step discrimination due to schedule interruptions.

Kersey (1965) examined the effects of an exploratory program with instrumental music, on the timbre perception of elementary students. Subjects were eight intact fourth-grade classes from two urban county schools. The students displayed a variety of academic abilities. The 225 students were divided into an experimental group ($n = 125$), and a control group ($n = 100$).

In lieu of a general pre-test, students were evaluated with the Seashore Test of Musical Talent (Seashore et al., 1960); and the California Test of Mental Maturity (Sullivan, Tiegs, and Willis, 1963); and a sociological and geographical analysis. When scores from the tests were compared, researchers found no significant difference *(p < .01)* in student ability, at the beginning of the study.

Students in the experimental group participated in the exploratory program, whereas the control group did not. At the conclusion of the study, students were tested with the Test of Aural Perception of Instrument Timbres, a test specifically designed for the study. The author reported a significant difference *($p < .01$)* between the experimental and control group's performance. Kersey (1965) concluded the exploratory program impacted timbre perception skills of elementary school children.

Development of timbre discrimination in preschool and lower elementary school children, seemed to coincide with models of psychological development suggesting children first learn by experiencing, responding to, and manipulating stimulus (Bruner, 1966; Pflederer, 1964; Piaget, 1950). As they matured, children associated familiar stimulus with a picture, or iconic representation, then were able to organize, generalize, and apply the concept of timbre to new musical situations (Bruner, 1966; Piaget, 1970). These studies, combined with those of Pflederer (1964), Serfine (1981), and Zimmerman and Schrest (1968), indicated the critical time for cognitive growth in these areas, was between birth and eight-years-old. The impact of training was most critical between the ages of five and seven-years-old (Zimmerman, 1982). Timbre discrimination development approximated its adult form between the ages of eight and nine-years-old (Petzold, 1966).

The described research identified seven musical timbre discrimination skills:

1. The ability to differentiate between synthesized complex tones of equal pitch, duration, and volume.
2. The categorization of musical timbres, despite variations in pitch, duration, and amplitude.
3. Identification of instrument sounds in isolation.
4. Association of instrument/vocal sounds with their appropriate picture representations.

5. Identification and discrimination of two different instrument sounds.

6. Isolation of classification of instrumental sounds, according to families.

7. Discrimination between two similar instruments from the same family.

Phonetic Discrimination

Phonetic discrimination has been described as the ability to differentiate consonant and vowel sounds. This type of auditory discrimination involved a relatively small collection of skills, interacting with a larger, more-global set of skills needed for successful reading. The ability to discriminate the various qualities of consonant and vowel sounds, was part of a complex system call phonological processing. Phonological processing has been defined as an individual's mental operation when using the sound structure of one's language to decode oral and written information (Torgensen, Wagner, & Rashotte, 1995; Wagner et al., 1993). Verbal and musical abilities researchers have suggested phonological abilities are cognitive processes, influenced by individual differences and environment, that endure over time. Researchers have also suggested that the skills associated with these abilities, if addressed at an early age, might respond to instruction and enhance the phonological processes (Ball & Blackman, 1991).

There was reason to explore the developmental stages of phoneme/alphabet discrimination, and identify skills associated with each. Developmental reading literature addressed the developmental hierarchy of phonological skills leading up to alphabet and phoneme discrimination.

Studies suggested reading development progressed through stages paralleling those of cognitive development (Chall, 1983). Chall's model included the (a) Pre-reading Stage [birth to 6-years-old], (b) Initial Reading, or Decoding, Stage [4 to 6-years-old], (c)

Confirmation, or Fluency, Stage [7 to 8-years-old], (d) Reading for Learning Stage [9 to 14-years-old], (e) Multiple Viewpoints Stage [14 to 18-years-old], and (f) Construction and Reconstruction Stage [18-years-old to adult].

Although each stage is influenced by cognitive growth, it is also affected by the child's environment. Findings from studies indicate the importance of interaction with the preschool, and elementary school, student through reading and conversation. Richness of the child's language experiences is directly related to later reading achievement (Chomsky, 1972; Wells, 1981).

Literature has suggested development of the phonological processing skills of phoneme discrimination began very early in life. Hepper et al. (1993) compared movement responses of 30 newborns, and 10 fetuses, to their mothers' natural voice, her recorded voice, and voices of strangers. The newborns exhibited an increase in movement in recognition of their mother's natural voice, over her recorded voice, and a female stranger's voice. Increased fetal movement, also, demonstrated a preference for their mother's natural voice, versus a recorded version played over a loudspeaker.

Brown (1979) tested infants' ability to discriminate the timbre, or quality, of their parents' voices against strangers' voices. The subjects were 40 Anglo infants, 20 males and 20 females, with a mean age of 3 months and 26 days. Twenty strangers provided contrast for the parents' voices, 10 males and 10 females. The infants were divided into 4 groups with 10 subjects in each. At timed intervals, each infant in each group heard the actual voice of one adult. The infants' vocal reactions were measured by quantity expressed in response to the voices.

Results indicated infants suppressed their responses to their father's voice. They showed the most significant amount of response to their mother's voice. This study led Brown (1979) to conclude 4-month-old infants could identify their parents'' voices, even when the infants were not relating to their parents' touch nor face. In most cases, infants responded to familiar voices with reciprocal vocalizations.

Findings of a later investigation conducted by Ockleford et al. (1988) suggested newborns could discriminate their parents' voices from voices of strangers. Just 24 hours after birth, infants responded to their mother and fathers' voices with a deceleration of heart rate, as opposed to an acceleration of heart beat in response to strangers' voices. Researchers concluded familiar voices of the parents have a soothing effect on the infant, while strangers' voices produce some anxiety.

Research results also suggested infants categorized spoken syllables on the basis of vowel identity, despite variations in pitch contour (Kuhl, 1979, 1987; Kuhl & Miller, 1982). In the initial part of the study, Kuhl (1979) sought to demonstrate the infant's ability to recognize similarities between phonetic sounds (a) when they occur in different phonetic contexts, (b) when they occur in different portions of a syllable or (c) when they are spoken by different people.

Subjects were 4 infants, ages 5 1/2 to 6 months, without histories of hearing difficulties. The study progressed in 6 stages:

1. The Conditioning Stage - The infant became conditioned by visual reinforcement to turn its head upon changes in sounds.

2. Initial Training - Infants were trained to discriminate the vowel sounds [i] and [e].

3. Pitch Variation - Vowel sounds [i] and [e] were presented with a rise and fall in pitch.

4. Talker Variation - The vowels [i] and [e] were presented with male, female, and child voices.

5. Talker and Pitch Variation

6. Entire Ensemble - Variations were presented to the infant, consisting of male, female, and child's voices, along with rise and fall in pitch.

In Experiment 2, infants were conditioned to discriminate vowel contrasts, but then skipped directly to Stage 6.

The results of both experiments indicated infants recognized similarities amongst phonetic categories (a) in different contexts, (b) with pitch variations, (c) in different positions in a syllable, and (d) when they were spoken by different speakers.

Trehub (1972) explored infants' discrimination of vowel sounds, using human stimuli. The researcher sought to determine if infants' perception of vowel sounds were effected, if they were preceded by a consonant sound. The selected sample encompassed 182 infants, from 4 to 17 weeks of age. Infants were eliminated if they were fussy, or failed to reach a minimum of 20 sucks on a nipple apparatus. Trehub (1972) used the apparatus to record infant responses to stimuli presented in the study.

The infants were divided into 7 experimental groups of 10 subjects each. Groups 1 through 4 were presented with human voice stimuli. Groups 5 through 7 were presented with sounds generated by an audio oscillator. All groups were given the task of discriminating contrasting vowels. Experimental groups 1 through 3 were challenged to differentiate between [a] and [i]. Group 4's task involved setting [i] apart from [u].

Groups 5, 6, and 7 were to contrast simple tones of (a) 1,000 to 2,000 CPS, (b) 100 to 200 CPS, and (c) 200 to 1,000 CPS, respectively. Observers recorded the infants' sucking response to changes in sounds.

Results of the study indicated infants, 1 to 4 months of age, could detect vowel contrasts. In addition, Hillenbrand (1983) reported evidence of consonant discrimination, based on the color, or quality, of the phoneme/letter sound.

Babble has been identified as an important factor in language and musical development. Babble begins at approximately three to five months of age, is thought to be spontaneous and hereditary, and indicative of ability to respond to/imitate language timbre, pitch, stress, and intonation (Davidson et al., 1981; Holahan, 1985; Loewy, 1995; Zimmerman, 1985).

During the developmental period from 15 months to 3 years old, the child continues to acquire auditory discrimination and categorization skills. Additionally, the child learns aural sounds may be visually presented. Mastery of this knowledge is demonstrated by patting, or pointing, to pictures when a familiar aural cue (word) is given. At this stage, young children associate their own words with picture representations (Rozin & Glietman, 1977).

Ilg and Ames (1949) systematically observed children in natural settings and parent interviews. Results of their study produced a reading gradient suggesting three or four-year-old children began identifying letters and their corresponding sounds. They began to associate letters with initial sounds of familiar names, or words: (a) J = Johnny, (b) D = Daddy, (c) b = ball. Ilg and Ames also reported four-year-old, preschool children could identify and match isolated letters with their corresponding sounds. In addition, children of this age could isolate and repeat sounds of letters in words, and associate one-syllable words with their corresponding pictures.

At age five, the pre-reading child has knowledge of most of the letters of the alphabet. Often, children can more-consistently provide the corresponding phoneme sound for the identified letter (Byrne & Fielding-Barnsley, 1989; Ilg & Ames, 1949; Snider, 1977). Usually, preschool education has begun, and the student receives formal instruction in skills associated with phonological processing.

Debate has often centered on the importance and function of phonetic discrimination skills in preschool and early elementary, reading curriculums. Research indicated phonetic instruction usually served the student best when it was combined with other types of reading skills (Downing & Thackary, 1975). Several studies presented evidence of the importance of phonetic discrimination skills on later reading achievement. These studies, also, identified preschool skills associated with the discrimination of alphabet/phoneme sounds.

Wagner and Torgensen (1987) proposed three constructs of phonological processing have emerged from existing research: (a) phonological awareness, (b) phonological coding in working memory, and (c) retrieval of phonological codes from long-term memory (Baddley, 1982; Mattingly, 1972).

The general definition of phonological awareness, is the individuals' sensitivity to the sound structure of their language (Torgensen & Wagner, 1994). Usually, it is measured by tasks requiring students to identify, isolate, and blend individual phonemes in words. In a factor-analysis study conducted by Wagner et al. (1993), various modes of phonological processing were compared. Several factors were found to be components of phonological awareness: (a) phoneme segmentation, (b) phoneme elision, (c) sound isolation, (d) sound categorization, (e) blending and onset of rhyme, (f) blending phonemes and words, (g) blending phonemes and non-words.

Phonological working memory has been defined as the coding of information in a sound-based verbal system for efficient storage in working memory during ongoing phonological processing (Baddley, 1982). Tasks thought to assess working memory included those requiring brief verbal retention of non-meaningful sequences of verbal items. Usually, these exercises were termed memory-span tasks. In memory-span tasks, students must mentally represent the phonological features of the language. This construct would impact students' ability to compare sounds with another (Baddley).

The definition of phonological long-term memory is the student's ability to retrieve and access phonological information from long-term memory (Wagner et al., 1993). Tasks used to demonstrate these abilities, usually, are concerned with naming letters, digits, or colors serially, and in an isolated fashion. Task performance is thought to be indicative of the speed with which a child can access phonemic information for decoding, and ultimately reading, words. Research has suggested there is a strong relationship between phonological processing skills, and reading achievement.

Although all three constructs have been described as factors significantly related to reading success, a critical skill was that of being consciously-aware that spoken words are made up of individual sounds (Wagner et al., 1993). Snider (1977) concurred that the definition of the ability to discriminate phoneme sounds, is phonemic awareness. As in music processing, the ability to hear differences in qualities of sounds seemed to be a prerequisite for discrimination of phoneme and, ultimately, alphabet sounds.

Snider (1977) conducted two longitudinal studies to examine the relationship between phonemic awareness and reading achievement, in the primary grades. The goal centered on determining the predictive power of student performances on different types of phonetic awareness tasks, to reading achievement later on.

In the initial study, all participants were kindergarten students from a small rural community (n = 73). There were 36 males and 37 females, with a mean age of 6 years and 6 months. Trained test administrators gave the Test of Phonemic Awareness [TOPA] (Torgensen, Wagner, Bryant, & Pearson, 1992) to each student, individually. The TOPA had 5 subtests, with 10 items each. The subtests were: (a) phoneme segmentation, (b) substitute initial consonant, and (c) initial consonant the same, (d) rhyme supply, and (e) strip initial. Scores were recorded at the end of the year. Before they conducted the second evaluation, 24 students moved away.

Two years later, the remaining second-graders were tested with the word analysis and reading comprehension sections of the Iowa Test of Basic Skills [ITBS] (Cantor, Dunbar, Frisbie, Hieronymus, Hoover, Lewis, & Lindquist, 1986). Of those remaining, 14 students were in private school, 36 remained in public school, and a few were in special education for learning disabilities. In the spring, students were administered a test similar to the ITBS subtests, a section of the California Achievement Test [CAT] (Hoover & Lindquist, 1986). Skills tested included: (a) ability to identify same, middle, or ending sounds; (b) ability to identify a word when each phoneme is pronounced separately; (c) ability to pronounce each phoneme in a one-syllable word; and (d) ability to identify words when phonemes were added, or deleted. TOPA, ITBS, and CAT results were compared by regression analysis.

All TOPA subtests, except rhyme supply, predicted reading achievement as indicated on the ITBS and CAT, at the *($p < .001$)* level of significance. Results indicated phonemic awareness is a strong predictor of reading success.

Snider (1977) conducted the final portion of the study the next year, with students ($n = 12$), who had consistently scored in the lower quartile of the earlier study. By second grade, most had not been fluent readers. All subjects were re-tested with the TOPA, and asked to read a third-grade passage from the Gray Oral Reading Inventory (1992). All showed significant gains in all tests, except rhyme supply.

Results of the three studies led Snider (1977) to conclude phonemic awareness was a powerful predictor of reading achievement. Research implies children who enter school with little phonemic awareness, will have trouble later in acquiring the concept that an alphabet represented a particular phonetic sound. Researchers predicted these students would ultimately have problems decoding words.

Other longitudinal studies supported findings highlighting the relationship between phonemic awareness and reading. In a study by Torgensen et al. (1995), 288 kindergarten children were randomly selected from 6 elementary schools. The ethnic ratio sampled was 75% Anglo and 25% African-American. Children with gross articulation defects were eliminated. The children were given 22 tasks to assess phonemic awareness, phonemic working memory, and phonemic long-term memory and retrieval. Pre-reading and verbal ability were also evaluated. The same tasks were re-administered, to the same children, at the beginning of first and second grade.
The number of participants ($n = 244$) dropped, due to attrition.

Study results indicated growth rates on all variables were different from one another, with the fastest growth occurring in serial naming, and the slowest growth in verbal short-term memory. Analytic phonological awareness, defined by the authors as phoneme awareness and differentiation, emerged as the most powerful predictor of further reading achievement. It had a significant influence on word reading skills. Pre-test assessment included the children's knowledge of letters. Results implied the children who knew their letters, upon entering kindergarten, had more reading success than those who did not.

Research conducted by Wayne and Cornwall (1995) focused on the impact of phoneme awareness on reading and spelling achievement. Students participated in an 11-year study, beginning with their enrollment in kindergarten. They were assessed with the Auditory Analysis Test [AAT] (Rosner & Simon, 1971); the Peabody Picture Vocabulary Test [PPVT] (Dunn, Dunn, Eisenberg, & Robertson, 1989) and the reading and spelling subtests of the Wide-Range Achievement Test [WRAT] (Wilkinson, 1978). Scores were recorded and correlated.

Students proceeded with schooling for the next 11 years, and were taught with a variety of teaching techniques. In the follow-up study, only 24 subjects from the original group participated. Some subjects moved away, while others declined to participate. There were 11 males and 13 females, with a mean age of 17 years. All were middle-income Anglo youth.

Students were given the same test as administered in the original study. In addition, they took the word-attack subtest from the Woodcock Reading and Mastery Test [WRMT-R] (Woodcock, 1987). This test analyzed the students' ability to decode phonetically regular non-words. The passage comprehension subtests of the WRMT-R, required subjects to read sentences of increasing complexity, and fill in a missing word with one of appropriate context.

Researchers suggested scores on the AAT in 1993, significantly correlated with scores obtained in 1982. They concluded phoneme awareness acted as a concurrent, and long-term predictor, of word identification and spelling skills, based on assessment results at age 6, and again at age 17. Wayne and Cornwall (1995) also indicated phonological awareness at age 7, approximated its adult form sooner than word identification and spelling skills.

Byrne and Fielding-Barnsley (1990) created a reading program to enhance preschool and kindergarten skills in phoneme awareness. The program focused on developing students' knowledge of phonemic invariance. The authors defined phonemic invariance as the knowledge that different words can begin, or end, with the same sound. The program used visual and audio aids to depict the large variety of words and sounds. In addition, the researchers suggested their program reinforced the alphabetic principle. Byrne and Fielding-Barnsley define the alphabetic principle as the knowledge that the same sound can be represented by the same letter, regardless of its position in a word. In an earlier study, the authors hypothesized the understanding of phonemic identity, combined with letter sound knowledge, produced better long-term reading results (Byrne & Fielding-Barnsley, 1989).

Byrne and Fielding-Barnsley conducted their initial evaluation of the program in 1991. Preschoolers were trained with the authors' reading program, Sound Foundations (Byrne & Fielding-Barnsley, 1991), for 12 weeks. The control group received no treatment. Results indicated the experimental group gained substantially in phonemic awareness, and scored in top levels on the test. The control group had only modest gains.

One year later, some of the same subjects were selected for a follow-up study (Byrne & Fielding-Barnsley, 1993). Students had been dispersed into 19 different classrooms, thereby experiencing a variety of teaching techniques. Subjects were divided into 12 experimental subgroups ($n = 63$), and 12 control subgroups ($n = 50$). One year later, the results were the same. The experimental group showed gains in phonemic awareness at the ($p < .05$) level of significance. The task of comparing initial and final phonemes was notable, at the ($p < .0001$) level. On the basis of the results, the authors concluded students who entered first grade with an understanding of phonetic identity, demonstrated a significant advantage in reading and spelling.

A study conducted with German preschool children assessed the predictability of phonological awareness tasks on later literacy performance (Naslund & Snider, 1996). The researchers were also interested in the impact of phonological awareness, compared with letter knowledge, on reading skills.

Participants were 134 children from the region of former West Germany, with a mean age of 4.1 years, at the beginning of the study. The children were part of the Munich Longitudinal Study on the Genesis of Individual Competencies (Weinhart & Schnider, 1989). Task performance assessment occurred at the institute associated with the project. Phonemic awareness tasks were administered in the students' last year of kindergarten. The verbal ability and word discrimination tasks were assessed at the beginning, and end, of first grade. Decoding tasks were administered at the beginning, and end, of second grade.

Results indicated the phonological awareness tasks vary in their prediction of later reading performance. Phonological awareness emerged as the stronger predictor of reading success. Researchers further concluded students' knowledge of the alphabet may, also, have an impact on literacy skills.

An interesting aspect of this study centered on German parents, who are encouraged not to teach their children letter sounds before the youngsters enter kindergarten. The researchers questioned whether or not phonemic awareness could develop without knowledge of letter sounds. They cited other studies that separated the effect of letter knowledge from phonemic awareness (Byrne & Fielding-Barnsley, 1990). However, Naslund and Snider (1996) concluded that without grapheme-phoneme (alphabet) knowledge, phonemic awareness could not predict reading success reliably.

Naslund and Snider (1996) found German children, at age six, despite their lack of letter knowledge, to have been more proficient in phonological tasks than their American counterparts. Also, they seemed to make better use of alphabet knowledge in decoding words, once they acquired the knowledge, in contrast to student performance in American studies.

The phonetic discrimination skills identified in this literature review, included:

1. Discrimination of parents' voices from those of strangers.
2. Discrimination of male and female voices.
3. Discrimination and categorization of (complex) vowel sounds.
4. Discrimination of consonant sounds.
5. Verbal identification of isolated phoneme sounds.
6. Association of the phoneme sound with its (visual) alphabet representation.
7. Discrimination of two different alphabet (phoneme) sounds.

8. Discrimination of phonemes in the initial, medial, or final position in a word.

9. Identification of a alphabet/phoneme sound within a short word.

10. Separation of a short word into individual letter sounds.

11. Identification of words when phonemes were added or deleted.

Identification of Cognitive Skills Thought to be Similar in Musical Timbre and Phoneme Quality Discrimination

The underlying assumption of this study is that learning in one discipline may facilitate learning in another. To ultimately conduct an investigation of possible influence of training in one cognitive area on another, a relationship was outlined between skills believed to be similar in both areas.

The review of musical timbre and phoneme/alphabet discrimination literature identified specific perception skills, and discussed a hierarchy of skill development. Possible similarities in music and phoneme discrimination skills and perceived parallels in skill development can be identified for comparison.

Research findings, in both areas, suggested the development of timbre discrimination skills used in speech and music perception may begin before birth. Findings by Cheour-Luthanen et al. (1996), Hepper et al. (1993), Kamora (1991), Ockleford et al. (1988), Ostwald (1973), and Shahidullah and Hepper (1994), suggested the fetus responded to changes in sounds before birth.

Other research finds infants exhibiting musical and phoneme/alphabet discrimination skills in the first months of life (Kuhl, 1979; Swoboda et al., 1976). One to five-month-old infants seemed able to differentiate (a) between voices of their parents, and voices of strangers; (b) between male and female voices; and (c) between complex musical sounds of different timbres that maintain constant pitch, duration, and volume (Brown, 1979; Clarkston et al., 1988; Kuhl, 1979; Trehub, 1972).

Between five and seven months-of-age, researchers suggested infants progress from discriminating different musical timbres and phoneme distinctions, to categorizing them on the basis of their characteristic sound quality. Categorization has been defined as identifying the sameness, or invariance, in quality or timbre of a sound, despite modifications to other aspects of the sound. Infants could categorize the timbre of a complex musical tone, despite variations in intensity, duration, and pitch (Trehub et al., 1990). Similarly, infants of the same age were able to categorize spoken syllables on the basis of vowel quality, despite variations in pitch (Kuhl & Miller, 1982), context, position of the vowel in a syllable, or diversity of speakers (Kuhl, 1979). Khul and Hillenbrand 1979) suggested a possible parallel between infant skills required to categorize single musical tones by timbre, and skills required to categorize speech sounds on the basis of their timbre, or quality. Kuhl and Hillenbrand speculated pre-linguistic listeners could use timbre as a learning basis to process speech, music, and other auditory input.

Musical timbre and phoneme discrimination literature indicated the impact of early music and language activities on later achievement, in both areas. An environment featuring frequent reading and language interaction had a positive relationship to language learning (Chomsky, 1972; Wells, 1981). Likewise, an environment rich in musical experiences had a positive impact on musical achievement (Davidson & Scripp, 1988; Kokas, 1968; Ramsey, 1983; Wooderson, 1981; Wooderson & Small, 1981).

As discrimination and categorization skills continued to develop, the next step in development of musical and phoneme quality discrimination skills seemed to be accurate association of aural sounds with visual representation (Ilg & Ames, 1949, 1970; Piaget, 1950). Between 15 months and 3 years-of-age, literature indicated a child began demonstrating the knowledge that aural sounds represented concrete visual images. The child also demonstrated evidence of skill development by patting a picture in a book, or pointing to an instrument, when familiar aural musical, or speech, cues are heard (Rozin & Glietman, 1977). Researchers in both music and speech stressed the importance of labeling each sound correctly (Davidson & Scripp, 1988; Rozin & Glietman; Sergeant & Roche, 1973).

As the skill of associating sounds with appropriate visual representations developed, three to four-year-old children began to consistently associate phoneme sounds with their corresponding alphabet representations. Also, they began to associate initial sounds of familiar names with the appropriate alphabet letter (Chall, 1983; Ilg & Ames, 1949, 1979). In like fashion, they were capable of accurately associating musical instrument sounds with their picture representations (Fullard, 1967; Jetter, 1978).

Research indicated a period of rapid skill growth between the ages of five and seven. Also, findings illustrated the importance of training, at this developmental level, on later performance (Ball & Blackman, 1991; Zimmerman, 1982). Five and six-year-olds have accurate knowledge of the letters of the alphabet, and their corresponding phoneme sounds (Snider, 1977). Phonetic discrimination skills have developed so rapidly, they can (a) identify individual letter sounds in isolation, (b) within words, and (c) discriminate the differences between pairs of letter sounds (Byrne & Fielding-Barnsley, 1993; Torgensen et al., 1995).

Musical timbre discrimination research indicated similar developmental patterns.

Five-year-old students could match an instrument's sound to its picture representation (Fullard, 1967), discriminate the differences between pairs of instruments (Wooderson & Small, 1981), and identify instrument sounds in isolation (Jetter, 1978).

Table 4 illustrates possible development similarities between musical timbre and phoneme/alphabet quality discrimination, as discussed in the comparisons. Specific skill similarities suggested by literature comparison, included:

1. Discrimination between the quality of two different phoneme/alphabet sounds, and discrimination between the timbres of two different musical sounds.

2. Identification of isolated (single) phoneme/alphabet sounds, and identification of isolated musical instrument sounds.

4. Matching of phoneme sounds to their appropriate alphabet representation and the matching of instrument sounds to their appropriate picture representation.

Table 5 illustrates possible skill similarities between phoneme quality and musical timbre discrimination. General cognitive similarities between musical timbre discrimination, and phoneme/alphabet quality discrimination, suggest both are based on cognitive processes that are influenced by individual differences, and are enduring over time.

Stimulation and instruction early in life influence later achievement, in both. A particularly responsive period for both areas is between the ages of five and seven. In both mediums, skill performance improves with age, and the capacity for skill development seems to approximate its adult form between seven and nine years-of-age.

Table 4

Possible Similarities in the Development of Musical Timbre Discrimination and Phoneme Discrimination Skills, From Infancy Through Nine Years-of-Age

Age	Musical timbre discrimination skills	Phoneme/alphabet discrimination skills
Prenatal	Fetus responds to and discriminates changes in musical sounds. Musical stimulation impacts post natal musical achievement.	Fetus responds to the mother's voice and discriminates changes in language sounds. Language stimulation impacts post natal language achievement.
1-4 mos.	Infant discriminates voice qualities of parents from those of strangers. Discriminates male and female voices. Discriminates mother’s voice from father’s.	Infant discriminates voice qualities of parents from those of strangers Discriminates male and female voices. Discriminates mother's voice from father's.

Table 4 continued

Age	Musical timbre discrimination skills	Phoneme/alphabet discrimination skills
1-4 mos.	Infants discriminate complex musical tones based on timbres, when other aspects, such as pitch, duration, and volume are held constant.	Infants discriminate differences in the quality vowel and consonant sounds.
5-6 mos.	Appearance of babble. Infant vocally demonstrates aural processing of musical sounds. Indicative of the child's ability to imitate timbre, pitch, intonation, and stress in musical sounds.	Appearance of babble. Infant vocally demonstrates aural processing of speech sounds. Indicative of the child's ability to imitate timbre, pitch, intonation and stress in speech sounds.
5-7 mos.	Infants identify (categorize) the timbre of a musical tone, despite modifications of intensity, duration and pitch.	Infants identify (categorize) the timbre/quality of a vowel sound despite variations in its context, position in a word, or variation of the speaker.

Table 4 continued

Age	Musical timbre discrimination skills	Phoneme/alphabet discrimination skills
15 mos.	Child demonstrates knowledge that aural sounds represent concrete visual images.	Child demonstrates knowledge that aural sounds represent concrete visual images.
3 yrs.	Child can identify, by patting or pointing to, pictures of familiar instruments, when aural cues are given.	Child can identify, by patting or pointing to, pictures of familiar objects, when aural cues are given.
3-4 yrs.	Child continues to associate musical instrument sounds with appropriate picture representation.	Child begins to associate phoneme sounds with their alphabet pictures. Child begins associate initial sounds of familiar words and names with alphabet sounds.
4-5 yrs.	Children can discriminate differences between pairs of musical instrument sounds.	Children can discriminate differences between pairs of phoneme/alphabet sounds.

Table 4 continued

Age	Musical timbre discrimination skills	Phoneme/alphabet discrimination skills
4-6 yrs.	Children can identify instrument sounds in isolation.	Children can identify, with greater accuracy, alphabet sounds in isolation.
5-7 yrs.	Period of rapid skill development. Skill growth is highly influenced by instruction.	Period of rapid skill development. Skill growth is highly influenced by instruction.
6-7 yrs.	All skills improve and develop, as the child matures.	All skills improve and develop as the child matures.
7-9 yrs.	Growth in musical timbre discrimination skills begins to stabilize, and approximate adult form.	Growth in phoneme/alphabet sound discrimination skills begins to stabilize, and approximate adult form.

Table 5

Skills Thought Common to Musical Timbre Discrimination and Alphabet Sound Discrimination

	Musical timbre discrimination skills	Phoneme/alphabet sound discrimination skills
1.	Discrimination between two instrument sounds as same/different.	Discrimination between two alphabet sounds as same/ different.
2.	Identification of isolated musical instruments as visual representations of specific musical sounds	Identification of isolated alphabets as visual representations of phoneme sounds. .
3.	Matching of instrumental and vocal sounds with their appropriate picture.	Matching of phoneme sounds with their appropriate alphabet symbol.

CHAPTER THREE

DESCRIPTION OF THE RESEARCH DESIGN, DATA COLLECTION AND ANALYSIS

Research Design

The purpose of this study was to investigate the effects of three different levels of skill training in musical instrument sound discrimination on alphabet sound discrimination in pre-kindergarten and kindergarten students. The research questions were formulated to explore whether or not students receiving treatment in all three skill levels and who were taught for transfer would score higher in alphabet sound symbol matching skills than those who did not have such treatment. The purpose of this chapter is to describe the methodology used to investigate the possible treatment effects. The discussion includes a description of (a) the research design, (b) sample and sample selection, (c) independent, dependent variables and group treatments, (d) test instrumentation, (e) instructional materials used, and (f) the statistical tools and analyses used to explore the possible effects of instruction in musical timbre discrimination on alphabet sound discrimination.

The effects of five types of musical timbre discrimination instruction were explored using a modified form of a Randomized Pre-Test, Post-Test design with intermittent measures. This design was selected because it was thought to be most appropriate for (a) estimating the effects of multiple treatments on a specified outcome, and (b) comparing two or more treatment groups in terms of a dependent variable (Bickman and Rog, 1998; and Campbell and Stanley, 1966). The randomized design also effectively controlled for possible bias due to individual selection differences (Reichardt and Mark, 1993).

Subjects in the population (N=225) were randomly assigned to one of five treatment groups (n=40). The assignment was based on a series of random numbers, range [1-225], generated by the Texas Instruments Graphing Calculator (TI-83). All students were pre-tested using the Sounds and Letters portion of the Stanford Early School Achievement Test Form S (SESAT, Harcourt Brace Educational Measurement, 1996). They were assessed using the researcher-designed Timbre Discrimination Test (TDT). A description of the SESAT and TDT and modifications made by this investigator appear later in this chapter. Copies of both instruments may be found in Appendix A. The inclusion of a pre-test in the research design further established the equivalence or non-equivalence of groups achieved through random assignment. The pre-test was also used as a statistical baseline to achieve a more precise and efficient analysis of treatment effects (Asmus and Radocy, 1992). Furthermore, it also assisted in controlling for possible student attrition during the study and unforeseen variables which would have compromised the randomization procedure (Riechardt and Mark, 1993).

The duration of the study was 18 weeks. Along with daily phonetic instruction, students had two 45-minute music classes per week. The researcher provided the instruction. Trained college, and high school students and non-classroom teachers served as test graders/monitors and were also present during the classes to assist with instruction.

Independent Variables

Campbell and Stanley (1966) have defined independent variables as the treatment conditions in the study, which might lead to change in the dependent variables. The independent variables for this study were the five treatments designed to develop musical timbre discrimination skills, which were hypothesized to impact alphabet sound discrimination skills.

In an attempt to determine which level of timbre discrimination skill training had the greatest effect on alphabet sound discrimination skills, subjects were placed on a treatment schedule in which they received specified instruction in one or more of the treatment variables. The treatments were: (a) same/ different musical sound discrimination, (b) visual recognition of musical sound sources, (c) association of musical instrument sound with their appropriate symbol or picture, (d) all three levels of musical instrument timbre discrimination skills with instruction for the transfer of musical sound discrimination skills to alphabet sound discrimination skills, and (e) traditional timbre discrimination instruction through an introduction to the instruments of the orchestra. Classroom music was used as when skill training was discontinued in a treatment group. Lesson plans for each treatment group and classroom music are located in Appendix B.

Dependent Variable

The dependent variable may be defined as the response or criterion variable. It is presumed to be caused or influenced by the independent treatment conditions (Campbell and Stanley, 1966). Because it is a skill which provides a foundation for and immediately precedes the actual decoding of musical and linguistic information (Barnes & Fielding

Barnsley, 1990, 1993; Chall, 1983; Snider, 1997; and Torgensen et. al 1992), the dependent variable identified for this study was alphabet sound/symbol discrimination skill tasks used to measure the development of this discrimination skill involved the pairing of a phoneme sound with its matching grapheme or alphabet symbol. For example, upon hearing the phonetic sound [a], students were asked to point to or write its matching alphabet symbol (the sound [a] was represented by the alphabet symbol "a".

Testing Procedure

In order to determine the effects of musical treatment on alphabet sound discrimination at each skill level and in an attempt to isolate the musical timbre skills which contributed most to alphabet sound/symbol discrimination, the design was created to incorporate evaluation of possible treatment effects at each skill level. Students were tested upon completion of treatment at each skill level using the appropriate subsection of the SESAT Sounds and Letters Test. In light of their developmental level subjects were divided into smaller groups of 5-10 students for testing. Each small group was assigned to one of the trained test administrators. The time frame required to test all of the subjects in small groups was approximately 2 class periods per week. Because it was selected as the dependent variable, the sound-symbol portion of the Sounds and Letters Test was used as the post-test for all treatment groups. To avoid the effects of student familiarity with the test, the delayed post-test, an equivalent forms version of the SESAT Sounds and Letters Sound/Symbol subsection, was be repeated three weeks later to determine lasting effects. Table 6 illustrates the research design devised to fit the needs of this study.

Sample Selection

The pre-kindergarten and kindergarten classes were selected for the study because the study of the alphabet and their corresponding sounds were part of the prescribed sequence of pre-reading instruction at their developmental level. Therefore the instructional focus during the first semester at both levels was alphabet sound discrimination. The school site was selected because conditions needed for the study were already in place. Students at the site already had classroom music delivered for two 45-minute periods per week by a music specialist as a part of their weekly schedule. Since children in the district were not allowed to participate in piano lessons or band until fourth grade there was little chance of this group being contaminated by other formal music instruction at school. Students thought to be non-English speakers or who had significant speech and hearing difficulties were identified through the pre-kindergarten and kindergarten screenings at the beginning of each school year. Students with significant hearing difficulties were recommended to another school site. Students with speech difficulties were referred to and treated by a certified speech therapist housed at the school site. Students identified as non-English speakers were placed in the English as a Second Language (ESL) Program. Both speech and ESL students were removed for speech therapy or language instruction during music class. Based on the results of the screening processes, subjects selected for the study used English as their primary language and did not manifest speech or hearing difficulties. All classes were non-

Subjects

Approximately 40 pre-kindergarten and 185 kindergarten subjects participated in the study. Subjects were from an urban school in the Southeastern region of the United

States. They comprised the entire pre-kindergarten and kindergarten population. Numbers in the study were based on the school's enrollment records for the 1998-1999 school year. Students resided in a low-middle income area. Approximately seventy five percent of the parents held blue-collar jobs while the other twenty-five percent worked sporadically and were receiving some type of public assistance. The residences consisted of single family dwellings and multiple housing units. The subjects were ethnically diverse. Sixty-nine percent of the study's population was African-American, thirty percent Asian American (Vietnamese), .50 percent Hispanic American and .50 percent Anglo-American. The subjects reflected the racial and soci-economic composition of the surrounding community and were randomly divided by the principal and teachers at the end of the last school year to ensure equalization of race, gender, academic ability and behavior problems. With the exception of extreme cases, students were not identified for special education until the end of the second grade year. Therefore, all students were assumed.to be of normal intelligence. The age range of the students was 4 years 0 months through 5 years 8 months.

The Randomization Procedure

From a population of 225 students five study groups of 45 per group were established. Assignment to each treatment group was achieved through a randomization procedure. One set of numbers ranging from [1,225] will be placed in a hat. Students from each class were asked to draw a number from the hat. When all children had numbers, teachers were asked to prepare a class roll with the child's selected number listed next to his or her name. Then, using the Texas Instruments Graphing Calculator (TI-83), the random integer function was selected for a range of [1,225]. Numbers

Table 6:

Randomized Pre-Test Post Test Design with Intermittent Measures

Group 1	R	O/T_1	O/A_1	SD	O/A_2 (O/T_2)	CM	O/A_3 (O/T_3)	CM	O/A_4 (O/T_4)	O/A_5 (O/T_5)
Group 2	R	O/T_1	O/A_1	SD	O/A_2 (O/T_2)	VR	O/A_3 (O/T_3)	CM	O/A_4 (O/T_4)	O/A_5 (O/T_5)
Group 3	R	O/T_1	O/A_1	SD	O/A_2 (O/T_2)	VR	O/A_3 (O/T_3)	SS	O/A_4 (O/T_4)	O/A_5 (O/T_5)
Group 4	R	O/T_1	O/A_1	SD_T	O/A_2 (O/T_2)	VR_T	O/A_3 (O/T_3)	SS_T	O/A_4 (O/T_4)	O/A_5 (O/T_5)
Group 5	R	O/T_1	O/A_1	TT	O/A_2 (O/T_2)	TT	O/A_3 (O/T_3)	TT	O/A_4 (O/T_4)	O/A_5 (O/T_5)

Key: Test Abbreviations

R= Randomized

O/A_1=Alphabet Discrimination Sound Symbol Pre Test

O/A_2=Alphabet Discrimination 5th-Week Same-Different Post Test

O/A_3=Alphabet Discrimination 10th-Week Visual Recognition Post Test

O/A_4=Alphabet Discrimination 14th-Week Sound-Symbol Post Test

O/A_5=Alphabet Discrimination 18th-Week Sound-Symbol Posttest (Equivalent Measures)

O/T_1=Timbre Discrimination Sound-Symbol Pre Test

O/T_2=Timbre Discrimination 5th-Week Same-Different Post Test

O/T_3=Timbre Discrimination 10th-Week Visual Recognition Post Test

O/T_4=Timbre Discrimination 14th-Week Sound-Symbol Post Test

O/T_5=Timbre Discrimination 18th-Week Sound-Symbol Posttest (Equivalent Measures)

Key: Instructional Group Abbreviations

SD=Same-Different Discrimination V/R=VisualRecognition/Discrimination

SS=Sound- Symbol Discrimination `SD_T=Same Different Discrimination w/Transfer

VR_T=Visual Recognition/Discrimination w/Transfer

SS_T=Sound Symbol Discrimination w/Transfer

TT=Traditional Timbre Instruction CM=Classroom Music

appeared on the calculator screen in random order. When a number was repeated, the. procedure continued on to the next new number until the first group of forty-five students was selected. This procedure continued throughout the selection of the first four groups for a total of 180 students. The remaining non selected forty-five became the fifth group

Approximately three weeks after the study began, treatment groups began to lose students due relocation of families. After this transition period, group numbers were as follows: (a) Group 1, n=44; Group 2, n=43; Group 3, n=45; Group 4, n=45; Group 5, n=39. This researcher does not have an explanation for the heavier attrition in Group 5, however, because the selection of subjects was randomized, she did not attempt to numerically equalize the groups. After the initial attrition student numbers remained the same for the duration of the study. There were 5 new students to enroll in school during the course of the study. They were allowed to participate in music as members of Group 1, however, their test scores were not used in the data analysis.

Other Controls

Other attempts to implement controls for possible variations within the groups included (a) the selection of students from one school site (b) the limitation of subject selection to pre-kindergarten and kindergarten students who have received limited formal instruction in phonetic or musical discrimination (c) the identification of possible hearing speech and cultural differences. These variables were being addressed by ESL and speech/hearing screenings, which removed non-English speakers and children with hearing and articulation difficulties from the study (d) the inclusion of students from middle-low income socio-economic status only.

<u>Other Participants</u>

Other participants in the study included: (a) 7 certified classroom teachers, (b) two teachers aides, (c) one principal, (d) one music specialist, and (e) 7-10 test monitors/graders.

<u>The teachers</u>. All classroom teachers were certified in elementary education. Forty -six percent held masters degrees or higher, 46 percent held early childhood certificates, and 8 percent certificates in areas other than education or early childhood. Their years of active teaching experience ranged from 5-31 years. The music specialist had sixteen years teaching experience and was a certified all level music instructor in vocal and instrumental and orchestral music. All teachers involved were aware of the study and agreed to participate. The principal agreed to allow the study to take place during the 1998-1999 school year. Authorization to conduct research in New Orleans Parish Schools and an authorization from the principal to conduct research at the school site may be found in Appendix D. During the third week of school parents were asked to sign an informed consent form, which explained the nature of the study, its purpose, possible outcomes and benefits to the students. The consent form may also be found in Appendix D. All parents returned the consent forms, therefore all students, including those who enrolled during the course of the project, were allowed to participate in the study. As mentioned earlier in this chapter, the test scores of the new students were not used in the data analysis.

Test monitors and scorers. The pre and post-test were monitored and graded by a team of 4 college education majors, 3 high school students, and three certified teachers. The college students were all elementary education majors in their final year at a local university. The senior high students were 4th year theology students using their participation to gain community service hours. The teachers involved were a school speech therapist, a reading specialist and a special education teacher. None of the teachers serviced or were instructors at the pre-kindergarten and kindergarten level.

In order to standardize test procedures and grading monitors and classroom teachers received three training sessions in administering the testing instrument. Only the monitors received training in scoring the test. In order to avoid any possibility of bias, neither the researcher nor classroom teachers graded the test. A description of teacher, test monitor and scorer training may be found in Appendix C.

Treatment Group Descriptions (Independent Variables)

Treatment for this study was designed specifically to develop musical timbre discrimination skills, which may impact the development of alphabet discrimination skills. In an attempt to diminish the presence of uncontrolled variables, instructional plans omitted all direct instruction of music literacy skill associated with other forms of aural discrimination (pitch, rhythm, amplitude). Music literacy instruction as suggested by state and local guidelines was resumed upon completion of the study. The ensuing discussion will outline frameworks of instruction and activities used in each treatment group to develop these skills. The sequence and time frame of instruction will also be described.

Group 1: Same Different Sound Discrimination Group (S/D, n=44)

The primary objective of lessons designed for the same different sound discrimination group was to develop student skills in discriminating pairs of instrumental or sung vocal sounds as same or different. Subjects received training in the first level of musical sound discrimination only. The duration of the training was three weeks. Therefore, students received six 45-minute training sessions in same-different musical sound discrimination. For the remaining weeks of the study they received instruction in classroom music. Classroom music acted as a control factor for students after treatment classes had ceased. A description of classroom music and its activities may be found later in this chapter.

Although the teacher identified instrumental and vocal sounds as they were introduced, it was important to remember the focus of instruction was to develop the skills needed for same different musical discrimination. Therefore students were not required to remember instrument names or families. They were only evaluated on their ability to identify musical timbres as same or different.

The sequence of instruction for the three-week treatment period was as follows (a) pretest (2 days preceding the week of treatment), (b) introduction to the concept of same and different (1 day), (c) discrimination of same and different vocal sounds (1 day), (c) discrimination of same and different instrumental sounds (1 day), (d) informal assessment of discrimination of same different musical sounds followed by the review/re-teaching of same and different sounds learned (2 days), (f) formal assessment of effect of same different musical learning on same different alphabet discrimination with the SESAT 5 week same different alphabet discrimination post test (2 days immediately following treatment), and (g) group began classroom music activities (singing and dancing) for the duration of the study (15 weeks).

Classroom music activities, (control activity), were followed by a formal assessment of the impact of the each timbre discrimination skill level, on its corresponding alphabet discrimination skill level. The 10^{th}-week, 14^{th}- week, and 18^{th}-week, SESAT Alphabet Discrimination PostTest was used as the evaluation instruments. In light of their age and inexperience with formal testing, students were tested in groups of 10 with one of the trained test administrators. The duration of actual testing was no more than 10-15 minutes; therefore, evaluation of all small groups was completed in two 45-minute periods. After the initial post-test, the group was given a delayed posttest two weeks later using the SESAT 18th week alphabet sound/symbol discrimination (equivalent forms) post test.

A typical 45-minute class period was structured as follows (a) introduction of new contrasting sounds/review of old sounds (10 minutes), (b) selected activities to reinforce the concept of same and different (15-20 minutes), (c) classroom music activities as described in this chapter (5-10 minutes), (d) Closure: review of same/different concepts learned in the lesson (5 minutes). Activities included verbal, written and kinesthetic responses to pairs of same and different sounds. A description of the activities for skill development may be found in Appendix B.

<u>Group 2: Visual Recognition of Musical Sound Sources Group (V/R, n=43)</u>

Music instruction for the Visual Recognition treatment group was designed to develop specific skills needed for the visual recognition of instrument differences. After receiving training and assessment at the first skill level (same different musical timbre discrimination) during the first three weeks of the study, students in the Visual Recognition group received training in the second skill level of visual recognition. The primary objective of the lesson was for students to demonstrate recognition of musical instruments as same or different. Students were also expected to demonstrate by pointing to or circling a picture, visual recognition of an instrument when it was named. Duration of the treatment was three weeks; therefore, subjects received six 45-minute training sessions in the visual recognition of musical instrument sound sources. The sequence of instruction for the three-week period was as follows (a) Concept introduction: each musical instrument is different from one another and has its own name (1 day), (b) discrimination of pairs of instruments as same or different (1day), (c) labeling/naming of instrument pictures (2 days), (d) informal assessment of discrimination of musical instrument visual representations followed by a review of the identification and discrimination of pairs of pictures as same and different (2 days).

Treatment was followed by a formal assessment of the impact of visual musical instrument recognition training on alphabet visual recognition, using the 10th-week alphabet discrimination visual recognition post test. The duration of testing with the visual recognition subsection of the SESAT Sound and Letters test was two 45-minute periods. In light of their age and inexperience with formal testing students were tested in groups of 10 with one of the trained test administrators. After evaluation the group began classroom music activities (singing and dancing) for the remaining twelve weeks of the study. Classroom music activities, (control activity), were followed by a formal assessments with the 14th and 18^{th-}week alphabet discrimination posttests. The duration of actual testing was no more than 10-15 minutes, therefore evaluation of all small groups were completed in the two 45 minute periods. As in the previous group, the 14th- week posttest was followed by the 18th-week sound-symbol alphabet discrimination posttest. A typical period of instruction included (a) Introduction of new instrument pictures, review of old instrument pictures (5-10 minutes), (b) activities in reinforcing the concepts of visual representations as same and different. Activities in accurately labeling instrument pictures (15-20 minutes), (c) classroom music activities (5-10 min), (d) Closure- review of pictures learned (5 min). Activities included verbal, written and kinesthetic responses to picture identifications. A description of the activities may be found in Appendix B.

<u>Group 3: Sound-Symbol Discrimination (SS, n=45)</u>

Music instruction for the sound/symbol treatment groups was designed to specifically incorporate all three levels of musical timbre discrimination instruction. After training was completed in the first two levels of timbre discrimination, the subjects received training in the third skill level of sound symbol discrimination. The primary objective of lessons designed for this group was to develop student skills needed to match musical instrument sounds with their appropriate visual representation (picture). The duration of this phase of treatment was four weeks; therefore students received eight 45-minute training sessions in sound-symbol discrimination. The order of instruction was as follows (a) concept introduction: each musical picture has a corresponding sound, each musical sound has a corresponding picture (1 day), (b) review instrument sounds as same/different, review pictures of instruments (1 day), (c) students match vocal and instrumental sounds learned in same/different training with their appropriate visual representation (4 days), and (d) informal assessment of discrimination of musical sound-symbol discrimination followed by review and re-teaching of sounds and matching symbol learned (2 days).

Treatment was followed by a formal assessment of the impact of musical sound - symbol matching on alphabet sound-symbol matching, using the 14^{th}-week sound-symbol alphabet discrimination posttest. In light of their age and inexperience with formal testing students were tested in groups of 10 with one of the trained test administrators. The duration of actual testing was no more than 10-15 minutes; therefore evaluation of all small groups was completed in two 45-minute periods. After the initial posttest, the group was given the 18^{th}-week alphabet sound/symbol discrimination post-test. A typical period of instruction included (a) introduction of new sounds and symbols, review of old sounds and symbols (5-10 minutes), (b) activities in reinforcing the concept of musical sound as having matching pictures. Activities in accurately labeling instrument sounds and pictures (15-20 minutes), (c) classroom music activities (5-10 min), and (d) Closure: review of sounds and symbols learned (5 min). Activities included verbal, written and kinesthetic exercises in sound-symbol matching. A description of the activities used to develop sound symbol discrimination skills may be found in Appendix B.

<u>Group 4: Sound-Symbol Discrimination Transfer Group (SST, n=45)</u>

Instruction for the Sound Symbol Transfer group was specifically designed to incorporate the concept of learning transfer at all three levels of musical timbre discrimination training. Instruction for this group was identical to the sound-symbol discrimination group, however, throughout all levels of musical sound discrimination training subjects were guided to identify similarities between skills used to identify musical sounds and skills used to discriminate alphabet sounds. Based on the perceived similarities, students were taught to use skills learned in musical timbre discrimination to facilitate leaning in alphabet sound discrimination. After training was completed in the first two levels of timbre discrimination with instruction for transfer, the subjects received training in the third skill level of sound-symbol discrimination with strategies for transfer. The primary objective of lessons designed for this group was to develop student skills needed to match musical instrument sounds with their appropriate visual representation (picture). The duration of this phase of treatment was four weeks; therefore students received eight 45-minute training sessions in musical sound-symbol discrimination and in how the musical skill related to alphabet sound-symbol discrimination. The order of instruction and skill comparisons included (a) Concept introduction: each musical picture has a corresponding sound, each musical sound has a corresponding picture. Each alphabet picture has a corresponding sound, each alphabet sound has a corresponding picture (1 day), (b) review of instrument sounds as same/different, review pictures of instruments; review of alphabet sounds as same and different, review pictures of alphabets (1 day), (c) students matched vocal and instrumental sounds learned in same/different training with their appropriate visual representation; students match alphabet sounds with their corresponding picture (4 days), and (d) informal assessment of discrimination of musical sound-symbols followed by a review and re-teaching of sound and matching symbol learned (2 days). Treatment was followed by a formal assessment of the impact of musical sound -symbol matching on alphabet sound-symbol matching, using the 14th-week sound symbol alphabet discrimination post test. In light of their age and inexperience with formal testing students were tested in groups of 10 with one of the trained test administrators. The duration of actual testing was no more that 10-15 minutes, therefore evaluation of all small groups were completed in two 45-minute periods. After the initial 14th-week post-test, the group was given the 18th-week alphabet sound/symbol discrimination posttest.

Activities for a typical period of instruction included (a) introduction of new sounds and symbols, review of old sounds and symbols (5-10 minutes), (b) activities in reinforcing the concept of musical and alphabet sounds as having matching pictures. Activities in accurately labeling instrument and alphabet sounds and pictures (15-20 minutes), (c) classroom music activities (5-10 min), (d) Closure: review of sounds and symbols learned (5 min). Activities included verbal, written and kinesthetic exercises in musical and alphabet sound-symbol matching. A description of the activities for developing strategies for transfer may be found in Appendix B.

Classroom Music

As an alternative to a control group, the researcher decided to select classroom music as the type of instruction for students when their timbre discrimination treatment periods had ended. Because of the statewide focus on interdisciplinary learning, instructional units presented were designed around seasonal holidays and school wide themes. Therefore, the sequence of instruction units for the duration of the study was as follows: (a) September: Patriotism, Famous Rivers, School Rules and Conflict resolution, (b) October: autumn celebrations: Loy Kratong, Tet Trung (Vietnamese mid-Autumn festivals), Halloween and Academic Achievement, (c) November: Thanksgiving Hanukkah, Reading Month, (d) December: Winter Celebrations Around the World, Christmas and Kwanzaa, and (e) January: Civil Rights/Martin Luther King Day and TET Chinese New Year. For the purposes of this study classroom music consisted only of songs and dances associated with these themes and holidays. Singing and movement activities were taken from Share the Music (Macmillan/McGraw-Hill, 1997) and The Music Connection (Silver Burdette-Ginn, 1997) Classroom Music Series. Within the thematic sequence of instruction a typical lesson included (a) introductory discussion or review of schoolwide theme or holiday theme on which the lesson is based (5-10 min), (b) rote instruction in 1-2 songs based on the selected theme or holiday (15-20 min), (c) movement activities to accompany the songs learned (15 minutes), (d) review of themes and concepts learned in the lesson (5 minutes). Weekly lesson plans for the duration of the study may be found in Appendix B.

Unlike the other treatments, the primary objective of this instruction was not to facilitate the development of timbre discrimination skills but to rather act as a control activity, which provided children with musical activity when treatments were terminated. To avoid the confounding of variables, lessons specifically designed to focus on musical timbre, music literacy, and listening analysis skills were purposely deleted from instruction. To ensure the subjects would not be denied the remaining timbre discrimination instruction groups receiving only one or two levels of timbre skill instruction were presented with the rest of the lessons upon completion of the study. Music literacy and listening lessons also resumed for all groups upon completion of the study. This course of action eliminated threats to validity, which would have been caused by the cessation of music instruction for groups one and two while the others continued. They included (a) diffusion or imitation of the treatment which would result from non-participants awareness of other student's participation in the study and (b) demoralization caused by children's awareness of their exclusion from a desirable activity (Cook and Campbell, 1979).

Group 5: Traditional Timbre Discrimination Instruction: The Instruments of the Orchestra Approach (TT, n=39)

For the purpose of this study, instruction for the traditional timbre group was in contrast to the other treatments, designed to provide a more general introduction to musical timbre discrimination through units, which introduced the instruments of the orchestra. The instructional sequence of the lessons was as follows: (a) introductory experiences: video-taped presentations on instrument sounds, (b) the voice, (c) un-pitched and pitched classroom and band percussion instruments, (d) brass instruments, (e) woodwind instruments, (f) stringed instruments, and (g) keyboard instruments. In each unit the students were introduced to and taught to identify 2 to 4 instruments of contrasting timbre.

The primary objective of lessons designed for this group was to develop student skills for identifying instruments, their families, physical properties, and other similarities and differences. Activities selected to provide practice in skill development included: (a) recorded and live listening lessons in which the children heard and identified the instrument or singing voice studied, (b) developmentally appropriate singing and movement activities using songs from the music series about the instrument or which used the instrument as accompaniment, (c) songs and rhythmic chants created by the researcher which described the characteristic structure, sound production and (tone color) timbre of the instrument (d) experiences in playing the instrument when possible, (e) categorization games to put instruments with similar characteristics together, (f) picture representations of the instruments and singing voices for the children to identify, draw and color, (g) listening excerpts, which allowed the children to identify instrumental and sung sounds heard. Activities for a Traditional Timbre lesson included: (a) Warm-up/Review: What sound do you hear? Children orally identified short excerpts of sounds of instruments or singing voices studied (5 minutes), (b) children heard and orally identified familiar instrument or singing sounds (5 minutes), (c) presentation of new instrument (audio, video or live performance) or singing sounds (10 minutes), (d) listening games, singing, movement or instrument playing or instrument coloring/ making activities which reinforced new sounds and concepts learned (10 - 15 minutes, and (e) weekly informal evaluations which assessed student skill in aurally discriminating instrument sounds (5minutes). The duration of the treatment was 18 weeks.

Treatment was followed by an intermittent formal assessment of the impact of traditional timbre instruction on alphabet same/different, visual recognition, and sound-symbol matching discrimination skills, using the 5th, 10th, 14th and 18^{th-}week alphabet discrimination posttest. In light of their age and inexperience with formal testing, students were tested in groups of 10 with one of the trained test administrators. The duration of testing was no more than 10-15 minutes; therefore evaluation of all small groups was completed in two 45-minute periods. After the initial sound/symbol discrimination post-test, the group was given a delayed posttest two weeks later using the 18th-week alphabet sound/ symbol discrimination (equivalent forms) posttest.

This instruction omitted direct instruction of music literacy skill associated with other forms of aural discrimination (pitch, rhythm, and amplitude). The omission of these skills for the duration of the study was an attempt to control for the impact of instruction in other auditory variables. Music literacy instruction was resumed upon completion of the study. Detailed descriptions of the lessons, objectives, musical examples and activities for this group may be found in Appendix B. Table 7 illustrates the treatment/testing schedule for each treatment group in the study.

<u>Phonetic Discrimination Instruction (Dependent Variable)</u>

The dependent variable in this study was student performance on phonetic discrimination tasks. The discussion which follows describes phonetic skills addressed in the regular classroom, the sequence of their presentation at both grade levels involved, the amount of time spent on phonetic instruction and the pre-reading skills to be mastered at each grade level.

Informal observations of pre-kindergarten and kindergarten classes conducted by the researcher at the proposed school site during the 1997-1998 school year suggested preparation for reading and comprehending the spoken and written word was a significant part of the instructional day. The phonetic skills identified as possibly related to timbre discrimination skills were: (a) The discrimination of same and different phonetic sounds; (b) identification of visual representations of alphabet sounds and (c) The pairing of a phonemic sound with its appropriate grapheme/phoneme representation. The ensuing discussion will outline activities used to develop these skills. The sequence and time frame of instruction will also be described.

Findings from developmental reading literature (Chall, 1988; Torgensen et al., 1992) and informal interviews with participating teachers identified phonetic discrimination as a critical factor in reading preparation and achievement. Findings from

Table 7
Treatment Group Schedule

Event	TDT Timbre Pre Test	SESAT Alphabet Pre Test	District Wide Pre Test	Practice Schedule For Study	Same Different Treatment	5th week Same Different Post Test	Winter Holidays	Visual Recognition Treatment	10th week Visual Recognition Post Test	Sound Symbol Treatment	14th week Sound Symbol Post Test	Delay Time	18th week Sound Symbol Post Test	End of Study
Time Frame/ Dates	One Week 9/21/98	One Week 9/27/98	Two Weeks 10/5/98 - 10/18/98	Two Weeks 10/26/98 11/6/98	Three Weeks 11/9, 11/16 *11/30/98	One Week 12/6/98, 12/14/98	Two Weeks 12/23/89 1/3/99	Three Weeks 1/4/99, 1/10, 1/18/99	One Week 1/24/99	Four Weeks 2/1,2/8, 2/15, 2/22	One Week 3/1/99	Three Weeks 3/8/99 - 3/26/99	One Week 4/29/99	End of Study 4/2
Treatment Group 1 Same-Different S/D *(n=43)*	Pre Test	Pre Test	No Classes Grade Tests	Classroom Music C/M Control Activity	Same Different Treatment S/D	5th week Same Different Post Test	Winter Holidays	Classroom Music C/M	10th week Visual Recognition Post Test	Classroom Music C/M	14th week Sound Symbol Post Test	No Instruction	18th week Sound Symbol Post Test	End of Study 4/2
Treatment Group 2 Visual Recognition V/R *(n=44)*	Pre Test	Pre Test	No Classes Grade Tests	Classroom Music C/M	S/D	5th week Same Different Post Test	Winter Holidays	V/R	10th week Visual Recognition Post Test	Classroom Music C/M	14th week Sound Symbol Post Test	No Instruction	18th week Sound Symbol Post Test	End of Study 4/2
Treatment Group 3 Sound-Symbol S/S *(n=45)*	Pre Test	Pre Test	No Classes Grade Tests	Classroom Music C/M	S/D	5th week Same Different Post Test	Winter Holidays	V/R	10th week Visual Recognition Post Test	Sound Symbol Treatment	14th week Sound Symbol Post Test	No Instruction	18th week Sound Symbol Post Test	End of Study 4/2
Treatment Group 4 Sound Symbol with Instruction for Transfer S/S/T *(n=45)*	Pre Test	Pre Test	No Classes Grade Tests	Classroom Music C/M	Same Different Treatment with Instruction for Transfer	5th week Same Different Post Test	Winter Holidays	Visual Recognition Treatment with Instruction for Transfer	10th week Visual Recognition Post Test	Sound Symbol Treatment with Instruction for Transfer	14th week Sound Symbol Post Test	No Instruction	18th week Sound Symbol Post Test	End of Study 4/2
Treatment Group 5 Traditional Timbre Instruction T/T *(n=45)*	Pre Test	Pre Test	No Classes Grade Tests	Classroom Music C/M	Traditional Timbre Instruction	5week Same Different Post Test	Winter Holidays	Traditional Timbre Instruction	10 week Visual Recognition Post Test	Traditional Timbre Instruction	14 week Sound Symbol Post Test	No Instruction	18 week Sound Symbol Post Test	End of Study 4/2
Class. Mus. CM/Co (C/M)	Pre Test	Pre Test	No Classes	Classroom Music C/M	Assign as Needed	Assign as Needed	Assign as Needed	Assign as Needed	Assign as Needed	Assign as Needed	Assign as Needed	Assign as Needed	Assign as Needed	CM

observations conducted during the 1997-1998 school year suggested approximately one third of the instructional day was spent on phonetic instruction. Therefore, based on a 6 hour instructional day, students involved in this study devoted approximately 1.8 to 2.0 hours per day to development of phonetic skills. The methods and activities used to present instruction varied from teacher to teacher. Activities used to present the skills pertinent to this study included (a) same different letter sound identification games included activities identifying environmental, shapes, letters and letter sounds as same and different. These games usually involved the pairing of two phoneme sounds and asking the student if they were the same or different. They also involved identifying the first sound and last sounds in two words as same or different. (b) visual games used to identify alphabet symbols (graphemes) included circle games to identify the letter, bean bag tosses to identify the letter and its sound, and finding the pictures which begins with a given letter sound. (c) games used to match the phoneme with its corresponding letter sound included chanting and singing the alphabet, and writing letters when given the sound. The time spent on each type of activity was left to the discretion of the teacher.

The findings of the informal observations suggested that phonetic instruction was consistently used in all of the classrooms involved in the study. Upon determination of the approximate amount of time spent on phonetic instruction and the type of activities used for skill development, the researcher conducted informal interviews with the teachers to determine an approximate sequence of concept presentation and time frame of instruction. State and local language arts curricula are currently under revision, however this researcher could not find evidence in the previous document of a daily requirement for amount of time spent in each academic area. Therefore it was assumed that times spent in each skill area vary from classroom to classroom. Although most teachers followed the sequence of instruction indicated, the time frames presented here are estimates based on informal teacher responses to informal questions posed by the researcher concerning the amount of time spent on phonetic skills.

The tables that follow (8 and 9), indicate the sequences and estimated time for phonetic instruction in the pre-kindergarten and kindergarten classes observed. The preparatory steps toward phonetic discrimination may be categorized as follows: (a) sound awareness: children are made aware of similarities and differences in sounds, (b) sound-symbol awareness: students introduced to the concept that written symbols represent sounds, and (c) sound/symbol matching: introduction to the letters of the alphabet and their sounds-students learned that each visual representation of the alphabet has a corresponding phonetic sound.

In light of the purpose of this study, the presence of musical (pitch and amplitude) discrimination in the sequence of instruction was of some concern to this researcher. However, through classroom observation and teacher interviews it became apparent that this instruction was not presented systematically or even on a daily basis but rather sporadically over the first few weeks of the school year. Musical discrimination discussions were found to focus on concepts of high/low and loud/soft rather than quality of sound. Table 8 is an outline of the first semester's sequence of instruction in phonetic discrimination.

All of the classroom teachers presented the consonants, and then vowels in the order in which they occur in the alphabet. Student development in all preparatory reading skills was assessed by a progress report at the end of each nine-week period.

Table 8

First Semester Sequence of Instruction for Phonetic Discrimination Skills in Pre-Kindergarten and Kindergarten Classes

Grade Level	Sound Awareness *(Same-Different Discrimination)*	Visual Representation of Sounds *(Visual Recognition Discrimination)*	Introduction to Alphabet Sounds/ Symbols *(Sound-Symbol Discrimination)*
Pre-Kindergarten	Weeks 1-4	Weeks 5-9	Weeks 10-22
	Students identify and are Made aware of differences In: Classroom, Outdoor Musical (pitch/amplitude) And Animal Sounds	Children are introduced to written symbols as representations of sounds Awareness is developed of initial letters as representative of familiar Names and sounds	Alphabets and their corresponding sounds are introduced at the rate the rate of one per week or every two weeks depending on overall ability of the class.
Kindergarten	Weeks 1-2	Weeks 3-4	Weeks 5-15
	Students identify and are made aware of differences In: Classroom, Outdoor Musical (pitch/amplitude) and Animal Sounds	Children are introduced to written symbols as representations of sounds Awareness is developed of initial letters as representative of familiar names and sounds	Consonants and their corresponding sounds are introduced at the rate the rate of one per week or every two weeks depending on overall ability of the class.
	Weeks 16-22: Vowels-short then long sounds are presented at the rate of 1 per week		

This evaluation instrument defined what pre-reading skills students must master at each primary grade level. Table 9 was a summary of the skills assessed. The classroom teacher determined the proficiency of skill at each grade level. Also included in the assessment were the auditory skills identified in the sequence of phonetic instruction.

Generalizations relating to this study, which have been made about instruction in phonetic discrimination at the school site, are as follows: (a) Approximately 1.8-2.0 hrs. of the instructional day was spent on the development of phonetic discrimination skills; (b) methods and activities used to present and develop skills varied from teacher to teacher; (c) the sequence of skill presentation addressed those phonetic skills identified as possibly similar to music skills; and (d) although the sequence of phonetic concept presentation was similar among classes the amount of time spent on various concepts varied from class to class.

Description of Data Collection and Analysis

In addition to the randomization process described earlier in this chapter, results of pre-testing with the Sound/Symbol Alphabet Discrimination Test and Timbre Discrimination Test were used to establish student baseline performance in both skill areas before treatment. After instruction at each skill level, students were post-tested at the end of 5^{th}, 10^{th} , 14^{th} and 18^{th}- weeks with the appropriate skill test for that phase of instruction. Scoring after each administration of the test was completed and recorded by research assistants. Upon completion of the study, scores were transferred to the computer for analysis.

The Analysis of Variance (ANOVA) was selected as the tool for statistical analysis of the data. It was determined appropriate for the comparison of the effects of

Table 9

Skills Assessed at Each Grade Level at the End of Each Nine-Week Grading Period.

Aural Discrimination Skills	Visual Discrimination Skills	Language Development
The student will demonstrate:	The student will recognize and identify:	The student will:
Discrimination of environmental, loud/soft, like/different, high/low, consonant sounds, short vowel sounds, and long vowel sounds	Name, parent's name	Trace shapes and letters
	Address, phone number	Trace numbers
	Upper and Lower case letter recognition	Print first and last name
	5-6 Initial blends	Follow directions
	Primary colors and words	Speak clearly
	In context	Express ideas in complete sentences
	5-10 sight words	Listens attentively
	rhyming words and phonograms	Completes two and three step directions
	Recognizes numbers 1-10.	

two or more levels of independent variables on a dependent variable. Results indicated whether there was a significant difference among the levels of the independent or treatment variables on the dependent variable (Asmus and Radocy, 1992).

The statistical design used for this study complied with the assumptions necessary for the use of forms of ANOVA. The assumptions met were (a) the sample was randomly assigned to treatment groups, and (b) the size of the sample N=200 was large enough to ensure adequate cell size (not less than 10 subjects), for analysis (Asmus and Radocy, 1992; Bickman and Rog, 1994).

To specify the cause of the significant difference between instructional groups, the Measure of Association Test (w^2), was performed to determine the proportion of the variance in the dependent variable (alphabet sound/symbol association), which was accounted for by the levels of the independent variable (five instructional treatments). In order to determine significant differences between particular pairs of means, the Tukey Kramer or the (HSD) Honestly Significant Difference Test, was used to make all pairs-wise comparisons. The test was used because it was determined to be most suitable for the pairs-wise comparison of unequal groups (Hinkle, Jurs, and Weirsma, 1988). The *Q* distribution was used because it was determined to be the most appropriate statistic to calculate the minimum difference between the largest and smallest means in a group of means needed to determine that the population means are not equal (Hinkle, Weirsma, and Jurs, 1988). The Pearson Product Moment Correlation Coefficient was calculated to determine the relationship between scores generated by the 14^{th} and 18^{th}-week alphabet and timbre discrimination posttests. Since the original SESAT Sounds and letters Subtest was modified by this researcher to more precisely fit the need of this study, pilot groups were established to determine reliability of the measurement instruments. The Test-Retest was determined to be the most appropriate instrument to establish consistency of student performance over time (Nitko, 1983). The Pearson Product Moment Correlation Formula was used to calculate score correlations between testing occasions. Reliability coefficients yielded by the test-retest analysis and comparison with the standards outlined in the Harcourt Brace Data and Technical Manual revealed the eight tests designed for this study to be satisfactory in terms of length, time required for testing and consistency of results regardless of occasion.

Calculations for the Tukey-Kramer, Scheffe, Pearson Product Moment Correlation Coefficient,and ANOVA can be found in Appendix F. Descriptive and inferential statistics for the study were calculated using the Microsoft Office 97 Excel Program. All data was processed at the .99 confidence level. Randomization and post hoc comparisons were calculated using the TI-83 and hand calculations. State Certified Mathematical experts from a local Magnet High School, Junior College, and University verified results.

Test Instrumentation

Screening Instruments

The school district required that each student at the pre-k and kindergarten received a formal assessment upon entering school. Pre-kindergarten and kindergarten students were screened by the classroom teachers with the school district's selected pre-school assessment instruments to determine general grade level readiness. Classroom teachers administered these tests at the time of student registration. There was an early registration in the spring for students who entered school in the fall. Students were also allowed to register for any available spaces at the beginning of the new school year. The screening instruments used at each grade level are described in the next section.

<u>Pre kindergarten: The Dial R.</u> The school district selected the Dial R (America Guidance Services, 1990) as the standard pre-kindergarten screening instrument. The purpose of the Dial-R, as stated in its manual was to assess general pre-school readiness. The skill areas evaluated are: (a) Language, (b) Motor Skills, (c) Concepts (naming colors, body parts letters and numbers), and (d) behavioral observations which are anecdotal in nature. Each subtest had 8 sections and yielded a total score of 31 points per subtest. Each subtest was followed by behavioral observations designed to further clarify skills, personality traits and maturity.

The test claimed to evaluate students briefly for auditory discrimination and memory in the language category. Further examination of the instrument by this researcher suggested that the tasks required in this category was one of visual letter identification and pattern memory. The designers of the instrument assumed the student has not had formal phonetic instruction and did not test prior knowledge of alphabet sounds. Recommendations for ESL, Speech and Hearing screening were left to the discretion of the classroom teacher.

<u>Kindergarten: The Chicago Early Assessment.</u> The Chicago Early Assessment was published between 1981-1984. It is a district mandated screening instrument which tests general readiness for Kindergarten in the areas of (a) Gross Motor Skills, (b) Fine Motor Skills, (c) Language, (d) Visual Discrimination, and (e) Auditory Perception

and Memory. The purpose as stated in the manual was to act as a screening instrument to assess individual student abilities in order to provide remedial instructional activities in weak areas of functioning. It was designed to assess the student population from age three through six. The test was administered to students on an individual basis. The duration of the test was 15-20 minutes.

Auditory perception was more of a memory task than a word or letter sound discrimination task and was not suitable to test the phonetic discrimination skills that were the subject of this study. Students were required to recall patterns of words rather than tell the difference between initial or final sounds. In a review by Constantine (1992) test reliability is reported to be between $r = .56$ *and* $.86$ for the five subtest. Constatine questioned the validity $(r = .89)$ because it was reported to be based on a sample of 160 children. Judgments on auditory discrimination and speech difficulties were left to the subjective judgment of the teacher.

The tests described above provided a general of assessment student readiness for the grade level being entered. They did help to identify serious speech, hearing and learning disabilities and assist the teachers in identifying non-English speaking students. They did not provide enough test items in the area of auditory discrimination to thoroughly assess student skills needed to discriminate phonetic quality or alphabet sound.

<u>Pre and Post Test Instruments</u>

The previous discussion addressed the school district screening instruments used to determine student readiness for the pre-kindergarten and kindergarten grade levels. The same instruments were used to detect speech and hearing difficulties and language differences. In the discussion that follows the pre-test and posttest instruments selected as data collection tools for the study are also described.

The Stanford Early School Achievement Test. The pretest, posttest instrument chosen for the evaluation of phonetic discrimination skills in this study was the Stanford Early School Achievement Test. It was a part of the Stanford 9 Achievement Test series and was published by Harcourt Brace Educational Measurement, San Antonio, TX. 1996. It was originally designed in 1972 by Madden, Gardner and Collins and published by the Psychological Corporation. It was most recently revised in 1998. The instrument has been designed to measure student school achievement in reading, language arts, mathematics, science and social science.

The SESAT consisted of two levels (a) SESAT 1: Fall Kindergarten, and (b) SESAT 2: Spring Kindergarten. There were five subtests at each level: (a) Sounds and Letters, (b) Word Reading, (c) Mathematics, (d) Environment, and (e) Listening. The test had a standard multiple choice format and arrived with directions for administration of each test. Each item of the test had to be read aloud by the teacher. It was designed for the population from 5.0-5.5 years of age. For this study, pre-kindergarten teachers at the research study site were allowed to review this test for its' suitability to test their students whose age's ranged from 4.0-4.5 years of age. The teachers suggested that because the test would be used in a modified form, as described in the treatment section of this chapter, and because the pre-kindergarten's sequence of phonetic instruction is very similar to the kindergarten's instructional sequence, the test was an appropriate tool for the evaluation this sample's four-year-old students.

The SESAT Sounds and Letters subtest Level 1 was used as the pretest-posttest measurement instrument for this study. The test was selected because it is was determined by consensus of participating teachers in the study to be a developmentally appropriate assessment of phonetic/alphabet discrimination skills at the pre-kindergarten, and kindergarten levels. The test adequately assessed the auditory and visual discriminations skills identified for comparison in the study. The auditory and symbol discrimination skills tested included: (a) identification of phoneme sounds as same or different, (b) visual discrimination of graphemes or alphabet symbols, (c) pairing of phoneme sound with its matching alphabet symbol.

The subtest consisted of 48 examples. The first 24 items assessed student skill in discriminating like and unlike letter and word sounds. Items 25-36 tested visual skills needed discriminate different alphabets. Items 37-48 tested student understanding of sound symbol relationships. It was designed for group assessment of pre-phonetic skills upon entering school. In order to more effectively evaluate the impact of musical skill training on each level of alphabet skill development, only 12 items from each appropriate subsection of the Sounds and Letters sub-test was administered in modified form after each treatment phase. After training in musical same/different discrimination, students in order to maintain consistency in the test format, were administered only 12 of the 24 items of the same-different portion of the Sound and Letters Sub-Test which tested the differentiation of letter sounds.

Similarly, after the visual representation treatments, and the sound symbol musical timbre discrimination treatments students were administered 12 questions from the corresponding portions of the subtest. The sub-tests, now divided into three distinct skill levels were designated as the (a) the 5th-week same/different alphabet discrimination post test, (b) the 10th-week visual recognition alphabet discrimination post test, (c) the 14th-week sound symbol alphabet discrimination post test, and the 18th-week sound symbol alphabet discrimination post test (an equivalent forms version of the 14th-week posttest also designed by the researcher). In order to comply with the legal specifications of The Psychological Corporation (Harcourt Brace, 1999), only selected sample items from these tests may be found in Appendix A. In order to avoid the effects of students becoming familiar with the Sound/Symbol Alphabet Discrimination test, after three administrations, an equivalent forms version of the sound symbol test was developed for the delayed posttest. Sample items from the equivalent forms version may also be found in Appendix A.

Timbre discrimination test. The hypothesis for this study was that the development of musical sound (timbre) discrimination skills would facilitate the development of alphabet sound discrimination skill. Therefore, this investigator thought it necessary to evaluate progress in timbre discrimination development as well as that of alphabet discrimination development. The timbre discrimination test (TDT) was designed by this researcher and used to assess pre-test and post test skills of subjects in each skill level of timbre discrimination. It was a 36-item test constructed to specifically test timbre discriminations skills possibly related to alphabet discrimination skills. The format paralleled the Sounds and Letters Subtest as closely as possible. Items 1-12 assessed student skill in discriminating pairs of instrumental and sung vocal sounds as same and different. Items 13-24 assessed student skill in the discrimination of visual identification representations of musical instruments. Items 25-36 assessed student skill in matching instrumental and sung vocal sounds with their appropriate picture representations. A copy of the test may also be found in Appendix A. As stated in the data collection and analysis section of this chapter, the validity and reliability of this test and the SESAT Alphabet Discrimination Test have been established. Reliability and Validity findings for both tests are outlined in the next two sections of this chapter.

Reliability

The KR 21 reliability coefficients for the SESAT Sounds and Letters subtest are reported in the Stanford 9 Technical Data Manual (Harcourt Brace, 1999). The manual reports an overall subtest reliability coefficient of $r = .90$ for each skill section of the Sub-test. They are categorized as (a) Auditory Discrimination (8 items, $r = .72$), (b) Auditory Perception (16 items, $r = .82$), (c) Visual Discrimination (6 items, $r = .69$) and Symbol Perception (18 items, $r = .84$).

Although derived from the SESAT Sound and Letters subtest, in customizing the alphabet discrimination measurement instrument for the study, one will recall that the researcher reorganized the items at each skill level differently from their presentation in the technical data manual. Therefore, reliability for the Same/Different, Visual Recognition, Sound/Symbol and the Equivalent Forms Sound/Symbol Alphabet Discrimination tests had to be established. Table 10 illustrates a comparison of the skill divisions and item organization for the SESAT Sound and Letters and Sub-test and the modified version of that test (SESAT Alphabet Discrimination Tests) used for this study. It was also necessary to determine the reliability for the similarly designed sections of the newly created Timbre Discrimination Test.

Table 10

Item Organization: Comparison of the SESAT Sound and Letters Subtest to the Researcher Modified Alphabet and Timbre Discrimination Tests.

SESAT = Stanford Early School Achievement Test; TDT = Timbre Discrimination Test;
Confidence Level = .99; ** = Test not Administered; *** Harcourt Brace Data and Technical Manual

Name of Test	*Skill Cluster*	*Item Organization*	Name of Test	*Skill Cluster*	*Item Organization*
SESAT Sounds and Letters Subtest			SESAT Alphabet Discrimination Test		
	Auditory Discrimination	#1-8		Same Different Discrimination	#1-12
	Auditory Perception	#9-24			
	Visual Discrimination	#25-30		Visual Recognition of a Sound Source	#25-36
	Symbol Perception	#30-48		Sound Symbol Discrimination	# 37-48
			TDT Timbre Discrimination Test		
				Same Different Discrimination	#1-12
				Visual Recognition of a Sound Source	#25-36
				Sound Symbol Discrimination	#37-48

Test Re-Test Reliability

Pilot group one and inter-scorer reliability. The pilot group was established to evaluate the eight sub-test (SESAT Same/Different, Visual Recognition, Sound/Symbol, Sound/Symbol Equivalent Form Alphabet Discrimination Tests and the TDT Same/Different, Visual Recognition, Sound/Symbol, and Sound/Symbol Equivalent Forms Timbre Discrimination Tests) in terms of test length, time needed for testing, and reliability.

Fourteen students, all children or relatives of teachers at the research site were volunteered to take the tests. Children ranged in age from 4 and 1/2 to 6 years of age *(X = 5.2 months).* All were enrolled in school at the pre-kindergarten and kindergarten levels. The ethnic breakdown was 70% African American, 25% Vietnamese and 5% Anglo-American. Parents of the students involved in the group reported that students had not had any formal alphabet or timbre discrimination training. Some, however were participants in church children's choirs. All students were enrolled in local public or private schools but did not attend school at the research site.

The Test- Re-Test Method was used to establish instrument reliability. The first group of eight tests was administered over a two-week period. The research assistants met after-school with pilot group 1 students for 4 days per week until the testing was completed. The average length of testing time was 12-15 minutes. The amount of time needed for testing was similar to those recommended on the SESAT Directions for Administering (Harcourt Brace, 1999). The Re-Test cycle of testing was administered over the following two-week period. Therefore, there was no more than a two-week time lapse between each test/re- test. The average length of re-testing time was the same as that of the initial testing period. The Pearson Product Moment Correlation Coefficient was calculated to determine Test-Re-test reliability for the Alphabet and Timbre Discrimination measurement instruments. The results are summarized in Table 11.

Since there were more than one assistant responsible for test scoring and since the test were hand scored, it was necessary to establish inter-scorer reliability. Scorers used the sound and letters hand scoreable answer key provided by Harcourt Brace to grade the Alphabet Discrimination Tests, and the researcher designed an answer key to grade the Timbre Discrimination Tests. With the exception of the 14^{th}-week sound/symbol posttest, tests were administered to the students by seven of the ten research assistants (4 college and 3 high school students, per testing session. Assistants who were not assigned to students in a particular session were allowed to function as monitors. The assistant-student ratio for pilot group one was 2:1. When calculating inter-scorer reliability, In order to allow maximum variation in scoring, the three non-classroom teachers were added as test scorers for the sound symbol testing and the investigator functioned as monitor for this testing session. As mentioned earlier the non-classroom teachers did not have contact with the research subjects during the duration of the study. Therefore, any threats to validity due to scorer bias were minimal.

Tests for Pilot Group 1 were graded and raw scores calculated for the SESAT Alphabet Discrimination Sound/Symbol and Timbre Discrimination Sound- Symbol tests. Tables 12 and 13 illustrate the results of the inter-scorer reliability correlations. The Pearson Product Moment Correlation was calculated to determine Inter-scorer Reliability which was r = .95 for the Alphabet Discrimination Sound/Symbol Test. Inter-scorer reliability for the Timbre Discrimination Sound Symbol Test was r=1.00.

Table 11
<u>Comparison of Test-Retest Reliability Coefficients for Pilot Groups 1 and 2</u>

SESAT = Stanford Early School Achievement Test; TDT = Timbre Discrimination Test; Confidence Level = .99;
** = Test not Administered; *** Harcourt Brace Data and Technical Manual

Test	Group 1 (*N* = 14) *r*	Group 2 (*N* = 165) *r*	*Coeficient Difference* (r_1-r_2)
SESAT			
Alphabet Discrimination Same Different (5th wk) Post Test	.86	.80	*.06*
Alphabet Discrimination Visual Recognition (10th wk) Post Test	.87	.77	*.10*
Alphabet Discrimination Sound/Symbol (14th wk) PostTest	.84	.80	*.04*
Alphabet Discrimination Sound/Symbol (18th wk) Post Test	.87	.88	*.01*
TDT			
Timbre Discrimination Same Different (5th wk) Post Test	.89	.82	*.07*
Timbre Discrimination Visual Recogn. (10th wk) PostTest	.83	.78	*.05*
Timbre DiscriminationSound/Symbol (14th wk) Post Test	.84	.84	*.00*
Timbre Discrimination Sound/Symbol (18th wk) Post Test	.89	.84	*.05*

Table 12

Interscorer Reliability for the14th Week Alphabet Sound-Symbol Discrimination Posttest: Pilot Group 1

ID/Scorer	1	2	3	4	5	6	7	8	9	10
1	4	4	4	4	4	4	4	4	4	4
2	4	4	4	4	4	4	3	4	4	4
3	3	3	3	3	3	2	3	3	3	3
4	3	2	3	3	3	3	3	3	3	3
5	2	2	2	2	2	2	2	2	2	2
6	0	0	0	0	0	0	0	0	0	0
7	3	3	3	3	3	3	3	3	3	3
8	4	5	4	4	4	4	3	4	4	4
9	0	0	0	0	0	0	0	0	0	0
10	3	3	3	3	3	3	3	3	3	3
11	2	2	2	2	2	2	2	2	2	2
12	2	1	2	2	2	1	2	2	2	2
13	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	1	0	0	0

Reliability Coefficients:

r = .96 *r =1.00* *r =.97* *r = .97* *r = 1.00*

Table 13: Interscorer Reliability for the 14th Week Timbre Discrimination Sound/Symbol Posttest: Pilot Group 1

ID/Scorer	1	2	3	4	5	6	7	8	9	10
1	3	2	3	3	3	3	3	3	3	3
2	2	2	2	3	3	3	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3
4	2	2	2	2	2	2	3	2	2	2
5	1	1	1	1	1	1	1	1	1	1
6	3	3	3	3	3	3	3	3	3	3
7	4	4	5	4	4	4	4	4	4	4
8	4	4	4	4	4	4	4	4	4	4
9	0	0	0	0	0	0	0	0	0	0
10	3	3	3	3	3	3	3	3	3	3
11	2	2	2	2	2	2	2	2	2	2
12	3	3	3	3	3	3	3	3	3	3
13	0	0	0	0	0	0	0	0	0	0
14	1	1	1	1	1	1	1	0	1	1

Reliability Coeficients:

	r = .98		*r = .96*		*r = 1.00*		*r = .97*		*r = 1.00*	

Students were rewarded at the end of the re-testing period with a gift certificate to a local restaurant. To avoid contamination of test performance, students were not told about the reward before or during testing. Students were co-operative during testing and seemed to especially enjoy taking the test during the re-test period.

Pilot group II and comparison of pilot group results. Table 11 revealed reliability coefficients for test-re-test method, which were acceptable for pilot group one (Harcourt Brace, 1999; Kerlinger, 1973; & Nitko, 1983). However, this investigator was reluctant to draw conclusions about reliability based on such a small sample. Therefore, there was a need to establish similar results with a larger sample.

Permission to work in another district school was obtained by the researcher. The authorization to conduct research at the school site may be found in Appendix D.
The ethnic breakdown of Pilot Group 2 was similar to that of the study group:
80% African American, 15% Vietnamese, 4% Anglo American and 1%Hispanic. To avoid the possibility of contamination by association, the school was located in an area of the city different from the research study site.

Two intact Pre-Kindergarten, $n = 38$, and 4 intact Kindergarten classes $n = 127$, were used for the testing. Their ages ranged from 4 and 1/2 to 6 years old $(X = 5.6)$. The socio-economic status was slightly different in that more children in Pilot Group 2 lived in housing projects and were on public assistance than those in the actual research study.

At the time of testing, all students had received 6 weeks of pre-kindergarten and kindergarten instruction. Based on informal teacher interviews, the curriculum was similar to the one implemented at the research site. Students did not receive classroom or other organized music instruction at this school site.

All ten research assistants were used for the testing. The student-assistant ratio was 1:8 per group. Students were tested in the afternoon, after rest period, for two weeks. Students were tested four days per week until all eight tests were completed. Students tested again for another two-week period. There was a one-week delay between test and re-test periods due to scheduling conflicts at the school site. Test- Retest correlations for Pilot Group 2 reported in Table 11, allow comparisons between both. Differences in pilot group findings for each test are also reported.

Analysis of the results suggested the reliability coefficients were similar for both pilot groups. Comparison of scores however, revealed that reliability coefficients for group two were lower than those of group one. The variation may have been due to the differences in (a) the size of the samples, (b) the time of day the test was administered, (c) the extra week delay in testing for group two, and (d) the difference in socioeconomic status.

Table 14 illustrates the comparison of test-re-test reliability coefficients calculated for the researcher-designed Alphabet Discrimination Test with reliability coefficients reported for comparable skill sections of the SESAT Sound and Letters Subtest. The findings for the researcher modified SESAT Alphabet Discrimination tests are consistent with the KR 21 findings for the SESAT Sound and Letters sub-test skill sections as reported in the Data and Technical Manual (Harcourt Brace, 1999). However, the Auditory Discrimination Skill (Same/Different) and Visual Discrimination (Visual Recognition) Scores were slightly lower than those of the Test-Re-Test findings for the two Pilot Groups. Differences were attributed to (a) the difference in the distribution of items for the sound and letters sub-test and the modified form of the sub-test developed

Table 14

Comparison of Reliability Coefficients for the SESAT Sound and Letters Subtest Skill Sections and the Alphabet Discrimination Tests

**Not taken by pilot subjects ++Not applicable to the standardization sample

Name of Test	Number of Items	Pilot Group 1 (N=14) r (Test-Retest)	Pilot Group 2 (N=165) r (Test-Retest)	SESAT *(N=2899)* Standardization Sample r (KR 21)
Sounds and Letters Subtest				
(Harcourt Brace Technical Manual)				
Skill Cluster				
Auditory Discrimination	8	**	**	.72
(Same/Different)				
Auditory Perception	16	**	**	.82
(Same/Different, Visual Recoin)				
Visual Discrimination	6	**	**	.69
(Visual Recognition)				
Symbol Perception	18	**	**	.84
(Visual Recog. Sound-Symbol)				
Alphabet Discrimination Test				
Skill Level				
Same/Different	12	.86	.80	++
Visual Recognition	12	.87	.77	++
Sound/Symbol	12	.84	.80	++

by the researcher, and (b) the function of the KR 21 as a lower bounds estimate of reliability. The smaller number of items in the original organization of the test, especially in the visual discrimination section, could have produced the lower reliability coefficients.

Conclusions for test-re-test reliability findings. The reliability coefficients obtained with the test-re-test method indicated that all eight tests under consideration as measurement instruments for the study produced similar results with similar pilot groups. There were variations in the raw scores of the pilot groups between testing periods may have been due to familiarity with the test or a slight increase/decrease in knowledge in the time between test administrations.

Despite the variations in raw scores however, the test-re-test reliability coefficients indicated that student performance on the tests were stable over a period of time. Therefore, the assumption was made that the tests would produce similar results. Furthermore, the reliability coefficients indicated all 8 tests to be satisfactory measurement instruments for the purpose of the study. They proved to be comparable to the standards outlined in the Data and Technical Manual, (Harcourt Brace, 1999) in terms of length, time required for testing and consistency of results.

Content Validity

The items used for both the alphabet and timbre discrimination tests were intended to represent the three skill levels identified in the rationale as critical to pre-reading sound-symbol discrimination in both music and language. Therefore, this researcher had to determine the extent to which the test content represented an appropriate sample of the skills, knowledge and understanding intended to be the defined goals of instruction (Harcourt Brace, 1999; Kerlinger, 1973; & Nitko, 1983).

The 3 skill levels that formed the basis for the instructional content of this study, are stated in Chapter 1. A description of the instructional content for both the alphabet and timbre discrimination instruction is detailed in Appendix B. Additionally a description of skills identified as necessary for the development of alphabet sound-symbol discrimination by the creators of the SESAT Sound and Letters Subtest may be found in the Stanford 9 Compendium of Instructional Objectives (Harcourt Brace, 1999).

The 12 items chosen from the SESAT Sound and Letters Subtest to create the modified measurement instruments for this study were compared by this researcher with the actual SESAT Sound and Letters Subtest itself. Table 10, used earlier to compare item organization for both the original and researcher modified alphabet discrimination tests, was also used to compare the similarity of skills identified for evaluation. Based on this comparison the items chosen for inclusion in the Alphabet Discrimination tests for this study were judged to be an accurate sampling of skills needed to determine student test performance at all levels of alphabet discrimination instruction.

Content validity for the TDT was determined by a comparison of its structure and content with the content and format of early elementary school timbre discrimination tests found in previous studies (Haufstader, 1976, Fullard, 1967; Loucks, 1974; Wooderson and Small, 1981). Perceptual tasks used for the evaluation of timbre discrimination achievement in pre-school/early-elementary school children in the earlier studies included (a) the visual and/or aural discrimination of various orchestral instruments and (b) the association of an instrument sound with its visual representation. Content validity for the Timbre Discrimination test was also determined by a comparison of the content objectives for this research study with Content Standard VI-4 as stated for Kindergarten timbre discrimination instruction in the National Standards for Music Education (Music Educators National Conference, 1994).

In addition to the content validity demonstrated by the consistency of items across various instructional sources, a source of quantitative evidence of content validity was needed as well. Nitko (1983) has reported that following specified content instruction, the administration of the same test on successive testing occasions should result in an increase of correct student responses on the test to indicate content validity. Therefore, this investigator compared the number of correct responses for both the alphabet and timbre discrimination sound symbol pre-tests, 14^{th}-week and 18^{th}-week posttests. The comparison revealed that items that were more difficult for students at the beginning of the instructional sequence, became progressively easier as the sequence of instruction continued. This higher level of student achievement at each level of instruction indicated that the content of the tests was learned during the course of the study and led to increasingly higher test scores; a quantitative indicator of content validity.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

The purpose of this study was to investigate the effects of three different levels of skill training in musical timbre discrimination on alphabet sound-symbol discrimination in pre-kindergarten and kindergarten children. This chapter is a presentation of the analysis of the five different timbre discrimination instructional procedures and their impact on alphabet sound symbol discrimination. The levels of instruction were: (a) Group 1 (Same/ Different), (b) Group 2 (Visual Recognition of a Sound Source), (c) Group 3 (Sound/Symbol), (d) Group 4 (Sound/Symbol Transfer), and (e) Group 5 (Traditional Timbre Instruction). Posttest data from each level of instruction and the results of both descriptive and inferential statistical procedures used for the analysis of the data generated by the treatment groups are discussed.

Alphabet Discrimination Tests

Research Question 1 explored the impact of transfer instruction on alphabet sound symbol discrimination. To illustrate student baseline performance in alphabet sound symbol discrimination before the study commenced, results of the Alphabet Sound Symbol Discrimination Pre Test were presented first. Following next are the results of the 14th week alphabet sound symbol discrimination posttest, which specifically addressed Research Questions 1 through 7. Finally the 18th week posttest was then be used to determine the lasting effects of the different instructional procedures.

This study was designed to evaluate the impact of transfer instruction not only on sound symbol discrimination but also on its two preceding skill levels (same-different and visual recognition of a sound source). In developmental research findings discussed in Chapter 2, these skill levels were identified as critical to the development of sound symbol discrimination. Therefore the results of the 5th and 10th week posttests are included as an integral part of all findings.

Alphabet Sound Symbol Discrimination Pre Test Results

Tables 15, 16 and 17 respectively, are summaries of the descriptive and inferential findings for the Alphabet Sound Symbol Discrimination Pre Test. The tables containing the complete statistical information for the study may be found in Appendix F. Table 15 reports all descriptive statistics based on the overall population N=216, and raw scores that ranged from 0 to 9. The overall median was $Mdn = 2$. Table 16 reports that the individual group mean scores for Groups 1 through 5 on the Alphabet Discrimination Sound Symbol pre-test ranged from $X_2 = 2.1$ to $X_1 = 2.9$. The narrow span of scores suggests a similarity among groups in overall test performance, and indicates that at the beginning of the study students possessed little baseline knowledge of the alphabet and its corresponding sounds. Table 17 presents results of ANOVA performed on the Alphabet Discrimination Sound/Symbol Pre-Test. The ANOVA yielded an F value of $F = .991$, As this value did not exceed the critical value of $F = 3.40$ at $p < .01$, no significant difference between or within the five groups in alphabet sound/symbol perception existed.

Table 15
Overall Descriptive Statistics *(N=216)* for the Alphabet Discrimination Tests

Test	*N*	*Sum*	*Range*	*X*	*Mdn*	*Mode*	*Std. Er.*	*SD*	*SDx*^{2}
SESAT Alphabet Discrimination Sound/Symbol Pre Test	216	522	0-9	2.42	2	0	141	2.08	4.33
Alphabet Discrimination Same Different (5th wk) PostTest	216	1548	0-12	7.16	7.5	8	.159	2.34	5.51
Alphabet Discrimination Visual Recogn. (10th wk) PostTest	216	1853	2-12	8.57	9	9	.163	2.39	5. 73
Alphabet Discrimination Sound/ Symbol (14th wk) PostTest	216	1923	0-12	8.90	9	10	.14	2.13	4.53
Alphabet Discrimination Sound/ Symbol (18th wk) PostTest	216	1924	3-12	8.90	9	10	.14	2.12	4.44

Table 16

Means, Medians, and Standard Deviations for Groups 1 through 5 on the Alphabet Discrimination Tests

	Group 1 (n = 43)			Group 2 (n = 44)			Group 3 (n = 45)			Group 4 (n = 45)			Group 5 (n = 39)		
Test	X	Mode	SD	X	Mode	SD	X	Mode	SD	X	Mode	SD	X	Mode	SD
SESATAlphabet Discrimination Sound/Symbol Pre Test	2.95	3	2.27	2.20	0	1.95	2.27	0	1.76	2.22	0	2.28	2.46	0	2.65
Alphabet Discrimination Same/ Different (5th wk) Post Test	6.10	5	2.63	7.52	8	2.08	6.53	8	2.31	8.47	10	1.78	7.15	5	2.22
Alphabet Discrimination Visual Recogn. (10th wk) Post Test	6.26	4	2.76	9.27	12	2.14	8.98	10	1.89	9.87	12	1.27	8.41	11	1.99
Alphabet Discrimination Sound/ Symbol (14th wk) Post Test	7.74	7	3.02	8.02	9	3.08	9.82	10	1.90	10.64	10	1.10	8.10	8	2.99
Alphabet Discrimination Sound/ Symbol (18th wk) Post Test	7.30	8	2.22	8.65	10	2.06	9.64	10	1.93	10.70	10	.933	7.97	1.82	3.34

Table 17

Summary of the Single Factor Analysis of Variance for Group Differences on the Alphabet Discrimination Tests

Test/Source of Variation	*df*	*SS*	*MS*	*F*	*F Crit. Val.*	*p*<
SESAT						
Alphabet Discrimination Sound/Symbol Pre Test						
Between Groups	4	17.16	4.29	.991	3.41	.01
Within Groups	211	913.34	4.33			
Total	215	930.5				
Alphabet Discrimination Same/Different (5th wk) Post Test						
Between Groups	4	147.13	36.78	7.48	3.41	.01
Within Groups	211	1036.87	4.91			
Total	215	1184				
Alphabet Discrimination Visual Recognition (10th wk) Post Test						
Between Groups	4	336.14	84.033	19.78	3.41	.01
Within Groups	211	896.53	4.25			
Total	215	1232.668				

Table 17 continued

Test/Source of Variation	*df*	*SS*	*MS*	*F*	*F Crit. Val.*	*p*<
SESAT						
Alphabet Discrimination Sound/Symbol (14th wk) Post Test						
Between Groups	4	291.32	72.83	22.47	3.41	.01
Within Groups	211	683.63	3.24			
Total	215	974.96				
Alphabet Discrimination Sound/Symbol (18th wk) Post Test						
Between Groups	4	325.60	81.40	27.33	3.41	.01
Within Groups	211	628.55	2.98			
Total	215	954.15				

Table 18
Post Hoc Comparison: Tukey Kramer for Unequal Groups (n) and Scheffe Complex Comparison for Unequal Groups (n) for the 14th Week Alphabet Discrimination Sound Symbol Post Test

Tukey-Kramer Comparison

Groups	*Q* Statistics			
1				
2	.28			
5	1.29	.28		
3	**7.70	**6.66	**6.18	
4	**10.74	**9.70	**9.40	*3.15

Critical Values of Q for *df = 211*

r =	2	3	4	5		2	3	4	5
**p< .05*	2.77	3.31	3.63	3.86	***p< .01*	3.64	4.12	4.40	4.60

Scheffe Complex Comparison

Groups	X_k	n_k	*Adjusted Coefficients*
1	7.74	43	.2514
2	8.02	44	.2573
5	8.10	39	.2280
3	9.82	45	.263
4	10.64	45	-1.00

$p < .01$ $F = 36.25$ *Critical Value = 13.64*

The 14th Week Alphabet Discrimination Sound Symbol Post Test

The results of the 14th week alphabet discrimination sound-symbol posttest provided the quantitative evidence on which this investigator based the findings for these questions.

Tables 15 and 16, presented earlier in this chapter, shows the descriptive statistics for the entire population and the descriptive statistics for the 14th week and all related alphabet testing on sound symbol skills. Descriptive data reported in Table 15 indicated an overall increase in the mean scores of all subjects, and thereby suggested an overall increase in alphabet sound/symbol performance for all study participants. Table 16 reported an increase in individual group means and highlighted Group 4 *(X = 10.64)* as having demonstrated the strongest alphabet sound symbol posttest performance.

Table 17 illustrates the results of the Analysis of Variance performed on the 14th week posttest scores. The ANOVA yielded an F score of $F = 22.48$ which exceeded the critical value of $F = 3.41$ at the $p < .01$ level of significance. Results indicate a statistically significant difference between group posttest performance in alphabet sound/symbol discrimination. The Measure of Association Test yielded a coefficient of ($w^2 = .29$). The results therefore suggest that the impact of the five different types of timbre discrimination instruction accounted for about 71% of the variance in group performance on the 14th week Alphabet Discrimination Test.

Table 18 illustrates post-hoc comparisons for the 14th-week alphabet discrimination sound symbol posttest. Tukey Kramer results revealed differences, at the $p < .01$ level of significance, between (a)groups who received one and three levels of timbre discrimnation instruction (1 and 3), (b) groups who received one level of timbre discrimination instruction and three levels of instruction and strategies for transfer (1 and 4), (c) two levels of timbre discrimnation instruction and three levels of timbre dicrimnation instruction (3 and 4), (d) two levels of timbre discrimnation instruction and three levels of instruction and strategies for transfer (2 and 4), (e) traditional timbre instruction and 3 levels of timbre discrimnation (5 and 3)instruction, and (f) traditional timbre instruction and three levels of instruction and strategies for transfer (5 and 4). These results provided the quantitative basis for the answers to research questions 2 through 7. The significant differences between treatment groups indicated a difference in effectiveness of skill transfer from music to alphabet sound discrimination when students were treated with 1, 2 or 3 levels of specific skill instruction, as opposed to the more general classroom music or instruments of the orchestra approaches to timbre discrimination instruction.

Results of the Scheffe Test for Unequal Groups are also presented in Table 18 and formed the basis for the answer to research question 1. The Scheffe results yielded an F value of $F = 36.25$, which exceeded the calculated critical value of $F = 13.64$. Findings for this multiple comparison of unequal treatment groups therefore indicated a significant difference between the mean of Group 4 (three levels of instruction and strategies for generalization) and the combined means of all other groups. Indications were that students taught to generalize timbre discrimination skills from music to language demonstrated a stronger 14th-week alphabet discrimination sound symbol posttest performance than the 14^{th-}week posttest performances of all other treatment groups combined.

The 18th Week Alphabet Discrimination Sound Symbol PostTest

The 18th-week posttest revealed the lasting effects of timbre discrimination instruction on alphabet sound symbol discrimination. Table 15 referred to earlier in this discussion contains the descriptive statistics for the 18th week sound-symbol posttest. The 18th-week overall mean of X =*8.90* was identical to the overall 14th week sound-symbol posttest mean of *X= 8.91* and thereby indicating that after a 3 week time delay, the learning gains reported for the 14th week posttest performance were maintained.

According to the individual group means shown in Table 16, the subjects in Group 4 maintained the strongest posttest performance. With the exception of Group 2 all other groups experienced a decline in posttest performance. A Pearson Product Moment Correlation calculated between 14th and 18th-week sound symbol discrimination posttest results yielded a coefficient of $r = .86$. This finding suggests a strong relationship between student test performance on the 14th and 18th -week alphabet discrimination posttests.

Table 17 summarizing the results for the ANOVA performed on the 18th week posttest showed a resulting *F* score of $F = 27.33$, a value which exceeds the critical value at the $p< .01$ level of significance (F $=3.41$). Consequently, a three-week time delay did not impact the test performance of the groups the sound/symbol discrimination posttest. The ANOVA findings confirmed earlier correlational findings which had indicated a strong relationship between 14th and 18th-Week posttest scores.

Table 19 illustrates post-hoc comparisons for the 18th-week sound/symbol posttest. The Tukey- Kramer Comparison revealed significant differences, at the $p< .01$ level of significance, between groups who received (a) one and three levels of timbre

Table 19

Post Hoc Comparison: Tukey Kramer for Unequal Groups (n) and the Scheffe Complex Comparison for Unequal Groups (n) for the 18th week Alphabet Discrimination Sound Symbol Post Test

Tukey-Kramer Comparison

Groups	*Q* Statistics			
1				
5	2.48			
2	1.87	2.56		
3	**6.5	**6.19	.26	
4	**13.3	**11.0	**7.7	**4.30

Critical Values of Q for *df = 211*

r =	2	3	4	5		2	3	4	5
*p< .05	2.77	3.31	3.63	3.86	**p< .01	3.64	4.12	4.40	4.60

Scheffe Complex Comparison

Groups	X_k	n_k	*Adjusted Coefficients*
1	7.30	43	.2514
5	7.97	39	.2280
2	8.66	44	.2573
3	9.64	45	.263
4	10.76	45	-1.00

p< .01 *F = 66.61* *Critical Value = 11.88*

discrimination skill instruction (1 and 3), (b) one and three levels of timbre instruction with strategies for similar skill association (1 and 4), (c) traditional timbre and three levels of timbre discrimination skill instruction (5 and 3), (d) traditional timbre and three levels of instruction with strategies for transfer (5 and 4), (e) (two levels of timbre discrimination skill instruction and three levels of timbre instruction with strategies for transfer (2 and 4) and (f) three levels of timbre discrimination skill instruction and three levels of instruction with strategies for transfer (3 and 4). Results were similar to the 14th week posttest with the exception of Group 2, in which the children experienced a significant increase in scores and Group 3, where the children experienced a significant decline in scores.

Results of the 18th-week post-hoc comparisons confirmed the lasting effects of different levels of instruction for research questions 2 through 7. Table 19 also presents results of the Scheffe Multiple Comparison for Unequal Groups for the 18th week posttest. The multiple comparison for unequal groups yielded an F value of $F = 66.61$ which exceeded the calculated critical value of $F = 13.64$. Results therefore indicated that a significant difference was maintained between the mean of Group 4 and the combined means of all other groups.

The 5th-Week Alphabet Discrimination Same/Different Post Test

In Table 15, a summary of overall descriptive statistics for the 5-week same-different alphabet discrimination posttest had been presented. When compared to alphabet discrimination pre-test results, the 5th-Week posttest scores indicated an overall increase in the research population's posttest achievement. Individual group findings presented in Table 16 had indicated that Group 4 emerged with the strongest post test performance in alphabet same-different discrimination achievement. Results of the ANOVA illustrated in Table 17 suggested a significant difference between groups in their same/different alphabet discrimination posttest performance.

Table 20 illustrates post -hoc findings for the 5 week same different alphabet discrimination post test. Tukey-Kramer results yielded significant differences at the $p<.01$ level of significance between groups 1and 4, 5 and 4, and 3 and 4. Indications were that treatments received by Group 4 had already begun to have a positive impact on skill discrimination achievement even at the first (same- different discrimination) level of instruction. Results of the Tukey- Kramer were also confirmed by the results of the Scheffe Complex Comparison (Table 20). The multiple comparison yielded an F value ($F = 19.92$), which exceeded the calculated critical value $F = 13.64$, and therefore indicated a significant difference between the mean of Group 4 and the combined means of all other treatment groups.

<u>The 10th Week Alphabet Discrimination Visual Recognition Post Test</u>

Table 21 shows post-hoc comparisons for the 10th-week alphabet discrimination posttest. The Tukey- Kramer Comparison results yielded significant differences, at the at the $p<.01$ level of significance between Groups 1 and 5, 1 and 3, 1 and 2, 5 and 4 and 1 and 4. Significant differences were also found between groups 1 and 4, and 5 and 4, for the 5th week, 14th week, and 18th week posttests. Results again indicated the consistently stronger performance of Group 4, even at the second discrimination skill level of instruction.

Table 21 also reports the Scheffe Multiple Comparison results for unequal groups which yielded an F value of $F = 19.90$. The resulting F value exceeded the calculated

Table 20
Post Hoc Comparison: Tukey-Kramer Comparison for Unequal Groups (n) and the Scheffe Complex Comparisons for Unequal Groups (n) for the 10th-Week Alphabet Discrimination Visual Recognition Post Test

Tukey-Kramer Comparison

Groups	*Q* Statistics			
1				
5	**6.75			
3	**8.90	1.75		
2	**9.24	2.68	.97	
4	**11.65	**4.53	*2.87	1.90

Critical Values of Q for *df = 211*

r =	2	3	4	5		2	3	4	5
*p< .05	2.77	3.31	3.63	3.86	**p< .01	3.64	4.12	4.40	4.60

Scheffe Complex Comparison

Groups	X_k	n_k	*Adjusted Coefficients*
1	6.26	43	.2514
5	8.41	39	.2280
3	8.97	45	.263
2	9.27	44	.2573
4	9.86	45	-1.00

p< .01 *F = 19.90* *Critical Value = 13.64*

Table 21

Post Hoc Comparison: Tukey Kramer for Unequal Groups (n) and the Scheffe Complex Comparison for Unequal Groups (n) for the 5th Week Alphabet Discrimination Same/Different Post Test

Tukey-Kramer Comparison

Groups	*Q* Statistics			
1				
3	1.27			
5	*4.00	1.85		
2	*4.27	3.00	1.05	
4	**7.12	**5.48	**3.85	*2.84

Critical Values of Q for *df = 211*

r =	2	3	4	5		2	3	4	5
*$p < .05$	2.77	3.31	3.63	3.86	**$p < .01$	3.64	4.12	4.40	4.60

Scheffe Complex Comparison

Group	X_k	n_k	*Adjusted Coefficients*
1	6.11	43	.2514
3	6.53	45	.263
5	7.15	39	.2280
2	7.52	44	.2573
4	8.46	45	-1.00

$p < .01$ *$F = 19.92$* *Critical Value = 13.64*

Table 22

Summary of Results: Alphabet Discrimination Pre-Test, 5th-Week, 10th-Week, 14th-Week, and 18th-Week Posttests Results

Statistical Analysis	One Way Analysis of Variance	Tukey Kramer Comparison for Unequal Groups *(n)*	Scheffe Multiple Comparison for Unequal Groups *(n)*
Formula	$F=\frac{MS_B}{MS_W}$	$Q = X_i - X_k / \frac{(1/n_i + 1/n_k)}{2}$	$F = \frac{(\text{Sum } C_k X_k)^2}{(MS_w)\,[\text{Sum } (C_k^2/n_k)]}$
Question Answered	*Significant Difference Between Group Means Yes/No*	*Significant Difference Between Pairs of Means* <u>*p*</u> *Group*	*Comparison of the Greatest Group Mean to the Total Remaining Group Means* X_k *Significantly*$>X_l+X_m+X_n+X_o$
Name of Alphabet Discrimination Test			
Sound-Symbol Pretest	No		******
5th-Week Same Different Posttest	Yes	*p<.01* 1 & 4, 2 & 4, 3 & 4, 5 & 4	Group 4
10th Week Visual Recognition Posttest	Yes	*p<.01* 1 & 5, 1 & 3, 1 & 2, 5 & 4, 1 & 4	Group 4
14th-Week Sound Symbol Posttest	Yes	p<.01 2 & 3, 1 & 4, 1 & 3, 5 & 3, 5 & 4, 2 & 4,	Group 4
18th-Week Sound Symbol Posttest	Yes	p<.01 1 & 3, 1 & 4, 5 & 3, 5 & 4, 2 & 4, 3 & 4	Group 4

critical value of *F = 13.64,* and therefore confirmed the significant difference between
`
the mean of Group 4 and the combined means of all other groups. The results also confirm the Tukey Kramer findings, which revealed that Group 4 had achieved the highest gains in the visual discrimination of an alphabet sound source. Table 22 summarizes findings for the alphabet discrimination pretest through the 18th week posttest.

Research Questions

From the results reported in Tables 15-22, the answers to all research questions were found.

The Difference in Alphabet Sound-Symbol Discrimination Achievement Between, Three Levels of Timbre Discrimination Treatment, and Instruction for Similar Skill Association (Transfer) and All Other Instructional Groups (Question 1)

The results yielded a significant difference between the scores of Group 4, in which all students had received all three levels of timbre discrimination treatment and instruction for transfer, and those who had not (Groups 1, 2,3, and 5). Students who received instruction in 3 sequential levels of timbre discrimination instruction (same-different, visual recognition, and sound-symbol), and who were taught to transfer skill similarities from musical timbre to alphabet sound discrimination, were significantly more proficient in alphabet sound symbol discrimination than all those who received other forms of instruction. The 5th and 10th-Week alphabet discrimination posttest results also revealed the posttest performances of Group 4 to be significantly stronger that the 5th and 10th-Week posttest performances of all other instructional groups combined.

The gains in test scores reported for the 14th-Week posttest in Table 18, was maintained over a three week time period between the mean of Group 4 and the combined means of all other groups. Group 4, which received three levels of timbre discrimination skill training and instruction for transfer throughout the study consistently maintained significantly greater gains at all levels of instruction than all other treatment groups combined.

The Difference in Alphabet Discrimination Sound-Symbol Discrimination Post Test Achievement Between One and Two Skill Levels of Timbre Discrimination Instruction-Groups 1 and 2 (Question 2)

Post hoc findings did not indicate a significant difference in alphabet sound symbol discrimination skills between the group that received one level of timbre discrimination skill instruction (Group 1) and the group that received 2 levels timbre discrimination skill instruction (Group 2). Results for the 18th-week posttest (Table 19) showed a decline in the academic performance demonstrated on the 14th-week posttest. Table 20 showed a significant difference found between the same-different posttest results of Groups 1 and 2 in the 5th week same different posttest results. However, this difference in test performance did not continue over the course of the study. Indications were that students who received only one level of timbre discrimination skill instruction (Group 1) did not maintain gains in alphabet sound discrimination over time.

The Difference in Alphabet Sound-Symbol Discrimination Post Test Achievement Between One and Three Levels of Timbre Discrimination Instruction-Groups 1 and 3 (Question 3)

According to the findings of the Tukey Kramer test reported in Table 18, there was a significant difference of $p < .01$ between the 14th-week alphabet sound-symbol\ discrimination test performances of the group that received one level of timbre discrimination instruction (Group 1) and the group which received three levels of timbre discrimination instruction (Group 3). Results of the 10th-week visual recognition posttest revealed a significant difference between Groups 1 and 3 as early as the second level of instruction. Results of the Tukey Kramer for the 18th-week sound symbol alphabet discrimination showed that the significant difference in alphabet sound/symbol discrimination between Groups 1 and 3 was maintained three weeks after the cessation of instruction.

The Difference in Alphabet Sound-Symbol Discrimination PostTest Achievement Between Two and Three Levels of Timbre Discrimination Instruction-Groups 2 and 3 (Question 4)

Results of the Tukey - Kramer Post -Hoc Comparison indicated a significant difference at the $p < .01$ level in the 14th-week Alphabet Discrimination Sound/Symbol posttest performance between the groups that received two levels of timbre discrimination instruction (Group 2) and three levels of Timbre discrimination instruction (Group 3). In contrast to the Post-Hoc findings for 14th-week posttest, results of the Tukey Kramer Post -Hoc Comparison did not yield a significant difference for the 18th-week (Table 19) sound symbol test performance between Groups 2 and 3. Learning gains had leveled off between the group that received two and three levels of sound discrimination instruction.

The Difference in Alphabet Sound-Symbol Discrimination PostTest Achievement Between One Level of Timbre Discrimination Treatment and Traditional Timbre Instruction-Groups 1 and 5 (Question 5)

The 14^{th}-week Tukey - Kramer comparison of means did not yield a significant difference between the group which received one level of timbre discrimination skill instruction (Group 1), and the group that received traditional timbre instruction (Group 5). Similarly, the 18^{th}-week posttest data did not yield a significant difference between the test performance Groups 1 and 5. Differences shown for the 5^{th} and 10^{th} week posttest had leveled off.

The Difference in Alphabet Sound-Symbol Discrimination Achievement Between Two Levels of Timbre Discrimination Treatment and Traditional Timbre Instruction-Groups 2 and 5 (Question 6)

The 14^{th}-week alphabet discrimination Tukey - Kramer comparison did not yield a significant difference between the alphabet sound/symbol discrimination posttest skills demonstrated by the group that received two levels of timbre discrimination instruction (Group 2) and the group that received traditional timbre instruction (Group 5). The lack of significance between two levels of timbre discrimination instruction (Group 2) and traditional timbre instruction (Group 5) was maintained for the 18th week alphabet discrimination posttest.

The Difference in Alphabet Sound-Symbol Discrimination Achievement Between Three Levels of Timbre Discrimination Treatment and Traditional Timbre Instruction-Groups 3 and 5)

(Question 7)

The Tukey-Kramer Comparison yielded a significant difference ($p < .01$) between the 14th-week Alphabet Discrimination Sound/Symbol posttest scores for the group that received three levels of timbre discrimination instruction (Group 3) and those that received traditional timbre instruction (Group 5). The results of the 18th week Posttest confirmed the findings of the 14th week sound symbol alphabet discrimination posttest and significant difference was maintained between the 18th-week sound symbol discrimination scores for three levels of timbre discrimination instruction (Group 3) and traditional timbre instruction (Group 5).

Results of research questions 1 through 7 indicated that (a) there was no significant difference between one or two levels of specific timbre discrimination instruction (Groups 1 and 2) and traditional timbre instruction (Group 5), (b) there was a significant difference between the incomplete sequence, (one and two levels of instruction of timbre discrimination instruction- Groups 1 and 2) and the complete sequence of instruction (Group 3- three levels of timbre discrimination instruction) and (c) the group that received 3 levels of timbre discrimination training and instruction for transfer achieved and maintained the strongest alphabet sound-symbol discrimination posttest performances throughout the duration of the study.

Ancillary Findings

The findings of this study led to an exploration of the strength of skill relationships between musical timbre and alphabet sound discrimination. Therefore the purpose of this section was to compare the findings of the timbre discrimination posttests concurrently administered with alphabet discrimination posttests after each level of skill instruction. The timbre discrimination pre-test and posttest are discussed here in terms of the relationship of timbre discrimination test achievement to alphabet discrimination test achievement for each level of skill instruction.

Similarity of Pre-Test Scores

Table 23 presents descriptive statistics for the entire population calculated for the Timbre Discrimination Sound/Symbol Pre Test and also reports overall descriptive statistics $N=216$ which revealed a range of raw scores from 0 to 9 points. The overall mode and median were *Mode = 4 and Mdn = 4.* Table 24 reveals individual mean scores for groups 1 through 5 which ranged from $X_2 = 3.77$ *to* $X_1 = 4.6$. Descriptive results suggested a similarity in individual group timbre discrimination pretest performance (Table 24). Comparison of the descriptive timbre discrimination pretest results to the alphabet discrimination sound-symbol pretest results indicated students initially demonstrated slightly more knowledge of musical instrument than alphabet sounds.

Table 25 is a summary of Pearson Product Moment correlations calculated between the timbre and alphabet discrimination pretests. Findings yielded an overall coefficient of r=. *32,* and implied that, because the test were designed to measure sound-symbol skills after formal instruction, there was generally a weak relationship manifested

Table 23

Overall Descriptive Statistics for the TDT Timbre Discrimination Tests *(N=216)*

Test	*N*	*Sum*	*Range*	*X*	*Mdn*	*Mode*	*Std. Er.*	*SD*	*SDx*^{2}
TDT Timbre Discrimination Sound Symbol Pre Test	216	862	0-10	3.99	4	4	.173	2.54	6.45
Timbre Discrimination Same Different (5th wk) PostTest	216	1376	0-12	6.37	6.5	8	.21	3.03	9.20
Timbre Discrimination Visual Recogn. (10th wk) PostTest	216	1790	0-12	8.28	9	10	.181	2.66	7.08
Timbre Discrimination Sound/ Symbol (14th wk) PostTest	216	1938	2-12	8.97	9	19	.15	2.14	4.56
Timbre Discrimination Sound/ Symbol (18th wk) PostTest	216	1922	0-12	8.90	9	10	.15	2.16	4.67

Table 24
Means, Modes and Standard Deviations for Groups 1 through 5 on the TDT Timbre Discrimination Tests

	Group 1 (n = 43)			Group 2 (n = 44)			Group 3 (n = 45)			Group 4 (n = 45)			Group 5 (n = 39)		
Test	X	Mode	SD	X	Mode	SD	X	Mode	SD	X	Mode	SD	X	Mode	SD
TDT Timbre Discrimination Sound/Symbol Pre Test	4.60	4	1.39	3.50	0	2.96	4.31	3	2.82	3.64	0	2.62	4.02	4	7.03
Timbre Discrimination Same Different (5th wk) Post Test	6.81	7	3.83	7.57	7	2.82	4.91	4	2.30	6.51	6	2.82	6.05	6	2.61
Timbre Discrimination Visual Recogn. (10th wk) PostTest	5.67	5	2.56	9.09	8	2.92	8.84	9	1.96	9.53	10	1.98	8.18	9	2.39
Timbre DiscriminationSound Symbol (14th wk) Post Test	7.53	8	2.33	8.11	8	2.14	10.02	9	.94	10.84	11	.95	8.15	7	1.78
Timbre Discrimination Sound Symbol (18th wk) Post Test	7.52	9	2.19	8.54	9	1.86	9.67	10	1.15	10.44	10	1.21	8.15	8	4.50

Table 25
Correlation Coeficients for Groups 1 through 5 on the SESAT Alphabet Discrimination Tests and the TDT Timbre Discrimination Tests

Test	Group 1 (n = 43) *r*	Group 2 (n = 44) *r*	Group 3 (n = 45) *r*	Group 4 (n = 45) *r*	Group 5 (n = 39) *r*	Overall (N=216) *r*
Test Correlated						
Alphabet and Timbre Discrimination Sound/Symbol Pre Test	.52	.20	.043	.31	.43	.32
Alphabet and Timbre Discrimination Same Different (5th wk) Post Test	.40	.79	.71	.68	.76	.66
Alphabet and Timbre Discrimination Visual Recognition (10th wk) Post Test	.69	.64	.50	.78	.41	.68
Alphabet and Timbre Discrimination Sound Symbol (14th wk) Post Test	.37	.47	.71	.83	.49	.75
Alphabet and Timbre Discrimination Sound/ Symbol (18th wk) Post Test	.65	.63	.66	.67	.80	.71

before instruction between the skills needed to discriminate musical and alphabet sounds and symbols.

The ANOVA (Table 26) yielded an F value of $F = 1.24$ which did not exceed the critical value of $F= 3.41$, *at* $p< .01$, and therefore, indicated no significant difference between or within groups in timbre sound symbol perception. The finding of no significant difference between groups for both the alphabet and timbre discrimination pretest indicated subjects in all groups had similar amounts of musical and alphabet sound-symbol discrimination skill immediately preceding formal instruction.

Table 23 a summary of descriptive statistics for the 5th -week timbre discrimination posttest has presented overall results of the timbre discrimination scores. As with the previously discussed alphabet discrimination tests, when compared to timbre discrimination pre-test results the 5th-week post test scores indicated an overall increase in population scores. Unlike alphabet discrimination findings, Table 24 indicates that individual group results for the 5th week same-different timbre discrimination posttest reveal that Group 4 had not yet emerged with the strongest posttest performance. Post hoc comparison findings presented in Table 27, suggest that at the 5th-week same-different level of instruction the effects of instruction in the association of musical timbre and alphabet sound discrimination skills were not yet apparent in skill relationships or posttest achievement.

Similarity in 10th Week PostTest Performance

The overall and individual group statistics for the 10th-week timbre discrimination posttest revealed a continued increase in timbre discrimination skills from the same-different to the visual recognition level. The increase was illustrated by the difference in

Table 26
Summary of the Single Factor Analysis of Variance for Group Differences on the TDT Timbre Discrimination Tests

Test/Source of Variation	*df*	*SS*	*MS*	*F*	*F Crit. Val.*	*p<*
TDT						
Timbre Discrimination Sound/Symbol Pre Test						
Between Groups	4	32.00	7.98	1.24	3.41	.01
Within Groups	211	1354.08	6.42			
Total	215	1385.98				
Timbre Discrimination Same/Different (5th wk) Post Test						
Between Groups	4	172.27	43.07	5.03	3.41	.01
Within Groups	211	1806.09	8.56			
Total	215	1978.37				
Timbre Discrimination Visual Recognition (10th wk) Post Test						
Between Groups	4	406.27	101.57	19.20	3.41	.01
Within Groups	211	1115.93	5.29			
Total	215	1522.20				

Table 26 continued

Test/Source of Variation	*df*	*SS*	*MS*	*F*	*F Crit. Val.*	*p*<
TDT						
Timbre Discrimination Sound/Symbol (14th wk) Post Test						
Between Groups	4	354.74	88.68	29.74	3.41	.01
Within Groups	211	627.09	2.972			
Total	215	981.83				
Timbre Discrimination Sound/Symbol (18th wk) Post Test						
Between Groups	4	243.92	60.98	16.93	3.41	.01
Within Groups	211	759.84	3.60			
Total	215	1003.76				

Table 27

Post Hoc Comparison: Tukey Kramer for Unequal Groups (n) and the Scheffe Complex Comparison for Unequal Groups (n) for the 5th Week Timbre Discrimination Same/Different Post Test

Tukey-Kramer Comparison

Groups	*Q* Statistic			
3				
5	2.53			
4	**3.72	1.00		
1	**4.41	1.62	.68	
2	**6.02	*3.21	2.39	1.70

Critical Values of Q for *df = 211*

r =	2	3	4	5		2	3	4	5
*p< .05	2.77	3.31	3.63	3.86	**p< .01	3.64	4.12	4.40	4.60

(No Scheffe Comparison Necessary)

the overall mean scores *(X_{sd}-X_{vr}) = 1.19.* Results of the individual group findings highlighted Group 4 *(X = 9.53)* as having achieved the strongest visual recognition timbre discrimination posttest performance. Results of the ANOVA (Table 26) and suggested a significant difference between groups in visual recognition posttest performance. In Table 25 Results of the Pearson Product Moment Correlation yielded a coefficient of $r = .68$ and indicated and overall relationship between alphabet and timbre skills need for visual recognition/discrimination of a sound source. Also indicated in Individual group coefficients ranged from Group 3, $r = .50$ through Group 4, $r = .78$.

Table 28 illustrates 10th week post-hoc comparisons. Scheffe results suggested a significant difference (p< .01) between the mean of group four and the combined means of all other groups. As in the visual recognition alphabet discrimination test, group four attained a significant difference between their 10th week timbre discrimination test performance and the test performance of all other treatment groups. The similarity of alphabet and timbre discrimination test performances raises the question of the impact of instruction in the generalization of skill similarities on achievement in both the music and language content areas.

<u>Similarities in the 14th and 18th -Week Test Performances</u>

14th week posttest results indicated an increase in musical timbre sound/symbol discrimination posttest performance. individual group means, illustrated in Table 24 reveals the group receiving three levels of timbre discrimination training in addition to similar skill association instruction (Group 4) as demonstrating the highest level of posttest achievement.

Results of the Pearson Product Moment Correlation calculated between the 14th-

Table 28

Post Hoc Comparison: Tukey Kramer for Unequal Groups (n) and the Scheffe Complex Comparison for Unequal Groups (n) for the 10th week Timbre Discrimination Visual Recognition Post Test.

Tukey-Kramer Comparision

Groups	*Q* Statistic			
1				
5	**7.14			
3	**9.32	1.75		
2	**9.77	2.68	.74	
4	**11.35	**3.78	2.03	1.29

Critical Values of Q for *df = 211*

r =	2	3	4	5		2	3	4	5
*p< .05	2.77	3.31	3.63	3.86	**p< .01	3.64	4.12	4.40	4.60

Sheffee Complex Comparision

Groups	X_k	n_k	*Adjusted Coefficients*
1	6.26	43	.2514
5	8.41	39	.2280
3	8.97	45	.263
2	9.27	44	.2573
4	9.86	45	-1.00

p< .01 *F = 19.90* *Critical Value = 13.64*

week timbre and alphabet discrimination sound-symbol posttests (Table 25) yielded an overall coefficient of $r=.75$. This suggest a strong relationship between alphabet and timbre sound-symbol discrimination skills after 14 weeks of formal instruction. Individual group coefficients resulting from the comparison ranged from $r=.37$ for Group 1 through $r=.83$ for Group 4. The results are consistent with the findings for research question 1 which provided empirical evidence (a) of the impact of timbre discrimination skill instruction on alphabet sound-symbol discrimination achievement and (b) that students taught to transfer skill similarities from one content area to another demonstrate stronger posttest performances than others. The findings of the 14th-week timbre discrimination posttest raises the issue of whether or not instruction the comparison of specific skills from one content area to another contributes to strong academic achievement in both areas.

Table 29 illustrates the post hoc comparisons for the 14th-week sound symbol timbre discrimination posttest. Findings for the Sheffe multiple comparison indicated a significant difference between the mean of Group 4 and the combined means of all other groups in their timbre discrimination sound symbol posttest performance. Examination of the results indicated that students instructed for transfer had the strongest posttest performance in musical timbre as well as alphabet sound-symbol discrimination. They also achieved the strongest correlational relationship between the two content areas $r=.83$. Findings for the 14th-week timbre discrimination posttest also indicated that the timbre discrimination and alphabet discrimination skills manifested a stronger relationship when students were given instruction in all three skill levels of timbre discrimination and strategies for transfer.

Table 29

Post Hoc Comparison: Tukey Kramer for Unequal Groups (n) and the Scheffe Complex Comparison for Unequal Groups (n) for the 14th week Timbre Discrimination Sound Symbol Post Test

Tukey-Kramer Comparison

Group	*Q* Statistic			
1				
2	2.23			
5	2.29	.15		
3	**7.64	**7.19		
4	**12.73	**10.5	**10.35	*3.15

Critical Values of Q for *df = 211*

r =	2	3	4	5		2	3	4	5
*p< .05	2.77	3.31	3.63	3.86	**p< .01	3.64	4.12	4.40	4.60

Sheffee Complex Comparision

Groups	X_k	n_k	*Adjusted Coefficients*
1	7.74	43	.2514
2	8.02	44	.2573
5	8.10	39	.2280
3	9.82	45	.263
4	10.64	45	-1.00

p < .01 *F = 36.25* *Critical Value = 13.64*

The 18^{th}-Week posttest revealed that the subjects who received three levels of timbre discrimination skill training in addition to instruction for similar skill association (Group 4) maintained the strongest posttest performance thee weeks after the end of instruction.

The Pearson Product Moment Correlation performed between posttest scores generated by the 14^{th} and 18^{th} week sound symbol timbre discrimination posttest results yielded a coefficient of $r= .86$. This score suggests a strong relationship between student test performance on the 14^{th} and 18^{th} week posttests. The Pearson Product Moment Correlation calculated to determine the relationship between music and alphabet sound-symbol discrimination skills yielded an overall coefficient of $r=. 71$ and thus indicated an overall maintenance of the music and alphabet discrimination skill relationship.

Table 30 illustrates the post-hoc comparisons for the 18^{th}-week sound-symbol posttest. Results of the Scheffe Complex Comparison indicated that a significant difference was maintained between the mean of Group 4 and the combined means of all other groups. Posttest findings further indicated that that although students instructed for transfer maintained the strongest posttest performance in musical timbre as well as alphabet sound-symbol performance, they did not maintain the strength of the relationship achieved in the 14^{th}-week between timbre and alphabet discrimination post test performances. Findings also suggest that relationship of timbre and alphabet discrimination skills designated for this study was stronger when students were actively instructed to be aware of similarities between the discrimination skills required foe musical timbre and alphabet sound perception.

Table 31 summarizes findings for the timbre discrimination pretest through the

Table 30

Post Hoc Comparison: Tukey Kramer for Unequal Groups (n) and the Scheffe Complex Comparison for Unequal Groups (n) for the 18th week Timbre Discrimination Sound Symbol Post Test

Tukey-Kramer Comparision

Groups	*Q* Statistic			
1				
5	2.33			
2	**3.68	1.44		
3	**8.27	**5.63	**4.52	
4	**11.68	**8.48	**7.60	*3.20

Critical Values of Q for *df = 211*

r =	2	3	4	5		2	3	4	5
*p< .05	2.77	3.31	3.63	3.86	**p< .01	3.64	4.12	4.40	4.60

Sheffee Complex Comparision

Groups	X_k	n_k	*Adjusted Coefficients*
1	7.52	43	.2514
2	8.54	44	.2567
3	9.67	45	.263
5	8.15	39	.2280
4	10.44	45	-1.00

p<.01 *F= 42.88* *CV = 11.88*

Table 31

Summary of Results: Timbre Discrimination Pre-Test, 5th-Week, 10th-Week, 14th-Week, and 18th-Week Posttests Results

Statistical Analysis	One Way Analysis of Variance	Tukey Kramer Comparison for Unequal Groups *(n)*		Scheffe Multiple Comparison for Unequal Groups *(n)*
Formula	$F = \frac{MS_B}{MS_W}$	$Q = X_i - X_k / \frac{(1/n_i + 1/n_k)}{2}$		$F = \frac{(\text{Sum } C_k X_k)^2}{(MS_w)\,[\text{Sum } (C_k^2/n_k)]}$
Question Answered	*Significant Difference Between Group Means Yes/No*	*Significant Difference Between Pairs of Means* *p*	*Groups*	*Comparison of the Greatest Group Mean to the Total Remaining Group Means* X_k *Significantly*$> X_l + X_m + X_n + X_o$
Name of Timbre Discrimination Test				
Sound-Symbol Pretest	No			
5th-Week Same Different Posttest	Yes	*p<.01*	3 & 4, 3 & 1, 3 & 2	******
10th Week Visual Recognition Posttest	Yes	*p<.01*	1 & 5, 1 & 3, 1 & 2, 1 & 4	Group 4
14th-Week Sound Symbol Posttest	Yes	p<.01	1 & 3, 1 & 4, 5 & 3,5 & 4,2 & 3,2& 4	Group 4
18th-Week Sound Symbol Posttest	Yes	p<.01	1 & 3, 1 & 4, 5 & 3, 5 & 4, 2 & 4, 2 & 3	Group 4

18th-week posttest. It is from tables 23-31 that the conclusions concerning the relationship of musical timbre and alphabet sound-symbol discrimination skills were derived.

In Summary, timbre discrimination test findings revealed that positive relationships existed between posttest performances at all skill levels. Findings indicate that (a) there was a similarity in alphabet and timbre discrimination test performance at all levels of evaluation, (b) the strength of alphabet and timbre discrimination skill relationships at all levels of treatment was positively impacted by instruction and, (c) the relationship between timbre and alphabet discrimination skills are significantly impacted by teaching students strategies for transfer between the two content areas.

CHAPTER FIVE

SUMMARY CONCLUSIONS DISCUSSION AND IMPLICATIONS FOR FURTHER STUDY

Summary

In light of developmental literature findings in both timbre and alphabet sound discrimination, which suggested that a parallel hierarchy of discrimination skill development in both areas may be feasible, this investigator proposed that similar skills, in each area, could be explored for possible cause and effects. The music and language variables included in this study were the (a) identification of same and different musical and alphabet sounds; (b) visual recognition of musical and alphabet (symbols) sound sources; and (c) association of alphabet and musical sounds with their matching symbols. Furthermore, an intense, sequential progression through three levels of discrimination skill development seemed to occur between the ages of four and seven. The levels are (a) same-different discrimination skills (b) visual recognition skills and (c) sound-symbol association skills.

In light of these findings from the literature, this study was conducted at the pre-kindergarten, and kindergarten levels to determine whether or which level of the identified variables in musical timbre discrimnation skills contributed to alphabet sound discrimination. Specifically, the purpose of this study was to investigate the effects of three different levels of skill training in musical timbre discrimination on alphabet sound discrimination in pre-kindergarten and kindergarten children. The following research questions were asked: (1) Was there a significant difference between the group who received instruction in all three levels of timbre discrimination skills and transfer instruction and the groups who did not? (2) Was there a significant difference between the group who received one level of skill instruction and the group who received two levels of instruction (Groups 1 and 2)? (3) Was there a significant difference between the group who received instruction in one skill level and the group who received instruction in three skill levels (Groups 1 and 3)? (4) Was there a significant difference between the group who received instruction in two skill levels and the group who received instruction in three skill levels (Groups 2 and 3)? (5) Was there a significant difference between the group who received instruction in one skills level traditional timbre discrimination instruction (Groups 1 and 5)? (6) Was there a significant difference between the group who received two levels of skill instruction and the group who received traditional timbre instruction (Groups 2 and 5)? (7) Was there a significant difference between the group who received instruction in three skill levels and the group who received traditional timbre discrimination instruction (Groups 3 and 5 respectively)?

Methodology

Forty pre-kindergarten and 185 kindergarten students participated in the study. Subjects were from an urban school in the southeastern region of the United States. They comprised the entire pre-kindergarten and kindergarten population at the research site. Sixty-nine percent of the study's population was African-American, thirty percent Asian American (Vietnamese/Chinese), .50 percent Hispanic American and .50 percent Anglo-American. The subjects reflected the racial and soci-economic composition of the surrounding community. The age range of the students was 4 years 0 months through 5 years 8 months.

From the population of 225 students, five study groups of 45 children per group were established. Assignment to each treatment group was achieved through a randomization procedure. One set of numbers ranging from 1 through 225 was placed in a hat. Students from each class were asked to draw a number from the hat. When all children had numbers, teachers were asked to prepare a class roll with the child's selected number listed next to his or her name. Then, using the Texas Instruments Graphing Calculator (TI-83), the random integer function was selected for a range of 1 through 225. Numbers appeared on the calculator screen in random order. When a number was repeated, the procedure continued on to the next new number until the first group of forty-five students was selected. This procedure continued throughout the selection of the first four groups for a total of 180 students. The remaining non selected forty-five became the fifth group.

Approximately three weeks after the study began, treatment groups began to lose students due to relocation of families. After this transition period, group numbers were as follows: (a) Group 1, n=44; Group 2, n=43; Group 3, n=45; Group 4, n=45; Group 5, n=39. After the initial attrition, student numbers remained the same for the duration of the study. There were 5 new students to enroll in school during the course of the study. They were allowed to participate in music as members of Group 1, however, their test scores were not used in the data analysis.

The researcher sought to discern possible group variances by administering the SESAT Sound/Symbol Alphabet Discrimination Pre Test to all participants in both alphabet and musical sound/symbol discrimination. The pre-tests were also used to establish each group's baseline knowledge of alphabet and musical instrument sound/symbol discrimination. To check for homogeneity of groups, a One Way Analysis of Variance was performed on both the alphabet and timbre discrimination sound-symbol pre-test data. Results indicated no significant difference between or within groups in alphabet sound/symbol recognition.

To determine the effects of musical treatment on alphabet sound discrimination at each skill level and in an attempt to isolate the musical timbre skills which contributed most to alphabet sound/symbol discrimination, a design was created to incorporate evaluation of the possible treatment effects at each skill level. Students were tested upon completion of treatment at each skill level using the appropriate subsection of the SESAT Alphabet Discrimination Sounds and Letters and the Timbre Discrimination tests. The final posttest was re-administered three weeks later (18^{th} week) to determine lasting effects of treatment group instruction. To avoid the effects of student familiarity with the test, the post-test administered contained versions of the Alphabet and Timbre Discrimination Sound/Symbol posttests.

The Test-Re-Test reliability coefficients indicated all 8 tests to be satisfactory measurement instruments for the study. The comparison of reliability coefficients for the two Pilot Group Tests revealed the tests designed for this study to be satisfactory in terms of length, time required for testing, homogeneity of items and consistency of results regardless of where the testing occurred. The content of all pre-tests and post-tests the tests used for this study were determined by the investigator to valid for the purpose of the study. The Analysis of Variance, The Measure of Association, The Pearson Product

Moment Correlation, The Tukey Kramer and The Scheffe Post Hoc Comparisons for Unequal Groups, provided the inferential statistical tools bases for answering the research questions.

Descriptive and inferential statistics for the study were calculated using the Microsoft Office 97 Excel Program. All data was processed at the .99 confidence level. Three mathematics experts from a local magnet high school, junior college and metropolitan university verified results,

Research Findings

Results reported in Chapter 4, revealed that different levels of timbre discrimination instruction had different degrees of effectiveness on the development of alphabet sound/symbol discrimination in pre-kindergarten and kindergarten children. Specifically, research question one explored the possibility of a significant difference between the alphabet sound symbol discrimination skills of the subjects given all three levels of timbre discrimination training and instruction for transfer (Group 4), and those who were not. The results of the 14^{th}- week post hoc comparisons indicated students who received instruction in three sequential levels of timbre discrimination skills (same different, visual recognition, and sound symbol), and who were taught to transfer skill similarities from music timbre discrimination to alphabet sound discrimination, were significantly more proficient in alphabet sound symbol discrimination than all those who received other forms of instruction. Similarly, student performance on the 18^{th}- week post test also indicated that the treatment with 3 skill levels and instruction for transfer had a significant impact on the retention of newly learned skills over time.

Research questions 2, 3 and 4 respectively explored the differences in alphabet sound/symbol discrimination post test achievement between the groups receiving one (Group 1), two (Group 2), or three (Group 3) levels of musical timbre discrimination training without instruction for transfer. Findings for research questions two revealed no significant difference between the group receiving one or two levels of timbre discrimination training in alphabet sound symbol discrimination achievement. Findings for question three indicated a significant difference between the groups receiving one and three levels of instruction while question four revealed simultaneous instruction in three levels of sequential timbre discrimination instruction to be significantly more effective in developing alphabet sound symbol discrimination skills than two levels of timbre discrimination instruction. Indications were that three levels of timbre discrimination skill instruction was significantly more effective in developing the skills needed for alphabet sound symbol discrimination than were one or two levels of instruction alone.

Questions 5, 6, and 7 explored the difference between groups, which received one, two, or three levels of timbre discrimination instruction (Groups 1, 2, &3), and the group which received the more traditional timbre discrimination instruction or the instruments of the orchestra approach (Group 5). Findings for research questions 5 and 6 did not indicate a significant difference between Groups 1, 2 as well as the subjects who received the instruments of the orchestra approach to timbre discrimination instruction (Group 5). However, students who had received instruction in three levels of timbre discrimination skill instruction (Group 3), delivered a significantly stronger test performance in alphabet sound symbol discrimination than those who received the more traditional instruments of the orchestra approach (Group 5).

Because the post test scores of Groups 5 & 1 and 5 & 2 and 1 & 2 were not significantly different from one another, one can assume that one or two levels of specific skill instruction had no stronger impact on alphabet sound symbol discrimination skills than would the more general approach of teaching the instruments of the orchestra approach. Although the approach used with Group 5 did address and teach timbre discrimination skills,however the musical discrimination skills were not specified nor were the students made aware of their similarity to the skills needed for language discrimination.

Classroom music was used as the control activity and followed the incomplete cycles of skill instruction (one skill or two skill levels and classroom music), for the duration of the study. Based on the lack of posttest achievement demonstrated by groups receiving one or two levels of timbre discrimination instruction, one can assume that the classroom music instruction also had little impact on the transfer between music and alphabet discrimination skills

Conclusions

Empirical evidence yielded by this study suggests that concurrent skill instruction in the discrimination of musical timbre and alphabet sounds does have a significant impact on alphabet sound-symbol discrimination achievement in pre-kindergarten and kindergarten children. Direct instruction in the similarity of discrimination skills from the music and language content areas produced significant increases in student alphabet discrimination achievement in this investigation. These results confirm those of prior investigations which report the efficacy of direct instruction in facilitating the impact of skill instruction from one content area to another (Aten, Smith and Tunks, 1984; Tunks, 1992).

Different levels of timbre discrimination instruction were found to have different degrees of effectiveness on alphabet sound-symbol achievement. Three levels of parallel development were identified for skills needed to discriminate alphabet and musical instrument sounds and symbols. Results of the study highlight the 3rd skill level, sound-symbol discrimination, as critical to sound-symbol achievement in both the music and language areas. Groups that received all three levels of instruction or all three levels with instruction for transfer (Groups 3 and 4) demonstrated posttest performances which were significantly stronger than those who had received the incomplete cycle of instruction. Conclusions therefore reinforce findings which label the third skill level as critical to both alphabet and timbre discrimination sound-symbol achievement ((Barnes and Fielding-Barnsley, 1990, 1993; Chall, 1983; Haufstader, 19; Jetter, 1964; Ilg and Ames, 1949; Naslund and Snider, 1996; Snider, 1997; and Torgensen et. al, 1992).

Groups who received only one or two levels of timbre discrimination instruction fared no better that those receiving traditional timbre instruction. The posttest performances of Groups 1, 2 and 5 consistently indicated that the incomplete sequence of specific (timbre discrimination) skill instruction was no more effective in its impact on alphabet sound-symbol discrimination than the less specific approaches of classroom music or traditional (instruments of the orchestra) timbre instruction. The findings of this study confirm reviews of the non-musical outcomes literature which report specific music skill instruction to have a more significant impact on alphabet discrimination achievement that the more general forms of music instruction (Wolf, 1978; Tunks, 1992).

The lack of sound-symbol discrimination achievement demonstrated by groups that received one (same–different), or two (visual recognition) levels of specific skill instruction when compared to the superior posttest performances of the groups receiving three levels (sound-symbol) of instruction, suggests that the positive impact of musical timbre discrimination instruction on alphabet sound discrimination must in part be due to the unique combination of aural and visual skills needed for sound-symbol discrimination in both areas. This conslusion would confirm those in the psychoacoustic research, which draws parallels between the perceptual functions of musical timbre and alphabet sound discrimination (Grey, Plomp, 1974; Slawson, 1968, 1985; and Sahadano and Corso, 1964).

Since students were taught to consciously draw parallels and associate similarities between musical timbre and alphabet sound discrimination skills (Group 4) achieved and maintained significant gains in alphabet sound-symbol discrimination throughout the study, it can be concluded that direct instruction for transfer between skill areas was the most effective means of facilitating the impact of musical timbre discrimination skill instruction of alphabet sound-symbol discrimnation achievement. This conclusion again validated Tunks' (1992) suggestions about the positive effects of teaching for transfer In summary, the conclusions for this study are:

1. Musical timbre discrimination instruction had a significant impact on alphabet sound-symbol discrimination achievement.

2. Different levels of timbre discrimination skill instruction have different degrees of effectiveness on alphabet discrimination skills.

3. The identification of similar skills between music and language contributed to the significant impact of musical timbre discrimination instruction on alphabet sound-symbol discrimination achievement.

4. Specific musical timbre discrimination skill instruction was more effective than more general approaches in its impact on language skills needed for alphabet sound symbol discrimination.

5. The complete cycle of specific musical timbre skill instruction (same-different, visual recognition and sound-symbol), is needed to significantly impact alphabet sound symbol achievement.

6. The third skill level (sound-symbol) is critical to discrimination achievement in both the music and language areas.

7. Direct instruction for the transfer of skills learned for musical timbre discrimination to those needed for alphabet discrimination had the most significant impact on alphabet sound-symbol discrimination

Discussion

For those in the education and research communities concerned with the place and importance of music in the school curriculum, the similarity and possibility of transfer from one content area to another has been a source of ongoing investigation and discussion. For this study, the exploration of skill similarities between music and language sound discrimination, occurred in the context of an investigation on the effects of training in three musical timbre discrimination skills on three similar alphabet sound discrimination skill. This study's findings and conclusions may have provided the research an educational communities with insight into a possible cause and effect relationship between skill perception in both areas.

Knowledge about such relationships also may provide support for current curricular policies, which are based on learning transfer theory (e.g.) Interdisciplinary

Learning (Irwin and Renyolds, 1994) and Discipline Based Arts Education (Eisner, 1988). Both policies are based on the assumption that learning in one area provides and conceptual basis for learning in another. Learning transfer characterized by the sequential, systematic presentation of specific, similar skills between various disciplines, it may emerge as an effective means of instruction for all students. The findings of this study would provide supporting evidence for the continuation of such policies in the schools.

In light of prior research reports, it was of interest that the timbre discrimination pre-test results for this study when compared to the alphabet discrimination pre-test scores, implied that prior to formal instruction, students at this development level, were more proficient in the discrimination of musical than alphabet sounds. The timbre discrimination post test performances were also consistently stronger than the alphabet discrimination test performance, thus again indicating music discrimination skills had perhaps been in place longer and were therefore easier for students to demonstrate that alphabet sound discrimination skills. The findings of this study raise the question if perhaps musical discrimination skills do develop before if not simultaneously with language discrimination. Therefore, development of skill in one content area may be critical to the development of skills in the other.

Without evidence provided by appropriately designed surveys and questionnaires, one can only speculate the reasons for the pre-test results. Perhaps student interaction with radio and television media may provide an explanation. Perhaps experience with video games and more access in the home to computer technology would emerge as reasons for the stronger timbre discrimination test performance. Further research is needed to determine why this phenomenon occurred.

Because specific musical timbre discrimination skills were isolated compared and associated with alphabet sound discrimination skills, the statistically significant impact of musical timbre discrimination skills on alphabet discrimination skills is clearly demonstrated. Researchers in these areas must continue to explore the possible role of music in establishing a necessary foundation for later learning. Findings highlight the critical need for (a) the inclusion of music instruction, provided by a music specialist, capable of sequential specific skill instruction, in the preschool, pre-kindergarten, and kindergarten curriculums; (b) the inclusion of specific music discrimination instruction in the general music classroom; (c) studies which explore the similarities between other musical and language discrimination skills; (d) Studies to determine what musical skills may impact achievement in other content areas.

An ancillary finding of this study worth noting was the strength of the relationship between the skills identified as similar for this study, timbre and alphabet discrimination posttests scores were compared at all levels of evaluation. Coefficients yielded positive relationships at all skill levels. Skill relationships were the strongest at the sound-symbol level of perception thereby indicating that the unique combination of aural and visual skills that are needed for sound-symbol discrimination in both areas may account for the significant impact of specific timbre discrimination skill instruction on skills needed for alphabet discrimination. Relationships were also impacted by instruction for transfer. In addition to those found in Appendix B of this study, educators should continue to explore and employ skill similarities to facilitate instruction between content areas. Through structured curriculum and lesson planning educators should develop other strategies for facilitating the impact of specific musical skill on skills in other content areas

In her initial observations at the research cite, this researcher noted that the pre-kindergarten and kindergarten teachers intermittently used music to teach new skills and concepts in language and other content areas. In light of these findings, teachers of students at the primary levels (Pre-K through 2nd grade) should continue to use music as a teaching tool for introduction and development of language skills and concepts. Additionally, they should collaborate with their music specialist to identify specific musical skills that might facilitate the introduction of new skills and impact achievement in the language and reading content areas.

This study produced strong evidence that there is no magical association of one academic area with another. Rather, students must be made aware of skill similarities between academic disciplines and then instructed in how to use those similarities to navigate and learn in unfamiliar areas. Daily logs, which documented the amount of time spent in each group on skill instruction, evidence that all groups received approximately the same amount of instruction in timbre discrimination skills at each skill level. However 5 to 10 minutes of musical timbre discrimination with direct transfer instruction to alphabet sound/symbol discrimination was incorporated into lessons delivered to Group 4. Based on the significant statistical findings for this study, the designation of 5-10 minutes per class period to be devoted to transfer instruction accounted for the difference between the post-test performances of Group 4 and those of all other groups combined. Therefore educators should consider the benefits of spending 5 to 10 minutes a day engaged in activities which would teach students to identify and associate similarities between specific skills in different content areas. These activities could possibly provide them with additional cognitive cues on which to build, anchor and retain skill knowledge.

Practical classroom experience has made this investigator aware of the growing number of children who learn "differently". The treatments and their corresponding activities designed for this study were intended to address the needs of the kinesthetic, tactile, oral, as well as the auditory and visual learner. The analysis of data generated by this study yielded support for the hypothesis of this research and thus has given the educational community positive empirical evidence for the use of a unique means of imparting knowledge critical to language and music achievement to many different types of primary grade students.

Although their achievement was statistically lower that that of Group 4, Group 3 ranked second in overall achievement during all three phases of the study. The significant gains in alphabet sound/symbol discrimination skills, as reflected by the 14^{th}-week post test scores made by Group 3 implied that some students perhaps transferred or associated similar skills from the music and language disciplines without direct instruction. The achievement demonstrated by Group 3 also highlighted the critical importance of instruction in the third skill level of timbre discrimination to alphabet sound symbol achievement. Findings indicated that even without direct instruction for transfer there were instructional benefits for identifying and using similar skills between disciplines to facilitate transfer between different content areas.

Also of note was the decline in the sound symbol alphabet discrimination performance of Group 3 on the 18^{th}- week posttest. Although the children demonstrated an apparent command of their newly acquired skills on the 14th- week post test, and in spite of their continued instruction in the regular pre-kindergarten and kindergarten classrooms, the skill proficiency was not maintained over the three week time delay between post tests. It is the opinion of this researcher that the stronger 14th- week alphabet sound/symbol discrimination post test performance of Group 4, and the maintenance of this achievement on the 18th- week post test, despite all of their apparent learning and behavior difficulties, illustrated the necessity of teaching for transfer to maximize its skill acquisition and retention benefits for all types of students. Implications highlight music as a pre-conditioning stimulus for all learning. The music skills of pitch and timbre discrimination in particular may provide foundation for the development of language sound discrimination skills.

Benefits to the Students

The students expressed their feeling of enjoyment for learning activities and test taking associated with this study. There was an enthusiasm expressed for learning of both music and alphabet skills. Student gains and positive teacher reactions to the instructional activities presented indicated educators should continue to search for empirical evidence of the impact of using subjects which students enjoy to increase achievement in those with which they may experience difficulty.

The subjects participated in an interesting and unique approach to the discrimination of musical and alphabet sounds. Subjects who were targeted for transfer instruction have, at the beginning of their academic careers, been introduced to the process of knowledge acquisition the through the conscious association of similarities in familiar concepts with similarities in new concepts. It is the desire of this researcher that the technique of conscious learning generalization will enable subjects to no longer view newly learned skills in isolation but to see them in terms a larger learning picture.

Empirical evidence of learning transfer between musical and alphabet sound discrimination has been produced by this study. The results of this study are but a small drop in the pool of existing and forthcoming knowledge in this area. However this investigator would hope the subjects who participated in the study have been involved in a learning experience which inspired them to explore the benefits of music on its merits alone.

The group treatments were designed not only to facilitate the development of music and alphabet sound discrimination skills, but through the use of a variety of musical examples and activities, to encourage students to use music as a means of self-expression and personal enjoyment. Through the use of diverse examples of musical instruments, listening selections, and learning games, this researcher has helped to generate student curiosity about different types of music, thus ultimately has helped them to become more informed consumers of music.

It was the intent of this investigator to continue this instruction longitudinally after the initial research study had ended. Study participants will be pre-tested at the beginning of the following school year and will receive alphabet/word discrimination transfer strategies as part of their musical timbre discrimination instruction. As the students progress through lower elementary school (Pre-K through 3), strategies for transfer between music and alphabet discrimination will be added at each succeeding grade level. Incoming Pre- K and Kindergarten students will also be pre-tested and transfer strategies between musical timbre and alphabet sound discrimination incorporated into their curriculum. The findings of this exploration will result in a monograph on specific teaching techniques for transfer at the pre-kindergaten and kindergarten levels of music instruction.

Implications

Implications for instructional practice and further research are many. For example, instruction in specific musical timbre discrimination skills when presented simultaneously with similar alphabet discrimination skills is an effective means of instruction for significantly increasing alphabet sound-symbol achievement therefore:

1. Instruction in specific musical timbre discrimination skills should, along with direct instruction for their association with similar alphabet discrimination skills should be used as an additional strategy for the development of skills needed for alphabet sound-symbol discrimination.

2. Music educators must develop through structured lesson and curriculum planning classroom strategies and materials that are specifically designed to facilitate the positive impact of specific music skill instruction on skills needed for alphabet discrimination.

3. There is a need for the development of a manual or monograph which outlines techniques, exercises and guidelines for the facilitation of skill association/transfer from musical timbre discrimination to the alphabet sound discrimination.

4. Music teachers both classroom and directors of choral and instrumental organizations must plan, incorporate and document in their daily lessons strategies for transfer between music and other content areas.

5. The significant impact of musical timbre discrimination skills on alphabet

discrimination skills supported research that suggested the existence of a parallel hierarchy of skill development between music and language discrimination skill from ages 3-7. Therefore classroom teachers of students at the primary levels (Pre-K through 2nd grade) should collaborate with the music teacher to identify specific musical skills which might facilitate the introduction and development of language skills and concepts.

6. Music and classroom teachers must collaborate and together explore and identify possible skill similarities between music and other content areas.
Classroom teachers should further explore and employ strategies for learning generalization between areas other than music and language

7. The use of skills in one area to facilitate the of skills achievement in another content area is reported to engage more than one area of the brain in the learning process, therefore teachers should incorporate these strategies to increase achievement for all children.

8. Because it makes use of more than one mode of learning the use of musical timbre discrimination skills to assist in the development of alphabet discrimination skills may also be an effective teaching strategy for children with learning differences.

9. Findings for this study highlight the importance of including specific music discrimination instruction in the general music and regular classroom at primary instructional levels. Therefore, there is a need in some school districts for a well defined, well planned, skill oriented, sequential music curriculum at the pre-kindergarten and kindergarten levels of instruction. Qualified music specialists capable of providing accurate music skill instruction must carry out the set curriculum.

In terms of future research, direct instruction for transfer of specific musical timbre discrimination skills emerged as the most effective means facilitating the development of alphabet sound- symbol discrimination skills. Therefore, educational researchers should continue to explore the effectiveness of using specific discrimination skills learned in music to increase achievement in language discrimination skills needed for alphabet/word discrimination. They should explore the effectiveness of using specific discrimination skills learned in music to increase skill achievement in language and other content areas. Futhermore, there is a need to conduct a longitudinal study which documents the reading achievement of students taught to associate/transfer similar skills from musical timbre alphabet discrimination at the pre-kindergarten, and kindergarten levels. Other suggestions are:

1. There is a need to identify skills and conduct additional studies which explore the impact of musical timbre discrimination and other types of specific musical skill instruction on discrimination skills needed for higher levels of reading instruction.

2. In light of the gains made by Group 3, who received all three level of skill instruction without instruction for transfer, studies must be conducted which further explore the effectiveness of transfer, which occurs without direct instruction for some students.

3. Student gains and positive teacher reactions to the instructional activities presented indicates educational researchers should continue to search for empirical evidence of the impact of using subjects which students enjoy to increase achievement in those with which they may experience difficulty.

4. Neurological findings report evidence from MRI and PET images which suggested the simultaneous stimulation of other learning areas by musical learning

5. (Altenmuller, 1997; and Oddliefson, 1990) The identification, isolation and comparison of skills though common to music and alphabet sound discrimination may have provided clues to specific behavioral manifestations of neurological findings.

6. In light of the success of this timbre discrimination skill instruction in effecting overall gains in alphabet sound symbol discrimination in the study population, Educational researchers should continue to explore the impact of transfer on instruction of students with learning differences.

7. Findings for this study support prior psychoacoustics, developmental and neurological research which suggest certain musical discrimination skills are developmentally in place prior to other discrimination skills (Leng & Shaw, 1993; Trehub, 1972; and Lowey, 1995). Implications raise the question of music as a pre-conditioning stimulus for all learning. Researchers in these areas must continue to explore the possible role of music in establishing a necessary foundation for later learning.

8. The random assignment of subjects to groups in this study illustrated the effectiveness of establishing treatment groups through the randomization process. Groups were homogenous at the beginning of the study therefore the impact of each treatment level was evident at the end of each treatment phase.

9. This study contains a comprehensive (from 1968-present), literature review and analysis of non-musical outcomes research in music education. It also provides a survey of literature related to the non-musical outcome research from the neurological, psychological and psychoacoustic disciplines. This information may prove helpful to those who wish to conduct further research in this area.

APPENDIX A

INSTRUMENTATION

SESAT

ALPHABET DISCRIMINATION

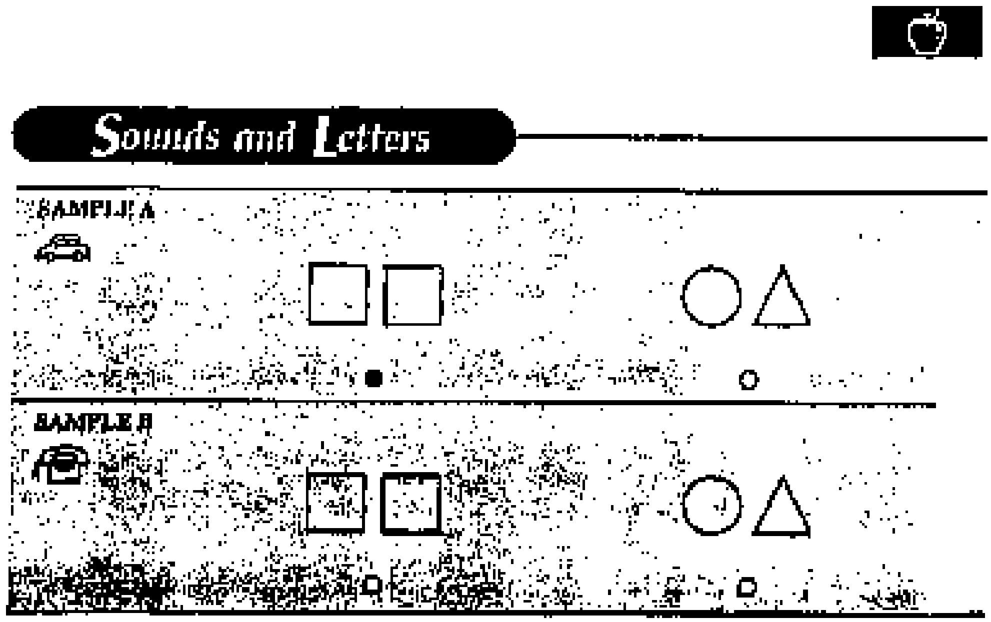
SOUNDS AND LETTERS SUBTEST

SAMPLE ITEMS

SESAT

Alphabet Discrimination

5th Week Alphabet Same Different Post Test



SAMPLE A

Listen carefully to these two words — *want ... want*. If they sound the same, put your finger under the square and the square. If they sound different, put your finger under the circle and the triangle.

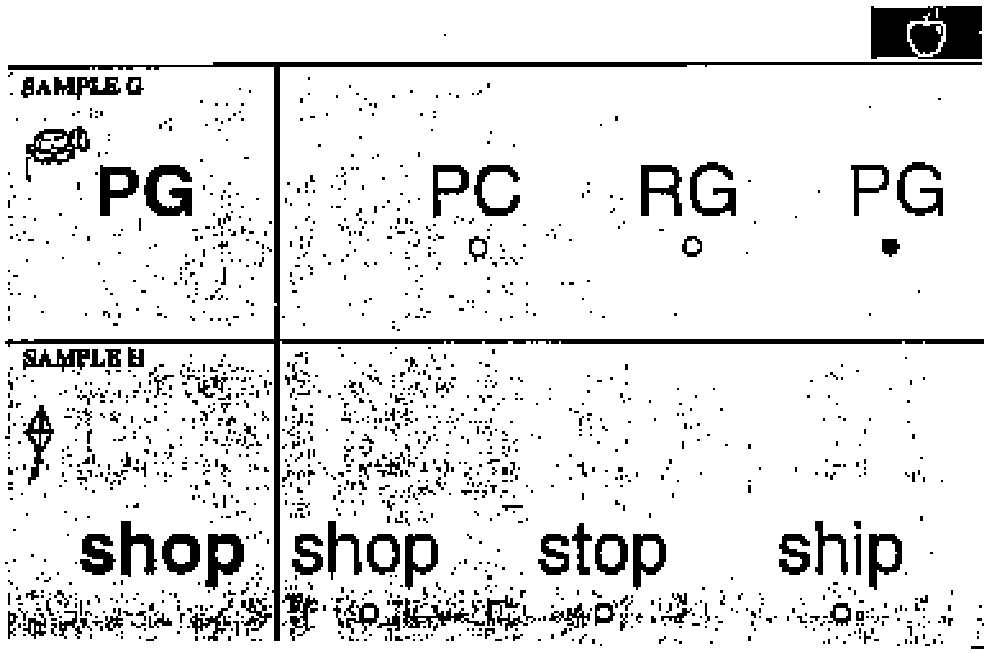
SAMPLE B

Listen to **these two words — *ground ... grand*. If they sound the same, mark the space under the two squares. If they sound different, mark the space under the circle and the triangle.**

SESAT

Alphabet Discrimination

10th Week Visual Recognition Post Test



SAMPLE G

Look at the first two letters. In the next part of the row, find the letters that are the same. Which letters are the same as the first two letters?

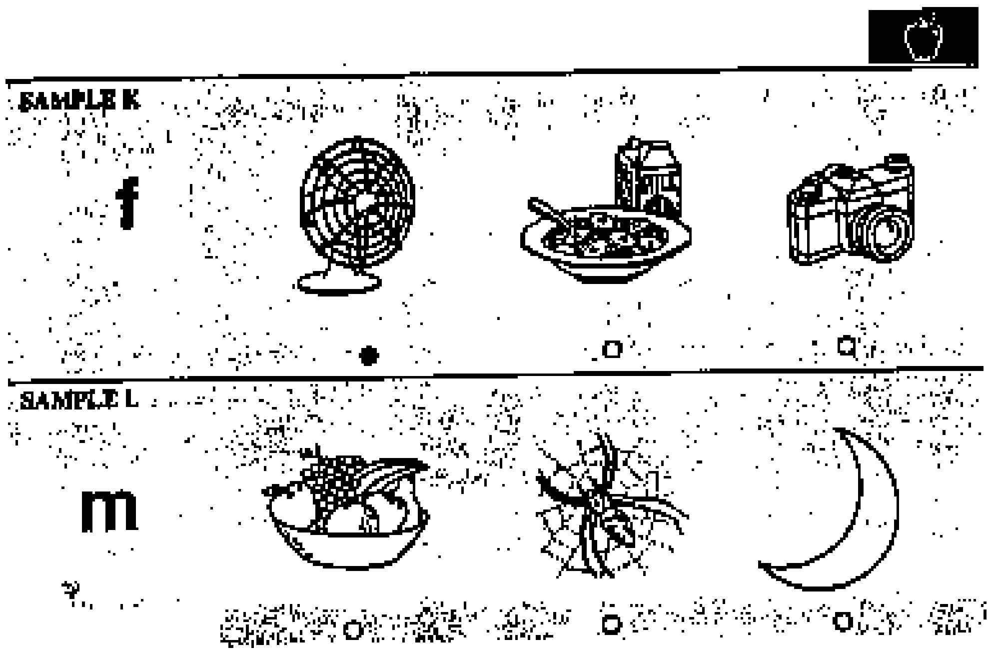
SAMPLE H

Look at the first word. Find the word in the row that is the same, and mark the space under it.

SEASAT

Alphabet Discrimination

14th Week Sound Symbol Association Post Test



SAMPLE K

Which picture begins with the letter you see? Is it fan, cereal, or camera?

SAMPLE L

Which picture begins with the letter you see? Is it fruit, spider, or moon?

TIMBRE DISCRIMINATION TEST
Same/Different Test
Visual Recognition Test
Sound/Symbol Matching Test

5th Week

Timbre Discrimination Same-Different PostTest

The directions are read to the students. Only the pictures appear on the student test.

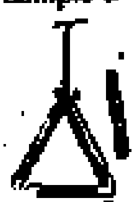
This test will measure how well you can recognize pairs of instrument or vocal sounds which are the same and pairs of instrumental and vocal sounds that are different from one another. Two musical sounds will be played for each question. Listen carefully and decide if the pairs of sounds are the same or different. Circle the matching squares if the sounds are the same. Circle the heart and triangle if the sounds are different. I will play each example twice. There is only one correct answer for each question.

Sample A

A. Next to the tambourine you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcake and the kissie.

A.

Sample B



B. Next to the triangle you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcake and the kissie.

B

(Whispering/shouting)

1. Next to the *tambourine* you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

1. 

(Adult male/children)

2. Next to the *Maracas* you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

2. 

(woodblock/triangle)

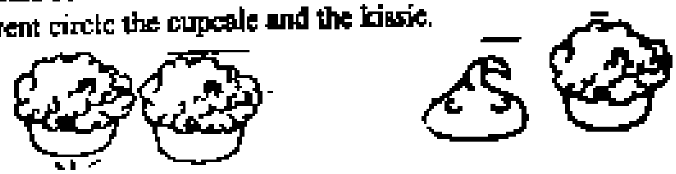
3. Next to the *Woodblock* you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

3. 

(snare drum/snare drum)

4. Next to the Maracas you see two cupcakes. Put your finger on the two cupcakes. Also on line number one you see a cupcake and a kissie. Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

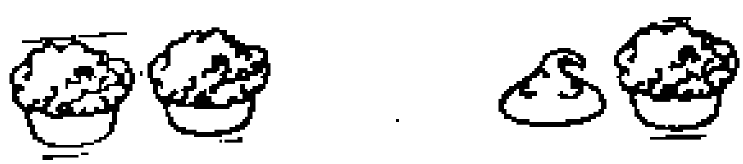
4.



(cymbals/glockenspiel)

5. Next to the triangle you see two cupcakes. Put your finger on the two cupcakes. Also on line number one you see a cupcake and a kissie. Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

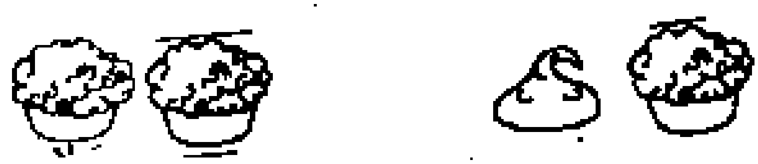
5.



(trumpet/trumpet)

6. Next to the wood block you see two cupcakes. Put your finger on the two cupcakes. Also on line number one you see a cupcake and a kissie. Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

6.



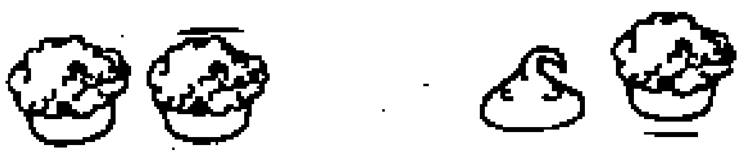
(Trumpet/tuba)

7. Next to the triangle you see two cupcakes. Put your finger on the two cupcakes Also on fine number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

7. 

(Flute/clarinet)

8. Next to the tambourine you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

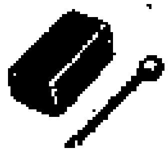
8. 

(Clarinet/clarinet)

9. Next to Maracas you see two squares. Put your finger on the two squares Also on line number one you see a heart and a triangle. Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle under the two squares. If the sounds are different color the circle under the heart and the triangle.

9. 

(Piano/organ)

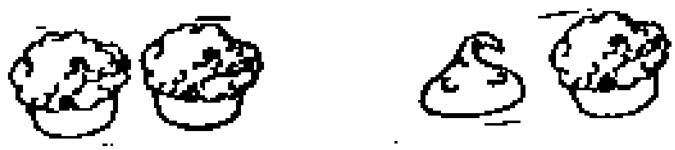


10. Next to the wood block you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

10. 

(Violin/bass)

11. Next to the maracas you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

11. 

(Trombone/trombone)

12. Next to the tambourine you see two cupcakes. Put your finger on the two cupcakes Also on line number one you see a cupcake and a kissie Listen to the music sounds I play on the tape recorder. If the sounds are the same color the circle the two cupcakes. If the sounds are different circle the cupcale and the kissie.

12. 

5th Week

Timbre Discrimination Same-Different PostTest

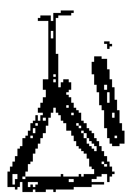
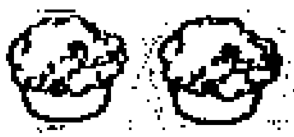
Student Copy

Name_______________________________Number_______________

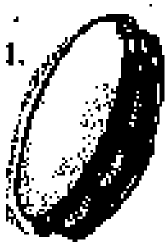
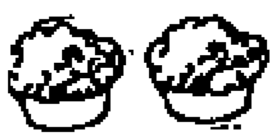
Sample A



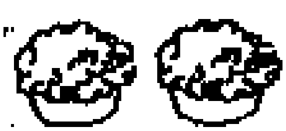
Sample B


1.


2.


3.

4.

5.

6.

7.

8. 

9. 

10. 

11. 

12. 

Timbre Discrimination Visual Recognition PostTest

The directions are read to the students. Only the pictures appear on the student test. A copy of the visual recognition student test may be found on pp. ______.

Test Directions:

This part of the test will measure how well you can match pictures of instruments to one another. Look at the first musical picture. Circle the picture that is the same as the first picture.

(tambourine)

Sample A: Look at the first musical picture. Circle the picture that is the same as the first picture.

A.

(tambourine)

Sample B: Look at the first musical picture. Circle the picture that is the same as the first picture.

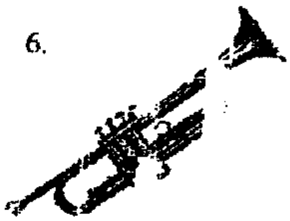
B.

(shouting)

1. **Look at the first musical picture. Circle the picture that is the same as the first picture**

(Trumpet)

6.



6.  

Part II: . This part of the test measures how well you recognize the instruments we learned. I will name the instrument. Circle the instrument that I name.

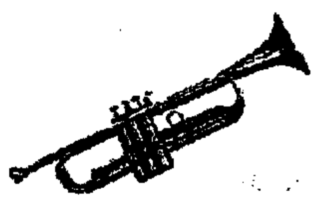
(Trombone)

7. This part of the test measures how well you recognize the instruments we learned. I will name the instrument. Circle the instrument that I name.

7.  

(Flute)

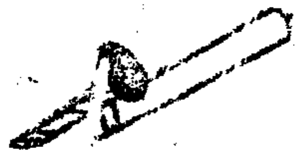
8. This part of the test measures how well you recognize the instruments we learned. I will name the instrument. Circle the instrument that I name.

8.  

(Piano)

9. This part of the test measures how well you recognize the instruments we learned. I will name the instrument. Circle the instrument that I name.

9.



9

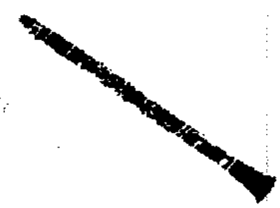
(Violin)

10. This part of the test measures how well you recognize the instruments we learned. I will name the instrument. Circle the instrument that I name.

10.

(String Bass)

11. This part of the test measures how well you recognize the instruments we learned. I will name the instrument. Circle the instrument that I name.



(Tuba)

12. This part of the test measures how well you recognize the instruments we learned. I will name the instrument. Circle the instrument that I name.

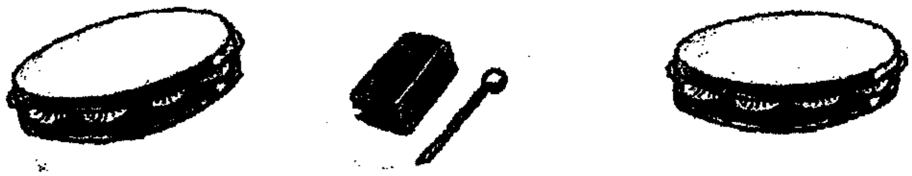
12.

10th Week Timbre Discrimination Post Test
Student Version

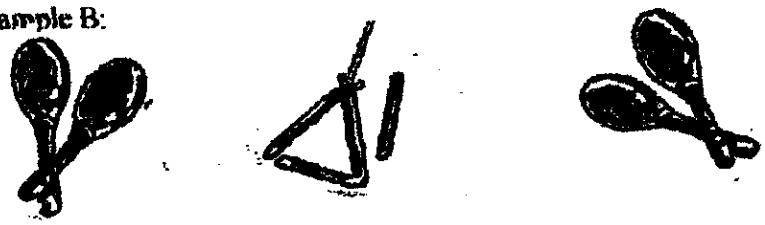
Name________________________________Number__________________

Part I: Test Directions:
This part of the test will measure how well you can match pictures of instruments to one another. Look at the first musical picture. Circle the picture that is the same as the first picture.

Sample A:

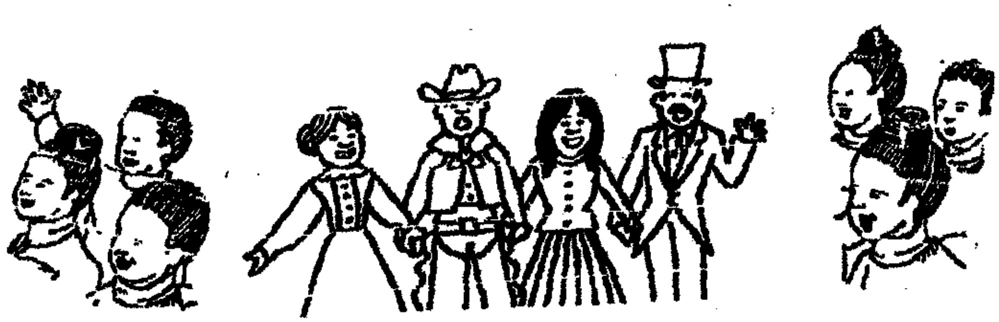


Sample B:



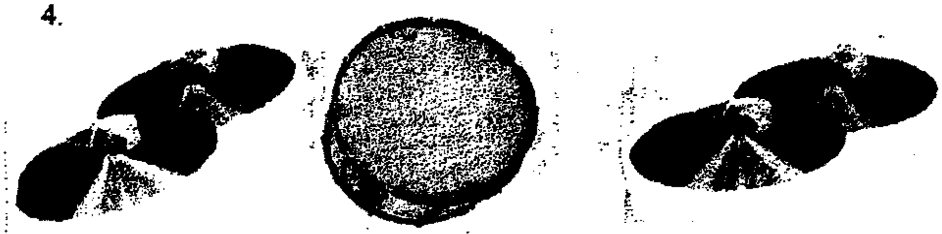
1

2



3.

4.

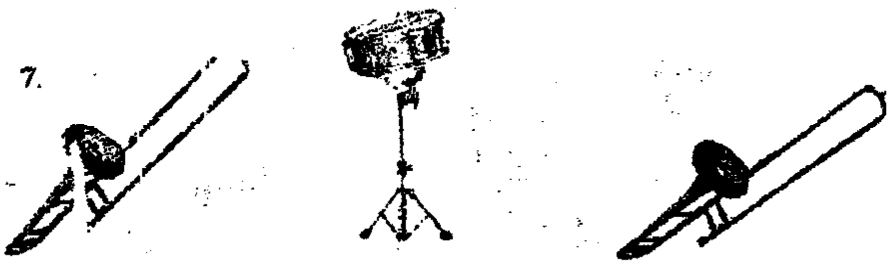


5.

6.

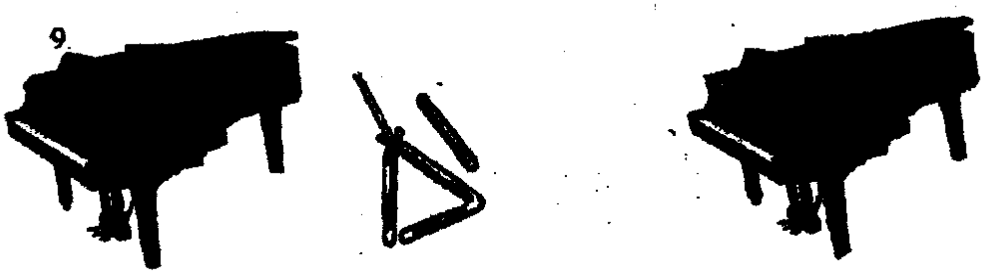
Part II

7.

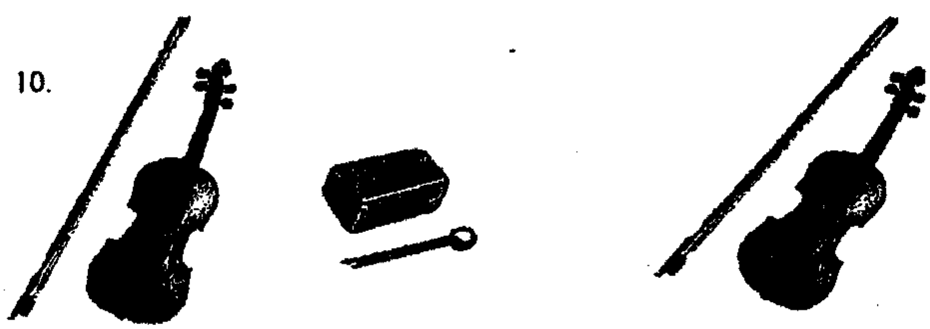


8.

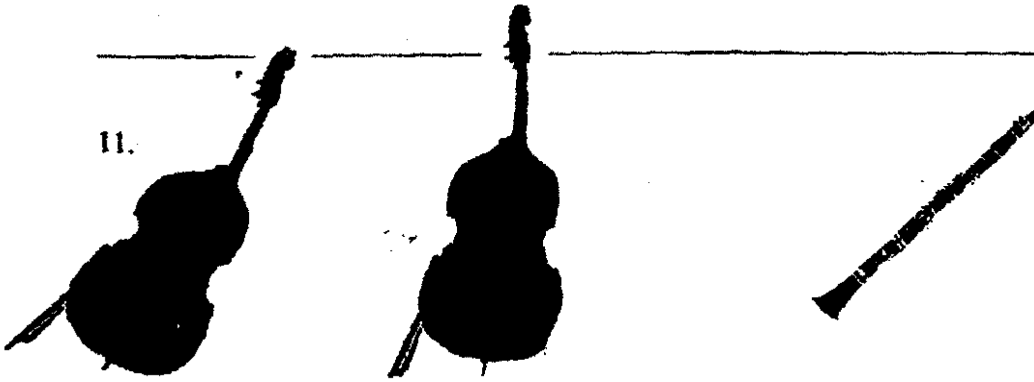
9.



10.



11.



12.

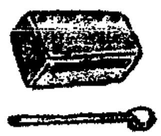
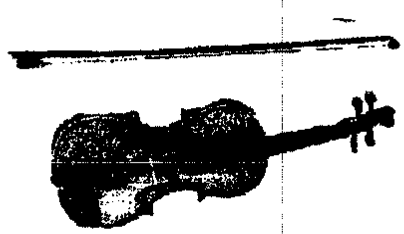
14th Week Timbre Discrimination Post Test
Teacher Guide

Name______________________________ Number__________

Test Directions:

This test will measure how well you can recognize and match instrument or vocal with their correct picture. One musical sound will be played for each question. Listen carefully. Look at the pictures of instrument or voice sounds and circle the sound you hear. I will play each example twice. There is only one correct answer for each question.

Sample A

A.  

Sample B

B.   

(Shouting)

1.  

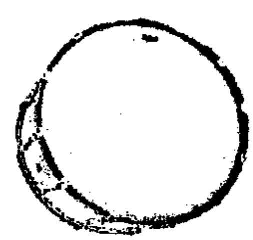
(Singing)

2.  

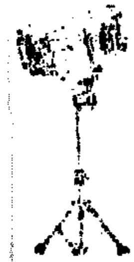
(Triangle)

3.  

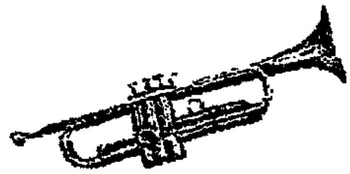
(Cymbals)

4.  

(Snare Drum)

5.  

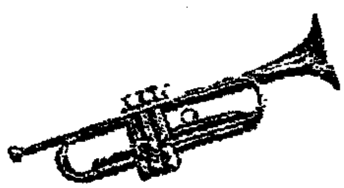
(Trumpet)

6.  

(Trombone)

7.  

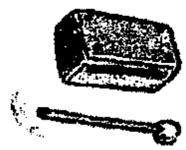
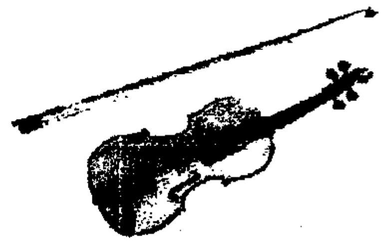
(Flute)

8.  

(Piano)

9.  

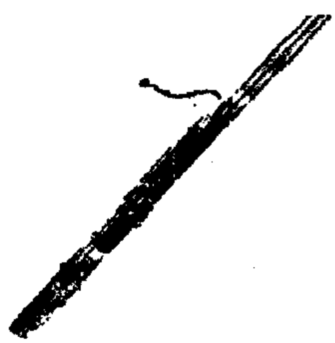
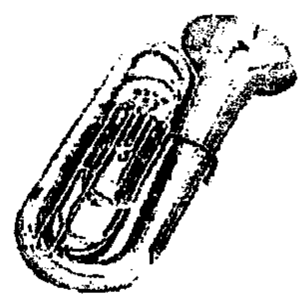
(Violin)

10.  

(String Bass)

11.  

(Tuba)

12.  

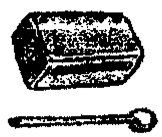
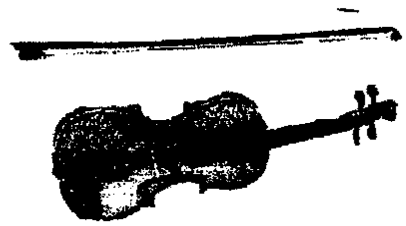
14th Week Timbre Discrimination Post Test
Student Version

Name______________________________________Number_______________

Test Directions:

This test will measure how well you can recognize and match instrument or vocal with their correct picture. One musical sound will be played for each question. Listen carefully. Look at the pictures of instrument or voice sounds and circle the sound you hear. I will play each example twice. There is only one correct answer for each question.

Sample A

A.  

Sample B

B.   

(Shouting)

1.  

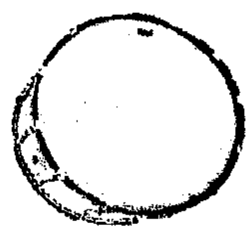
(Singing)

2. 

(Triangle)

3.  

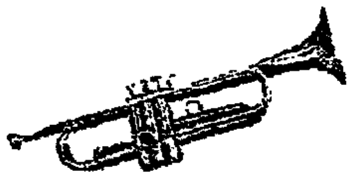
(Cymbals)

4.  

(Snare Drum)

5.  

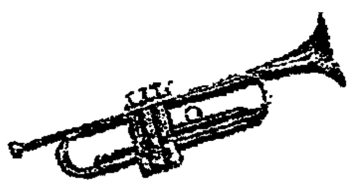
(Trumpet)

6.  

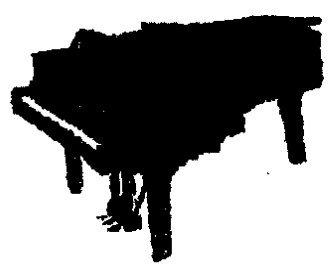
(Trombone)

7.  

(Flute)

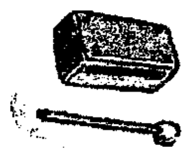
8.  

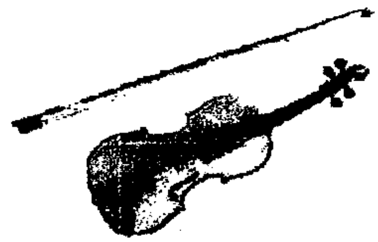
(Piano)

9.  

(Violin)

10.



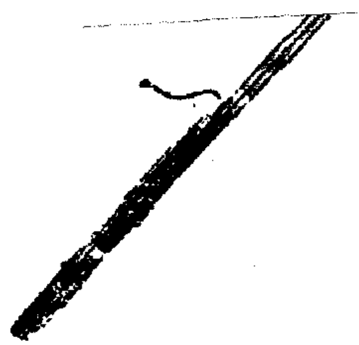


(String Bass)

11.

(Tuba)

12.



18th Week Timbre Discrimination Post Test
Teacher Guide and Student Version

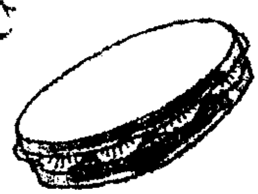
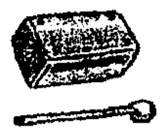
The content of this testing instrument is an exact replication of the 14th week posttest

Name____ Number________________

Test Directions:

This test will measure how well you can recognize and match instrument or vocal with their correct picture. One musical sound will be played for each question. Listen carefully. Look at the pictures of instrument or voice sounds and circle the sound you hear. I will play each example twice. There is only one correct answer for each question.

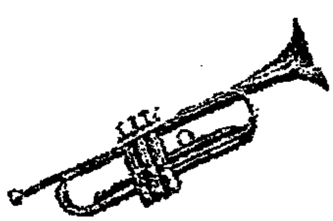
Sample A

Sample B




1.


APPENDIX B

INSTRUCTIONAL DESIGN

Instructional Design

<ins>Lesson Plans</ins>

<ins>Treatment Objectives and Activities</ins>

<ins>Daily Logs</ins>

<ins>The reading readiness Curriculum</ins>

<ins>The General Music Curriculum</ins>

<ins>The State Standards</ins>

Lesson Plans

An Investigation of the Effects of Three Different Levels of Skill Training in Musical Timbre Discrimination on Alphabet Sound Discrimination in Pre-Kindergarten and Kindergarten Children

Treatment Group Lesson Plans

Submitted By
Julia Blair Battle
Vocal Music Teacher
Sherwood Forest Elementary School

Fall 1998

Treatment Group I
Same/Different Group
Lesson Plans 1998
<u>Treatment I: Same Different Activities</u>

**Same Different Objective(s) # 1,2
++Lower case letters=transfer activities
**A Description of Skill Objectives and Activities can be found in Appendix B

Date	Objective(s)	Introduction	Same/Different**Activities	Classroom Music	Closure
9/21	Initial evaluation of student skills	Timbre Pre-Test	********************	**************	*******
9/27	Initial evaluation of student skills	SESAT Sound/ Symbol Pre-Test	********************	**************	*******
10/5-10/18	District Wide Reading Diagnostic Pre Testing		************	**************	*******
10/26-11/6	Classroom Music Schedule Adjustment for Teacher and Research Study Subjects*****				All Treatment Groups Classroom Music Only
11/9	Explore concept of same/different different using articles of clothing, shapes, and a song	Teacher/students explore concept of same and different with familiar objects	S/D #1, #3, #2	Sing:MM1 p.56-60, CD 2:1 CD 2:10 Classroom Instruments	Review examples of same/different
11/11	Students discriminate same/different vocal sounds	Students explore	S/D #1, #3, #4	Song: MMK p.48 51. CD 1:33.34 1:35	Children demonstrate. same/different vocal sounds vocal sounds

Date	Objective(s)	Introduction	Same/Different Activities	Classroom Music	Closure
11/16	Students discrim-inate same/diff. instrument sounds	Review S/D vocal sounds. Contrast with S/D sounds. instrument sounds	MMKp.60 Listen to S/D instrument S/D #6, #7. CD 1:43	Thanksgiving Fing. Plays MM1 p.246-47 Discussion and (Song) CD 4:45; 5:1	Compare S/D vocal sounds and instrument
11/18	Students discrim. S/D vocal/inst sounds	Same as above	MMK p.48, p.56 S/D #6, #7, #10	Thanksgiving: How music is used during the holidays	Compare S/D vocal/inst sounds
11/30	Students discrim. pairs of S/D sounds sounds	Review S/D#6	S/D #8, #9, MMK. 48, 56 and #60, S/D #10 (Small Groups)	Winter Celebration Explore trad. of Hanukkah MMK p.238-239 Resource Master C9	Review SD10 with taped sounds
12/2	Review discrim pairs of S/D	Review S/D #8	S/D #3, #9, MMK. p48, 56 and 60. MM1 p. 254-255	Explore trad. of Am. Christmas	Rev S/D #10 w/tape.sounds

12/6 Formal Assessment: SESATand TDT 5 Week Same/Different Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 review Traditions of Hanukkah and The American Christmas

12/14 Formal Assessment: 5 Week Same/Different Alphabet and Timbre Discrimination Post Test of the remaining 20 students. Those already tested review Traditions of Hanukkah and The American Christmas

12/21-1/3- Winter Holiday Break

Control Activity
Classroom Music

Day(s)	Schoolwide Theme	Objective(s)	Activities	Materials
1/4	The Traditions Kwanzaa	Students explore the traditions of Kwanzaa	Sing: Songs of Kwanzaa Dance: Dances of Kwanzaa	MMK p.244-245 CD 5:32
1/6	Kwanzaa Dialect	Learn a Poem in an African	Recite: An African Poem	MMK p.244-245 CD 5:33
1/10	Winter Holidays	Students explore the origins of the American Civil Rights Movement	Sing: Turn Me Around	MM1 pp.268-269 CD 5:22, 5:24
1/13	Winter Holidays	Students discuss principles of the American Civil Rights Movement:	Sing: Kum Ba Yah	CD 5:22, 5:24 MM1 pp. 268-269
1/18	Winter Holidays	Students discuss principles of the American Civil Rights Movement:	Sing: Sing About Martin Recite: Hand In Hand	CD 5:22, 5:24 MM1 pp. 268-269
1/20		Students discuss principles of the American Civil Rights Movement:	Sing: Sing About Martin Recite: Hand In Hand	CD 5:22, 5:24 MM1 pp. 268-269

1/24 Formal Assessment: SESAT and TDT Visual Recognition 10 week Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement

1/27 Formal Assessment: Visual Recognition10 week Alphabet and Timbre Discrimination Post Test for the remaining 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement

Date	Schoolwide Theme	Objective(s)	Activities	Materials
2/1	Winter Celebrations Around the World	Students explore the traditions of the Chinese New Year Learn Song in a Cambodian Dialect	Sing: Suk san wan pi mai	MM4 pp. 295-297 CD 8:1, 8:2
2/5	Winter Celebrations Around the World	Students explore the traditions of TET, the Chinese New Year.	Sing: Suk san wan pi mai Dance: Chinese Lion Dance	MM4 pp. 295-297 CD 8:1, 8:2, 8:3, 8:4 MM2 pp. 363-364 CD 8:18 through 8:25
2/8	Winter Celebrations Around the World	Students explore the origins of the Chinese Zodiac	Read: Play: The Tears of the Dragon	MM2 pp. 363-364 CD 8:18 through 8:25
2/10	Winter Celebrations Around the World	Students explore the origins of the Chinese Zodiac	Read: Play: The Tears of the Dragon	MM2 pp. 363-364 CD 8:18 through 8:25 Master S.2 Unpitched Classroom Instruments
2/15	African American History	Students explore the meanings of the Spiritual in African American History	Sing: Chatter With the Angels	MM3 p. 330 CD 8:31
2/17	African American History	Students define peace, justice and brotherhood	Sing: Woke Up This Morning On Our Way to Freedom Land	MM3 pp.292-293 CD 7:20, 7:21

Date	Schoolwide Theme	Objective(s)	Activities	Materials
2/22	African American	Students explore the meanings history and roots of the African American Gospel Tradition	Sing: Git on Board Go Tell It On the Mountain	MM3 p.217,157 History 274 CD 8:1, 8:2
2/24	African American History	Students explore the origins of Jazz in New Orleans Perform a New Orleans Second Line	Sing: It Don't Mean a Thing If it Ain't Got That Swing Pizza Pizza Daddy-O Perform: Kidd Jordan's Second Line	MM3 p. 246 MM2 p. 303 M2 p. 93 MM2 CD 9:43
3/1	Post Test- Formal Assessment: SESAT and TDT 14 week Sound Symbol Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 Review TET and African American History Songs.			
3/3	Formal Assessment: 14 week Sound Symbol Alphabet and Timbre Discrimination Post Test for the remaining 20 students. Those already tested review TETand African American History Songs			
3/8- 3/26	Delay time. No Instruction			
3/29-	Delayed Post Test: SESATand TDT 18 week Timbre and Alphabet Discrimination Sound Symbol Post test . All students.			
4/2	End of Study			

Treatment Group II
Visual Recognition Group
Lesson Plans 1998
<u>Treatment I: Same Different Activities</u>

**Same Different Objective(s) <u># 1,2</u>
++Lower case letters=transfer activities
**A Description of Skill Objectives and Activities can be found in Appendix B

Date	Objective(s)	Introduction	Same/Different**Activities	Classroom Music	Closure
9/21	Initial evaluation of student skills	Timbre Pre-Test	********************	**************	*******
9/27	Initial evaluation of student skills	SESAT Sound/ Symbol Pre-Test	********************	**************	*******
10/5-10/18	District Wide Reading Diagnostic Pre Testing		************	**************	*******
10/26-11/6	Classroom Music Schedule Adjustment for Teacher and Research Study Subjects*****				All Treatment Groups Classroom Music Only
11/9	Explore concept of same/different different using articles of clothing, shapes, and a song	Teacher/students explore concept of same and different with familiar objects	S/D #1, #3, #2	Sing: MM1 p.56-60, CD 2:1 CD 2:10 Classroom Instruments	Review examples of same/different
11/11	Students discrim-inate same/different vocal/sounds	Students explore same/different vocal sounds	S/D #1, #3, #4	Same/Different voices CD 1:33, 1:34, 1:35	Children demons. same/diff. vocal sounds

Date	Objective(s)	Introduction	Same/Different Activities	Classroom Music	Closure
11/16	Students discrim-inate same/diff. instrument sounds	Review S/D vocal sounds. Contrast with S/D sounds. instrument sounds	MMKp.60 Listen to S/D instrument S/D #6, #7. CD 1:43	Thanksgiving Fing. Plays MM1 p.246-47 Discussion and (Song) CD 4:45; 5:1	Compare S/D vocal sounds and instrument
11/18	Students discrim. S/D Vocal/Inst sounds	Same as above	MMK p.48, p.56 S/D #6, #7, #10	Thanksgiving: How music is used during the holidays	Compare S/D vocal/inst sounds
11/30	Students discrim. pairs of S/D sounds sounds	Review S/D#6	S/D #8, #9, MMK. 48, 56 and #60, S/D #10 (Small Groups)	Winter Celebration Explore trad. of Hanukkah MMK p.238-239 Resource Master C9	Review SD10 with taped sounds
12/2	Review discrim pairs of S/D sounds	Review S/D #8	S/D #3, #9, MMK. p48, 56 and 60. MM1 p. 254-255	Explore trad. of Am. Christmas	Review S/D w/ tape #10
12/6	Formal Assessment: SESAT and TDT 5 Week Same/Different Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 review Traditions of Hanukkah and American Christmas				
12/14	Formal Assessment: 5 Week Same/Different Alphabet and Timbre Discrimination Post Test of the remaining 20 students. Those already tested review the Traditions of Hanukkah and American Christmas				

Treatment II: Visual Recognition

**Visual Recognition Objective(s) #1,2

Date	Objective(s)	Introduction	Visual Recognition**Activities	Classroom Music	Closure
1/4	Each musical picture has its own name	Present pictures of instruments and their corres- ponding names (6 instruments)	V/R # 2, #9,	Sing: Songs of Kwanzaa	Review instruments and names introduced in the lesson
1/6	Identify musical pictures introduced as same and different	Present/name pairs of instrument pictures students identify them as same or different. (6 new, 6 pairs)	V/R # 2, #9, #11	Recite: An African Poem MMK pp. 244-245 CD 5:33	Review the pairs of instrument pictures introduced in the lesson
1/10	Name 12 different musical instruments Identify pairs of pictures as same and	Review names of musical instruments Identify pairs of instruments as same and different	V/R #1, #4, #3 #11	The Civil Rights Movement Sing: Turn Me Around MM1 pp. 268-269 CD 5:22, 5:44	Review instrument names. different
1/13	Name 14 different musical instruments Identify pairs of pictures as same and different	(Same as above) V/R # 1 as an opening activity.	V/R #4, 7	The Civil Rights Movement Sing: Kum Ba Yah CD 5:24 MM1 pp. 269	Review instrument names. Use V/R # 2 as a closing activity.

Date	Objective(s)	Introduction	Visual Recognition**Activities	Classroom Music	Closure
1/18	Informal Assessment. Instrument picture identification	Review instru-ment names	(Small Groups: Assistants assess children through game participation) V/R # 6, #11, #4 and #9	Sing: Sing About Martin Recite: Hand and Hand MM1 pp. 270, 271	Review instrument names. Use V/R #1 as closing activity.
1/20	Students match instrument pictures with (Same/same)	Review instrum-ment names. Use V/R #2 as an opening activity.	V/R #4 and #10	Recite: Hand and Hand CD 5:1 MM1 p. 271	Use V/R #1 as closing activity

1/24 Formal Assessment: SESAT and TDT 10 week Visual Recognition Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement

1/27 Formal Assessment: 10 week Visual Recognition Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement Control Activity

Classroom Music

Date	Schoolwide Theme	Objective(s)	Activities	Materials
2/1	Winter Celebrations Around the World	Students explore the traditions of the Chinese New Year Learn Song in a Cambodian Dialect	Sing: Suk san wan pi mai	MM4 pp. 295-297 CD 8:1, 8:2
2/5	Winter Celebrations Around the World	Students explore the traditions of TET, the Chinese New Year.	Sing: Suk san wan pi mai Dance: Chinese Lion Dance	MM4 pp. 295-297 CD 8:1, 8:2, 8:3, 8:4 MM2 pp. 363-364 CD 8:18 through

Date	Schoolwide Theme	Objective(s)	Activities	Materials
2/8	Winter Celebrations Around the World	Students explore the origins of the Chinese Zodiac	Read: Play: The Tears of the Dragon	MM2 pp. 363-364 CD 8:18 through 8:25
2/10	Winter Celebrations Around the World	Students explore the origins of the Chinese Zodiac	Read: Play: The Tears of the Dragon	MM2 pp. 363-364 CD 8:18 through 8:25 Master S.2 Unpitched Classroom Instruments
2/15	African American	Students explore the meanings of the Spiritual in African American History	Sing: Chatter With the Angels	MM3 p. 330 History CD 8:31
2/17	African American	Students define peace, justice and brotherhood	Sing: Woke Up This Morning On Our Way to Freedom Land	MM3 pp.292-293 History CD 7:20, 7:21
2/22	African American	Students explore the meanings History and roots of the African American Gospel Tradition	Sing: Git on Board Go Tell It On the Mountain	MM3 p.217,157 History 274 CD 8:1, 8:2
2/24	African American History	Students explore the origins of Jazz in New Orleans Perform a New Orleans Second Line	Sing: It Don't Mean a Thing If it Ain't Got That Swing Pizza Pizza Daddy-O Perform: Kidd Jordan's Second Line	MM3 p. 246 MM2 p. 303 M2 p. 93 MM2 CD 9:43

3/1 Post Test- Formal Assessment: SESATand TDT 14 week Timbre and Alphabet Discrimination Sound Symbol Post Test for the first 20 students. The Other 20 Review TET and African American History Songs.

3/3 Formal Assessment: SESATand TDT 14 week Timbre and Alphabet Discrimination Sound Symbol Post Test for the first 20 students. Those already tested review TET and African American History Songs

3/8-
3/26 Delay time. No Instruction

3/29- Delayed Post Test: SESATand TDT 18 week Timbre and Alphabet Discrimination Sound Symbol Post Test All students.

4/2 End of Study

Treatment Group III
Sound Symbol Discrimination
Lesson Plans 1998
<u>Treatment I: Same Different Activities</u>
**Same Different Objective(s) <u># 1,2</u>

Date	Objective(s)	Introduction	Same/Different**Activities	Classroom Music	Closure
9/21	Initial evaluation of student skills	Timbre Pre-Test	********************	**************	*******
9/27	Initial evaluation of student skills	SESAT Sound/ Symbol Pre-Test	********************	**************	*******
10/5-10/18	District Wide Reading Diagnostic Pre Testing		************	**************	*******
10/26-11/6	Classroom Music Schedule Adjustment for Teacher and Research Study Subjects*****				All Treatment Groups Classroom Music Only
11/9	Explore concept of same/different different using articles of clothing, shapes, and a song	Teacher/students explore concept of same and different with familiar objects	S/D #1, #3, #2	Sing: MM1 p.56-60, CD 2:1 CD 2:10 Classroom Instruments	Review examples of same/different
11/11	Students discrim- same/different vocal/sounds	Students explore same/different vocal sounds	S/D #1, #3, #4	Same/Different voices CD 1:33, 1:34, 1:35 Song: MMK. p.48 51.	Children demonst same/diff. vocal sounds.

Date	Objective(s)	Introduction	Same/Different Activities	Classroom Music	Closure
11/16	Students discrim-inate same/diff. instrument sounds	Review S/D vocal sounds. Contrast with S/D sounds. instrument sounds	MMKp.60 Listen to S/D instrument S/D #6, #7. CD 1:43	Thanksgiving Fing. Plays MM1 p.246-47 Discussion and (Song) CD 4:45; 5:1	Compare S/D vocal sounds and instrument
11/18	Students discrim. S/D Vocal/Inst sounds	Same as above	MMK p.48, p.56 S/D #6, #7, #10	Thanksgiving: How music is used during the holidays	Compare S/D vocal/inst sounds
11/30	Students discrim. pairs of S/D sounds sounds	Review S/D#6	S/D #8, #9, MMK. 48, 56 and #60, S/D #10 (Small Groups)	Winter Celebration Explore trad. of Hanukkah MMK p.238-239 Resource Master C9	Review SD10 with taped sounds
12/2	Review discrim pairs of S/D	Review S/D #8	S/D #3, #9, MMK. p48, 56 and 60. MM1 p. 254-255	Explore trad. of Am. Christmas	Rev S/D #10 w/ tape sounds

12/6 Formal Assessment: SESATand TDT 5 Week Same/Different Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 review the Traditions of Hanukkah and American Christmas.

12/14 Formal Assessment: 5 Week Same/Different Alphabet and Timbre Discrimination Post Test of the remaining 20 students. Those already tested review the Traditions of Hanukkah and American Christmas.

Treatment II: Visual Recognition Activities

**Visual Recognition Objective(s) #1,2

Date	Objective(s)	Introduction	Visual Recognition**Activities	Classroom Music	Closure
1/4	Each musical picture has its own name	Present pictures of instruments and their corres-ponding names (6 instruments)	V/R # 2, #9,	Sing: Songs of Kwanzaa	Review instruments and names introduced in the lesson
1/6	Identify musical pictures introduced as same and different	Present/name pairs of instrument pictures students identify them as same or different. (6 new, 6 pairs)	V/R # 2, #9, #11	Recite: An African Poem MMK pp. 244-245 CD 5:33	Review the pairs of instrument pictures introduced in the lesson
1/10	Name 12 different musical instruments Identify pairs of pictures as same and different	Review names of musical instruments Identify pairs of instruments as same and different	V/R #1, #4, #3 #11	The Civil Rights Movement Sing: Turn Me Around MM1 pp. 268-269	Review instrument names. CD 5:22, 5:44
1/13	Name 14 different musical instruments Identify pairs of pictures as same and different	(Same as above) V/R # 1 as an opening activity.	V/R #4, 7	The Civil Rights Movement Sing: Kum Ba Yah CD 5:24 MM1 pp. 269	Review instrument names. Use V/R # 2 as a closing activity.

Date	Objective(s)	Introduction	Visual Recognition**Activities	Classroom Music	Closure
1/18	Informal Assessment. Instrument picture identification	Review instru- ment names	(Small Groups: Assistants assess children through game participation) V/R # 6, #11, #4 and #9	Sing: Sing About Martin Recite: Hand and Hand MM1 pp. 270, 271	Review instrument names. Use V/R #1 as closing activity.
1/20	Students match instrument pictures with (Same/same)	Review instrum- ment names. Use V/R #2 as an opening activity.	V/R #4 and #10	Recite: Hand and Hand CD 5:1 MM1 p. 271	Use V/R #1 as closing activity
1/24	Formal Assessment: SESAT and TDT 10 week Visual Recognition Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement.				
1/27	Formal Assessment: 10 week Visual Recognition Alphabet and Timbre Discrimination Post Test for the remaining 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement.				

<u>Treatment III: Sound Symbol Matching Activities</u>

**Sound Symbol Objective(s): # 3,4

Date	Objective(s)	Introduction	Sound/Symbol**Activities	Classroom Music	Closure
2/1	Students explore the concept of each instrument having is own sound	Teacher/students match familiar instrument pictures with their corresp. sound.	MM. Video Tape: Instrument Sounds S/S #1, and #2,	Chinese New Year Suk san wan pi mai MM4 pp.295-297 CD: 8:1, 8:2	Review Instrument pictures and their matching sounds
2/5	Students match familiar instru- ment pictures with their corresp sound	Teacher explains concept of each person having their own voice	MM. Video Tape: Review each instrument its sound. S/S # 1 and 2 #10 w/ tape recording	Chinese New Year Suk san wan pi mai Dance: Chinese Lion Dance MM4, p.297	Review instruments and their matching sounds. Use V/R CD 8:2, 8:3 as closing activity

Date	Objective(s)	Introduction	Sound/Symbol**Activities	Classroom Music	Closure
2/8	Students match familiar inst. pictures with their corresponding sound.	Use S/S # 2 as opening activity	S/S #2, and #3	Chinese New Year Read: Tears of the Dragon (Play) MM2 pp.263-64 CD 8:18-8:25	Use S/S # 5 as a closing activity
2/10	Informal evaluation of student skill in matching familiar instrument pictures with their appropriate sound	Use S/S # 1 as opening activity	Use S/S # 4, in small groups as evaluation activity.	Chinese New Year Read: Tears of the Dragon (Play) MM2 pp.263-64 CD 8:18-8:25	Use S/S # 5 as a closing activity
2/15	Students identify instrument sounds in listening selections.	Use S/S #2 as introductory activity.	Students Listen to and identify instrument sounds in MM#2 pp. 88-89, CD 2:35	Af. Am History Sing: Chatter with the Angels MM3 p.330 CD 8:31	Use S/S # 3 as closing activity
2/17	Students identify vocal and inst. sounds in listening collage.	Use S/S #1 as introductory activity	Listening collage MM#2 pp. 6-7 CD 1:6	Af. Am History Sing: Woke Up This Morning Meaning of the Spiritual. MM3 pp.292-293 CD 7:20, 7:21	Use S/S # 5 as a closing activity

Date	Objective(s)	Introduction	Sound/Symbol Activities	Classroom Music	Closure
2/22	Students review instrument pictures and their matching sounds	Teacher has students point to appropriate instrument pictures when their matching (taped) sounds are played	S/S # 4, V/R #10 with taped sounds S/S #10.	Af. Am History Roots of Gospel Sing: Git On Board Go Tell It On the Mountain. MM3 pp. 157, 217 CD 8:1, 8:2	Use S/S # 2 as a closing activity.
2/24	Review sound/ symbol matching activities.	Review Sound collage as opening activity. SB#1 p28-29	S/S #4, #1 and #2	Af. Am History Roots of Jazz Sing: Pizza Pizza Daddy-O Perform: Kidd Jordan's Second Line MM2, p.92 CD 9:43	Use S/S # 3 as a closing activity

3/1 Posttest- Formal Assessment: SESATand TDT 14 week Sound Symbol Alphabet and Timbre Discrimination Post Tests for the first 20 students. The other 20 review TET and African American History Songs.

3/3 Formal Assessment: 14 week Sound Symbol Alphabet and Timbre Discrimination Post Tests the remaining 20 students. Those already tested review TET and African American History Songs.

3/8-
3/26 Delay time. No Instruction

3/29 Delayed Posttest: 18 week Sound Symbol Alphabet and Timbre Discrimination Post Tests 4/2 End of Study

Treatment Group IV
Instruction in Three Skill Levels with Strategies for Transfer
Lesson Plans 1998
Treatment I: Same Different Activities with Instruction for Transfer
**Same Different Objective(s) # 3

Date	Objective(s)	Introduction	Same/Different**Activities	Classroom Music	Closure
9/21	Initial evaluation of student skills	Timbre Pre-Test	********************	**************	*******
9/27	Initial evaluation of student skills	SESAT Sound/ Symbol Pre-Test	********************	**************	*******
10/5- 10/18	District Wide Reading Diagnostic Pre Testing		************	**************	*******
10/26-11/6	Classroom Music Schedule Adjustment for Teacher and Research Study Subjects*****				All Treatment Groups Classsroom Music Only
11/9	Explore concept of same/different different using articles of clothing, shapes, and a song	Teacher/students explore concept of same and different with familiar objects	S/D #1,1a,d #3, #2 2a++	Sing: MM1 p.56-60, CD 2:1 CD 2:10 Classroom Instruments	Review examples of same/different
11/11	Students discrim-inate same/different vocal/sounds	Students explore same/different vocal sounds	S/D #1c,d #3a, #4 #4a	Same/Different CD 1:33, 1:34, 1:35 Song: MMK. p.48 51.	Children demons. same/diff. vocal sounds.

Date	Objective(s)	Introduction	Same/Different Activities	Classroom Music	Closure
11/16	Students discrim-inate same/diff. instrument sounds	Review S/D vocal Sounds. Contrast with S/D sounds.	MMKp.60 Listen to S/D instrument S/D #6,6a #7,7a. CD 1:43	Thanksgiving Fing. Plays MM1 p.246-47 Discussion and (Song) CD 4:45; 5:1	Compare S/D vocal sounds and instrument sounds
11/18	Students discrim. S/D Vocal/Inst sounds	Same as above	MMK p.48, p.56 S/D #6, #7,7a, #10a	Thanksgiving: How music is used during the holidays	Compare S/D vocal/inst sounds
11/30	Students discrim. pairs of S/D sounds sounds	Review S/D#6	S/D #8, #9, MMK. 48, 56 and #60, S/D #10b (Small Groups)	Winter Celebration Explore trad. of Hanukkah MMK p.238-239 Resource Master C9	Review SD10 with taped sounds
12/2	Review discrim pairs of S/D sounds	Review S/D #8	S/D #3, #9b, MMK. p48, 56 and 60.	Explore trad. of Am. Christmas MM1 p. 254-255	Rev S/D #10 w/tape
12/6	Formal Assessment: SESAT and TDT 5 Week Same/Different Alphabet and Timbre Discrimination Post Test for the first 20 students. The other 20 review Traditions of Hanukkah and American Christmas				
12/14	Formal Assessment: 5 Week Same/Different Alphabet and Timbre Discrimination Post Test of the remaining 20 students. Those already tested review the Traditions of Hanukkah and American Christmas				

Treatment II: Visual Recognition Activities with Instruction for Transfer

**Visual Recognition Objective(s) #1,2

Date	Objective(s)	Introduction	Visual Recognition**Activities	Classroom Music	Closure
1/4	Each musical picture has its own name	Present pictures of instruments and their corres-ponding names (6 instruments)	V/R # 2, #9,2a	Sing: Songs of Kwanzaa	Review instruments and names introduced in the lesson
1/6	Identify musical pictures introduced as same and different	Present/name pairs of instrument pictures students identify them as same or different. (6 new, 6 pairs)	V/R # 2, #9, #11 9a, 2a	Recite: An African Poem MMK pp. 244-245 CD 5:33	Review the pairs of instrument pictures introduced in the lesson
1/10	Name 12 different musical instruments Identify pairs of pictures as same and different	Review names of musical instruments Identify pairs of instruments as same and different	V/R #1, #4, #3 #11,1a,4a	The Civil Rights Movement Sing: Turn Me Around MM1 pp. 268-269	Review instrument names. CD 5:22, 5:44
1/13	Name 14 different musical instruments Identify pairs of pictures as same and different	(Same as above) V/R # 1 as an opening activity.	V/R #4, 7,4a,7a	The Civil Rights Movement Sing: Kum Ba Yah CD 5:24 MM1 pp. 269	Review instrument names. Use V/R # 2 as a closing activity.

Date	Objective(s)	Introduction	Visual Recognition**Activities	Classroom Music	Closure
1/18	Informal Assessment. Instrument picture identification	Review instru-ment names	(Small Groups: Assistants assess children through game participation) V/R # 6,6a, #11, #4 and #9 9a	Sing: Sing About Martin Recite: Hand and Hand MM1 pp. 270, 271	Review instrument names. Use V/R #1 as closing activity.
1/20	Students match instrument pictures with (Same/same)	Review instrum-ment names. Use V/R #2 as an opening activity.	V/R #4,4a and #10,10a	Recite: Hand and Hand CD 5:1 MM1 p. 271	Use V/R #1 as closing activity

1/24 Formal Assessment: SESATand TDT 10 week Visual Recognition Alphabet and Timbre Discrimination Post Tests for the first 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement

1/27 Formal Assessment: 10 week Visual Recognition Alphabet and Timbre Discrimination Post Tests for the remaining 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement

<u>Treatment III: Sound Symbol Matching Activities With Instruction for Transfer</u>

**Sound Symbol Objective(s): # 3,4

Date	Objective(s)	Introduction	Sound/Symbol**Activities	Classroom Music	Closure
2/1	Students explore the concept of each instrument having is own sound	Teacher/students match familiar instrument pictures with their corresp. sound.	MM. Video Tape: Instrument Sounds S/S #1,1a and #2,2a	Chinese New Year Suk san wan pi mai MM4 pp.295-297 CD: 8:1, 8:2	Review Instrument pictures and their matching sounds
2/5	Students match familiar instru-ment pictures with their corresp sound	Teacher explains concept of each person having their own voice	MM. Video Tape: Review each instrument its sound. S/S # 1 and 2 #10 w/ tape recording	Chinese New Year Suk san wan pi mai Dance: Chinese Lion Dance MM4, p.297	Review instruments and their matching sounds. Use V/R CD 8:2, 8:3 as closing activity

Date	Objective(s)	Introduction	Sound/Symbol**Activities	Classroom Music	Closure
2/8	Students match familiar inst. pictures with their corresponding sound.	Use S/S # 2 as opening activity	S/S #2,2a, and #3a	Chinese New Year Read: Tears of the Dragon (Play) MM2 pp.263-64 CD 8:18-8:25	Use S/S # 5 as a closing activity
2/10	Informal evaluation of student skill in matching familiar instrument pictures with their appropriate sound	Use S/S # 1 as opening activity	Use S/S # 4,4a in small groups as evaluation activity.	Chinese New Year Read: Tears of the Dragon (Play) MM2 pp.263-64 CD 8:18-8:25	Use S/S # 5 as a closing activity
2/15	Students identify instrument sounds in listening selections.	Use S/S #2 as introductory activity.	Students Listen to and identify instrument sounds in MM#2 pp. 88-89, CD 2:35	Af. Am History Sing: Chatter with the Angels MM3 p.330 CD 8:31	Use S/S # 3 as closing activity
2/17	Students identify vocal and inst. sounds in listening collage.	Use S/S #1 as introductory activity	Listening collage MM#2 pp. 6-7 CD 1:6	Af. Am History Sing: Woke Up This Morning Meaning of the Spiritual. MM3 pp.292-293 CD 7:20, 7:21	Use S/S # 5 as a closing activity

Date	Objective(s)	Introduction	Sound/Symbol Activities	Classroom Music	Closure
2/22	Students review instrument pictures and their matching sounds played	Teacher has students point to appropriate instrument pictures when their matching (taped) sounds are	S/S # 4,4a V/R #10 with taped sounds S/S #10a. CD 8:1, 8:2	Af. Am History Roots of Gospel Sing: Git On Board Go Tell It On the Mountain. MM3 pp. 157, 217	Use S/S # 2 as a closing activity.
2/24	Review sound/ symbol matching activities.	Review Sound collage as opening activity. SB#1 p28-29	S/S #4, #1 and #2 4a,1a,2a	Af. Am History Roots of Jazz Sing: Pizza Pizza Daddy-O Perform: Kidd Jordan's Second Line MM2, p.92 CD 9:43	Use S/S # 3 as a closing activity

3/1 Posttest- Formal Assessment: SESATand TDT 14 week Sound Symbol Alphabet and Timbre Discrimination Post Tests for the first 20 students. The other 20 review TET and African American History Songs.

3/3 Formal Assessment: 14 week Sound Symbol Alphabet and Timbre Discrimination Post Tests for the remaining 20 students. Those already tested review TET and African American History Songs.

3/8-
3/26 Delay time. No Instruction

3/29 Delayed Posttest: SESATand TDT 18 week Sound Symbol Alphabet and Timbre Discrimination Post Tests All students

4/2 End of Study

Control Activity
Classroom Music

Date	Schoolwide Theme	Objective(s)	Activities	Materials
9/21	Patriotism	Students learn what is meant by patriotism.	Sing: America Recite: Pledge of allegiance March: Grand Old Flag	MM#1 pp. 232-233 CD 4:32-4:33
9/23		Students identify symbols of patriotism : flag, salutes, colors: red, white and blue	Review: Pledge, America and Grand Old Flag Sing: Sing out for Your Country Yankee Doodle	MM#1 pp.234-235 MMK pp.218-219 CD 4:34
9/27	School Rules/ Conflict Resolution	Learn appropriate behaviours for the school environment	Sing: School Rules School Bells Happy Children	MMK pp.261
9/30		Discuss appropriate ways of dealing with stress and conflict	Sing: Peacemakers I am a Person Movement: Hand and body movements to I am a Person.	NOPS: Second Step Songbook MMK 92-93.
10/5-10/18	District Wide Pre Testing***			No Classes
10/26-11/6	Classroom Music Schedule Adjustment for Teacher and Research Study Subjects*****			All Treatment Groups Classroom Music Only

Date	Schoolwide Theme	Objective(s)	Activities	Materials
10/26	Autumn Festivals	Explore traditions of Vietnamese Autumn Festival: Loy Kratong	Sing: Tet Trong Describe: Moon Festival traditions. Discuss: American Nursery Rhymes about the Moon	MM5 pp. 298-299 CC 7:9 7:10
10/28		Explore the traditions of the Hebrew Harvest Festival	Sing: Hag Asif/Hag Shavout Discuss: Motivations for Harvest celebrations Movement: Circle Dance	MM5 pp.272-273 CD 6:38
10/30		Explore Traditions of Halloween	Sing: Halloween Five Little Pumpkins Discuss: Origins/Meaning of the Holiday	MK pp. 226
11/2	Winter Holidays	Students explore the origins of Thanksgiving	Sing: Harvest Finger Play: Turkey went Out for a Walk	CD4:45.5:1 MM1 pp .244-245 MMK pp. 230-231
11/4		Recite Thanksgiving fingerplays with musical accompaniment Discuss possible Thanksgiving menus.	Sing: Five Fat Turkeys, Pumpkin Song, Shoo Turkey Dance: Turkey Game	MM1 pp.246-247 CD 5:2, 5:3 Resource Master #6
11/9		Students discuss how music is used during special holidays Students sing a Thanksgiving song in Danish	Sing: Turkey Ran Away, Thanks Song, and Thank You	MMK pp. 232 CD 5:14, 5:15, 5:16, 5:17, 5:19

Date	Schoolwide Theme	Objective(s)	Activities	Materials
11/11	Winter Holidays	Students explore the origins of Thanksgiving	Sing: Harvest Finger Play: Turkey went Out for a Walk	CD4:45.5:1 MM1 pp .244-245 MMK pp. 230-231
11/18		Recite Thanksgiving fingerplays with musical accompaniment Discuss possible Thanksgiving menus.	Sing: Five Fat Turkeys, Pumpkin Song, Shoo Turkey Dance: Turkey Game	MM1 pp.246-247 CD 5:2, 5:3 Resource Master #6
11/23-11/27	Thanksgiving Holidays	Thanksgiving Holidays	Thanksgiving Holidays	
11/30	Winter Celebrations Around the World	Students explore the traditions of Hanukkah Students play a Hebrew Game Students sing an Israeli folk song	Sing: Hanukkah is Here Dance: Candle Dance Sing: My Dreidel Play: The Dreidel Game Make: A Dreidel	MMK pp. 238-239 MM1 pp. 254-255 Resource Master C9
12/2		Students explore traditions of American Christmas	Sing: Must Be Santa Sing: Jolly Old St. Nicholas Sing: O Come Little Children Sing: The Friendly Beasts	MMK pp. 240-214 CD 5:27, 5:35, 5:28 MM1 pp. 262-23 CD 5:16, 5:17, 5:18

12/6 Formal Assessment: SESAT and TDT 5 Week Same/Different Alphabet and Timbre Discrimination Post Test for the first 20 students. The remaining 20 review Traditions of Hanukkah and American Christmas.
12/14 Formal Assessment: 5 Week Same/Different Alphabet and Timbre Discrimination Post Test for the remaining 20 students. Those already tested review Traditions of Hanukkah and American Christmas.
12/21-1/3- Winter holiday Break

Date	Schoolwide Theme	Objective(s)	Activities	Materials
1/4	Kwanzaa	Students explore the traditions of Kwanzaa	Sing: Dima, Wonko Dwom Recite: Umoja	MMK pp. 244-245 CD 5:32-5:33
1/6		Students learn a poem in an African dialect	Dramatize: Meaning of the poem through sign language.	MMK pp. 244-245
1/10		Students explore the principles of Kwanzaa	Sing: Dima, Wonko Dwom Recite: Umoja	MMK pp. 244-245 CD 5:32-5:33
1/13	Civil Rights	Students explore the meanings of Civil Rights	Sing: Sing About Martin Poem: Hand and Hand	MM1 pp. 266-267
1/17	Civil Rights	Students define the words justice, brotherhood, peace and hero	Sing: Turn me Around Sing: Kum ba Yah	MM 1 pp. 268-269 CD 5:22, 5:24
1/20	Civil Rights	Students define the words justice, peace and brotherhood	The Civil Rights Movement Sing: Turn Me Around	MM1 pp. 268-269 CD 5:22, 5:44.

1/24 Formal Assessment: SESATand TDT 10 week Visual Recognition Alphabet and Timbre Discrimination Post Tests The other 20 review Songs of Kwanzaa and the American Civil Rights Movement

1/27 Formal Assessment: 10 week Visual Recognition Alphabet and Timbre Discrimination Post Tests the remaining 20 students. The other 20 review Songs of Kwanzaa and the American Civil Rights Movement

Date	Schoolwide Theme	Objective(s)	Activities	Materials
2/1	Winter Celebrations Asian New Year	Students explore the traditions of the Chinese New Year Learn Song in a Cambodian Dialect	Sing: Suk san wan pi mai	MM4 pp. 295-297 CD 8:1, 8:2
2/5	Winter Celebrations Asian New Year	Students explore the traditions of TET, the Chinese New Year.	Sing: Suk san wan pi mai Dance: Chinese Lion Dance	MM4 pp. 295-297 CD 8:1, 8:2, 8:3, 8:4 MM2 pp. 363-364 CD 8:18 through 8:25
2/8	Winter Celebrations Asian New Year	Students explore the origins of the Chinese Zodiac	Read: Play: The Tears of the Dragon	MM2 pp. 363-364 CD 8:18 through 8:25
2/10	Winter Celebrations Asian New Year	Students explore the origins of the Chinese Zodiac	Perform: Play: The Tears of the Dragon	MM2 pp. 363-364 CD 8:18 through 8:25 Master S.2 Unpitched Classroom Instruments
2/15	African American	Students explore the meanings of the Spiritual in African American History	Sing: Chatter With the Angels	MM3 p. 330 History CD 8:31
2/17	African American	Students define peace, justice and brotherhood	Sing: Woke Up This Morning On Our Way to Freedom Land	MM3 pp.292-293 History CD 7:20, 7:21

Date	Schoolwide Theme	Objective(s)	Activities	Materials
2/22	African American History	Students explore the meanings History and roots of the African American Gospel Tradition	Sing: Git on Board Go Tell It On the Mountain	MM3 p.217,157 274 CD 8:1, 8:2
2/24	African American History	Students explore the origins of Jazz in New Orleans Perform a New Orleans Second Line	Sing: It Don't Mean a Thing If it Ain't Got That Swing Pizza Pizza Daddy-O Perform: Kidd Jordan's Second Line	MM3 p. 246 MM2 p. 303 M2 p. 93 MM2 CD 9:43
3/1	Post Test- Formal Assessment: SESATand TDT 14 week Sound Symbol Alphabet and Timbre Discrimination Post Tests for the first 20 students. The Other 20 Review TETand African American History Songs.			
3/3	Formal Assessment14 week Sound Symbol Alphabet and Timbre Discrimination Post Tests for the remaining 20 students. Those already tested review TETand African American History Songs			
3/8-3/26	Delay time. No Instruction			
3/29-	Delayed Post Test: SESATand TDT 18 week Sound Symbol Alphabet and Timbre Discrimination Post Tests. All Students			
4/2	End of Study			

Treatment Group V
Traditional Timbre Discrimination
Lesson Plans 1998

Lesson #1 The Voice Date(s): 11/9/98

Objectives

1. Students listen to, explore and identify different ways of using the voice
2. Students explore the concept of the voice as a personal musical instrument with its individual tone color or timbre
3. Students listen to, imitate and identify lighter and heavier vocal timbres
4. Students listen to and identify changed (adult) and unchanged (children's) voices

Activities:

1. Listen to my Voice: Children experiment with speaking, whispering, singing and calling voice. MM #1 pp. 14-15.
2. You'll Sing a Song: Children learn a song to explore different ways of using the voice SB #2 pp. 12-13
3. Children add lyrics to the song to explore ways of using the voice
4. Children work with partners to create explore different ways of using the voice. They present their findings to the class.
5. Student explore the concept of the voice as their own personal musical instrument with its own tone color or timbre.
6. Students read the poem "the Wind" and explore ways of producing vocal sounds suggested by the poetry.
7. Students are introduced to the concept of lighter and heavier vocal sounds through the recorded lesson: Bobby Mc Ferrin-Don't Worry be Happy. MM #5 pp 12-13.
8. Lift Every Voice and Sing: Children introduced to the concept of changed (adult) and unchanged (children's)voices. Children identify changed and unchanged voices in the song. MM #5 pp. 14-16

Materials/Resources: See Appendix E, musical excerpts, resource masters and other assessments

Key: SB=Silver Burdette Music MM=MacMillan Music TE=Teacher's Edition

Treatment Group V
Traditional Timbre Discrimination
Lesson Plans 1998

Lesson # 2 Percussion Instruments Date(s): 11/9/98; 11/16/98

Objectives:

1. Students review the concept of musical instrument sound and vocal sound having timbre or characteristic sound.
2. Students listen to and identify the following unpitched instrument timbres: (a) triangle, (b) woodblock, (c) cymbals, (d) and snare drum.
3. Students listen to and identify the following pitched instrument timbres: (a) glockenspiel, and (b) chimes.
4. Students discuss and identify differences between pitched and unpitched percussion instruments.
5. Students explore and identify three ways of producing sound on percussion instruments (striking, shaking and scraping).
6. Students discuss the materials used to construct percussion instruments and its impact on their individual timbres.

Activities:

1. Listen to the "Percussion Collage" students discuss and attempt to label the sounds heard. SB #1 pp. 52-53
2. Introduce class to unpitched classroom percussion instruments, discuss ways of producing sounds on each. MM #2 pp. 88-89
3. Students close their eyes and attempt to identify by sounds the instrument sound played.
4. Learn Song: A Sailor Went to Sea, Sea Sea. Use unpitched instruments to accompany percussive movements which accompany the song. MM #2 pp. 90-91.
5. Color and complete at home: pictures of triangle and drum. MM Music Resource Masters
6. Listen to: Recorded Lesson, "Identifying Families of Unpitched Instruments". Students categorize instruments by families. MM #2 pp. 89.
7. Introduce classroom glockenspiel and xylophone as pitched percussion instruments using nursery tune: Twinkle Twinkle Little Star.
8. Introduce pitched and unpitched Orchestral percussion instruments: Listen to Battery by Linda Williams. SB #6 pp. 56-58 (cymbals, chimes, and snare drum). Have band students perform a live demonstration of cymbals and snare drum. Listen to: Great Gate of Kiev, Mussorgsky for example of chimes.

Review: Review examples #1, 5,8 and 9 from Lesson One and #11, 12, 15, and 16 from Lesson Two
Materials/Resources: See Appendix E, for listings of musical excerpts, resource masters and other assessmen

Treatment Group V
Traditional Timbre Discrimination
Lesson Plans 1998

Lesson # 3 <u>Brass Instruments</u> Date(s): 11/16/98; 11/30/98; 1/4/99

<u>Objectives:</u>

1. Students review the concept of musical instrument sound and vocal sound having timbre or characteristic sound.
2. Students listen to, and identify brass instruments: Trombone, tuba and trumpet
3. Students discuss and explore how sound is produced on a brass instrument.
4. Students identify and discuss materials and structure of the instrument which help to produce its characteristic sounds

<u>Activities</u>

1. Begin with a review of the video Silver Burdette Music Magic: <u>Brass Instruments</u>
2. Discuss and demonstrate how sound is produced on the brass instruments
   a. Band students give the class a live presentation of how sound is produced on the trumpet and trombone.
3. Students each bring an empty paper towel or toilet paper roll from home. They experiment with sound production (lip buzzing) used for brass instruments.
4. "Sounds of Brass" MM #2 pp. 194-195. Recorded lesson: Each brass sound is heard and identified.
5. Song: Sing Frere Jacque MM #2 pp. 196-197. Listen to instrumental version: "Moving to Brass Instruments". Children listen to and identify (through movement) Brass sounds: Trombone, Tuba and Trumpet.
6. Identify and color resource masters MM #5 pp. 5:3 and Musical Instrument Masters for Brass Instruments.
7. Listen to " 76 Trombones" from the Music Man. Follow Listening Map and identify brass sounds when played. MM #2 pp. 343
8. Listen to and identify Brass sounds in the following examples: SB. #6 pp. 54-55 Aida, Grand March (trumpet), Pictures at an Exhibition, Bydlo (tuba), Tannhauser, Pilgrim's Chorus (trombone)

<u>Review:</u> Review examples #1, 5,8 and 9 from Lesson one ; #11, 12, 15, and 16 from lesson two; and 19, 21, and 23 from Lesson 3.

<u>Materials/Resources</u>: See Appendix E, for listings of musical excerpts, resource masters and other assessments.

Treatment Group V
Traditional Timbre Discrimination
Lesson Plans 1998

Lesson #4 Woodwind Instruments Date(s): 1/10/99; 1/18/99

Objectives:

1. Students review the concept of musical instrument sound and vocal sound having timbre or characteristic sound.
2. Students listen to, and identify woodwind instruments: flute, clarinet and bassoon
3. Students discuss and explore how sound is produced on a woodwind instrument.
4. Students identify and discuss materials and structure of the instrument which help to produce its characteristic sounds.

Activities:

1. Review Silver Burdette Music Magic: Woodwind Instruments
2. Band students perform live demonstrations of woodwind instruments
    a. Demonstrate and discuss how sound is produced.
    b. Discuss material and construction of the instrument which might impact the sound.
3. Listen to recorded examples of flute, clarinet and bassoon, SB #6 pp. 52-53
4. Listen to, identify and pantomime woodwind, brass and percussion sounds in "When the Saints go Marchin In". SB #1 pp. 26-27
5. Listen to and identify instruments in recorded lesson "Some Instruments We Will Hear". SB #1 pp. 30-31.

Review: Review examples #1, 5,8 and 9 from Lesson one ; #11, 12, 15, and 16 from lesson two; 19, 21, and 23 from lesson 3 and 30, 31, 31 from Lesson 4

Materials/Resources: See Appendix E, for listings of musical excerpts, resource masters and other assessments

Key: SB=Silver Burdette Music MM=MacMillan Music TE=Teacher's Edition

Treatment Group V
Traditional Timbre Discrimination
Lesson Plans 1998

Lesson # 5 Keyboard Instruments Date(s): 2/1/99; 2/8/99

Objectives:

1. Students review the concept of musical instrument sound and vocal sound having timbre or a characteristic sound.
2. Students listen to, and identify keyboard instruments: piano and pipe organ
3. Students discuss and explore how sound is produced on a keyboard instrument.
4. Students identify and discuss materials and structure of the instrument which help to produce its characteristic sounds.

Activities:
1. Listen to excerpts from the "World of Keyboards". Recorded Lesson, MM #5 pp. 94-96.
2. Listen to recorded examples of piano, MM #6 (pp. 109) and pipe organ, MM #6 (pp. 110). Discuss structural mechanisms.
3. Students take turns producing sounds on the school upright piano. Open the piano and allow them to set how the mechanism works which produces the sound
4. Learn song "Harmony", discuss various uses of the piano and pipe organ.
5. Color Music Instrument Masters: Piano and Pipe Organ.

Review: Review examples #1, 5,8 and 9 from Lesson one ; #11, 12, 15, and 16 from lesson two; 19, 21, and 23 from lesson 3 , # 30, 31, 31 from lesson 4 and 36, and 39 lesson 5

Materials/Resources: See Appendix E, for listings of musical excerpts, resource masters and other assessments

Key: SB=Silver Burdette Music MM=MacMillan Music TE=Teacher's Edition

Treatment Group V
Traditional Timbre Discrimination
Lesson Plans 1998

Lesson # 6 String Instruments Date(s): 2/15/99; 2/22/99

Objectives:

1. Students review the concept of musical instrument sound and vocal sound having timbre or characteristic sound.
2. Students listen to, and identify stringed instruments: Violin, string bass, harp.
3. Students discuss and explore ways o producing sound on a stringed instrument.
4. Students identify and discuss materials and structure of the instrument which help to produce its characteristic sounds.

Activities

1. Students view the Share the Music: Instrument Sounds. Identify and listen to string instruments.
2. Review " Some Instruments We Will Hear". Identify the sound of the violin SB #1 pp. 30-31.
3. Listen to Russian Slumber Song. Identify the accompaniment as sound of the violin
4. Listen to and sing Brahm's Lullaby. Pantomime bowing motions to the sound of the violin.
5. Older violin students demonstrate different ways of producing sounds on the violin (bowing and plucking).
6. Listen to recorded lesson "All About the Double Bass." Hear and identify pictures and the pizzicato sounds of the string bass. MM #3 pp. 212-215.
7. Listen to Recorded lesson " Milt Hinton" identify sound as slap/jazz bass MM# 3 pp. 214-215
8. Listen to and identify the sound of the harp MM #3 pp. 88-89
9. Sing Song "Oh Lord I Want Two Wings" with harp accompaniment. MM #3 pp. 88-89.

Review: Review examples #1, 5,8 and 9 from Lesson one ; #11, 12, 15, and 16 from lesson two; 19, 21, and 23 from lesson 3 , # 30, 31, 31 from lesson 4; 36, and 39 lesson 5; #42, 46, and 47.

Materials/Resources: See Appendix E, for listings of musical excerpts, resource masters and other assessments.

Treatment Objectives and Activities

Treatment Objectives/Activities
Classified by Skill

Same Different Objectives and Activities

Objective # 1: Students are introduced to the concept of same and different musical sounds.
Objective #2: Students identify specified pairs of musical instrument and vocal timbres as same or different
Objective #3: Students identify pairs of alphabet sounds covered in the regular classroom as same and different.

<u>Activities</u>

1. Visual Same/Different Preparatory Activities-Two students stand next to each other
   Equipment: Paper shapes, articles of clothing
   Number of players: Two students along with class participation
   Directions:
   a. Students identify the pair of students in front of them as same or different. Discuss what is meant by same, discuss what is meant by different.
   b. Students identify articles of clothing as same or different (pair of socks, pair of shoes=same; skirt and blouse, different)
   c. Paper shapes- Students sit in circles of 5. Each child is given a pair of shapes (circle/square) when the teacher says <u>"Same"</u> all students in the circle try to put down the same shape. The first circle to have matching shapes in the winner. When the teacher says different, the first circle to have non-matching shapes is the winner.
   d. <u>Transfer Variation</u>: Students substitute alphabet cutouts for geometric shapes. Teacher suggests that alphabets also have same and different shapes and sounds.

2. Special Instrument- Preparatory activities-Auditory Warm Up
   Equipment: Classroom Instruments
   Number of Players: Small or Large Group
   Directions: The players stand in a circle. Each are given a different classroom instrument. One child is selected to whisper the name of the instrument which will be the "special instrument". The players play their instruments 4 steady beats and pass them to the next player of the next set of four beats. They may chant "One two three four; Pass it on and get one more". This continues until the teacher says "Stop"!. The players freeze in place. The student who picked the special instrument reveals it to the group. The player who is holding the special instrument gets to choose the "Special Instrument" for the next round.

3. What Do You Hear?
   Equipment: None

Number of Players: One or two players along with the response of the entire class

Directions: Students close/hide eyes. One child is selected from the class stands behind the group. He/she makes a pair of vocal sounds (whispering/Shouting or whispering/whispering). Individual students take turns identifying the sounds heard as same or different. The student who guesses correctly gets to make the next pair of sounds.

a. Transfer Variation: Students take turns naming same and different familiar alphabets and their sounds.

4. What Do You Hear? #2

Equipment: None

Number of players: Two along with response of the entire class

Directions: Two children stand behind the group. Each makes a sound to form a pair of sounds. Individual students identify them as same and different. The student which guesses correctly gets to replace one of the student in the original pair.

a. Transfer Variation: Students use familiar alphabet sounds.

5. What do You Hear? #3

Equipment: None

Number of players: Two (May be used with entire classes divided into groups of two)

Directions: Lighter and Heavier- Students listen to pairs of recorded vocal sounds and identify them as light or heavy. Discuss the concept of light and heavy. Associate light and heavy with Male/female.

a. Each student is given a partner. Partners face each other. They take turns making light and heavy sounds. Partners demonstrate their sounds for the class.

6. Sound Matching- Use Sound Cylinder (Sound cylinders are two paper cups taped together. Each set of cylinders contains different sound materials-rice, beads, beans, rocks, sand/sale ect).

Number of Players: Individual

Equipment: Five pairs of Sound Cylinders

Directions: The student spreads out all the cylinders and then listens to each one individually until he/she finds the matching pairs. The number of cylinders may be varied according to the ability of the students

a. Variation # 1-Sound Matching Team

Number of Players: Small Group

Equipment: Sound Cylinders

Directions: Players are divided into two teams. Each player is given a sound cylinder. The teacher must carefully divide the cylinders so one cylinder from each pair is on each team. The two teams stand several feet apart. Player A from team one listens to his cylinder and them goes over to the other team and shakes each plays cylinder until he finds the one matching his own. He takes them to the teacher for a "check". If he is correct the teams receives a point. This activity should be demonstrated to the class with a small group first. Children are added to the team based on behavior. The team that accumulates the most points is the winner.

7. Which Sound Is Different?

Number of Players: Small group of Entire Class

Equipment: Classroom instruments

Directions: Teacher stands behind the students. She selects three instruments. Two are matching one is not. Each sound is given a number (1), (2), (3). Teacher plays the instruments students identify the different sound by calling out the numbers 1, 2 and three. If this is too difficult for the students, the teacher can begin the activity in front of the students and then progress to hiding in back of them to play the sounds.

a. Transfer Variation: The game is played using alphabet sounds.

8. Thumbs Up

Number of Players: Small Group or Entire Class

Equipment: Classroom Instruments

Directions: Standing behind the class, the teacher or a selected student plays a pair of classroom instrument sounds. The Class shows thumbs up if the sounds are the same, thumbs down if they are different. Select a new leader form the students who identify the sound correctly.

a. Variation #1: Procedure is the same. Students can raise their arms if the sound is the same and fold their arms if the sound is different.

b. Transfer Variation: Game is played using alphabet sounds. Similarities between telling the difference between letter and musical sounds are highlighted.

9. What Sounds Do You Hear?

Equipment: Cardboard shapes of circles squares and triangles.

Number of Students: Multiple Circles of Five-eight students each

Directions: Students are grouped into circles. Each student is given pairs of like and unlike cardboard shapes. When a like pair of instrument sound are played students with matching shapes hold up their matching pair. When unlike instrument sounds are played, students hold up their unlike pairs

a. Variation # 1: The Students sit in a circle. Each student in the circle is given a circle, square or triangle. When matching instrument sounds are heard, students with the same shape place their shapes together in the middle of the circle. When unlike sounds are played students with unlike shapes place their shapes in the middle of the circle.

b. Transfer Variation: Students play the game using alphabet shapes and recorded alphabet sounds.

10. Circle What You Hear

Equipment: Chalkboard or Piece of Paper

Number of Students: Entire Class

Directions: The Teacher draws pairs of like and unlike shapes on the board. She then plays a recording of like or unlike instrument sounds. One child goes to the board and circles like shapes if the sounds are the same, unlike shapes if the sounds are different.

a. Variation #1: The Students are each given a sheet with six example of like and unlike shapes. The teacher plays pairs of like and unlike sounds. The Students circle the like shapes if the sounds are the same and the different shapes if the sounds are different.

b. Transfer Variation: Teacher uses alphabet shapes and sounds.

Objectives and Activities
Classified by Skill

Visual Representation of a Sound Source

Objective # 1: Students introduced to the concept that all pictures have a name. The pictures studied represent sources of musical sound.
Objective # 2: Students identify pictures of musical instruments by name.
Objective # 3: Students identify pictures of alphabet by name. Students are taught to see the similarities between alphabets and musical instruments as visual representations of sound sources.

<u>Activities</u>

1. Picture Puzzle
Equipment: Instrument pictures that have been laminated and cut up into a simple jigsaw puzzle (no more than 4-8 pieces).
Number of Players: Individual students or pairs of students
Directions: Each player or set of partners assembles a picture from and instrument puzzle. Students name their puzzle upon completion.
a. Transfer Variation: Use alphabet puzzles

2. See and Jump
Equipment: Instrument Picture Cards, Instrument Word Cards
Number of Players: Large Group
Directions: The picture cards are arranged in a large circle in the floor. Players and the teacher stand outside the circle. "It" stands in the center. The teacher selects a card from the deck. The teacher says the name of the instrument. "It jumps from the center to a picture of the instrument indicated. Children decide if it is correct. The child who is "It" selects another child to take his/her place. The game begins again.
a. Transfer Variation: Play the game using alphabet pictures.

3. What Instrument is This??
Equipment: None
Number of Players: Entire Class
Directions: The child who is "It", stands in front of the class and pretends to play a musical instrument. He calls on students who take turns guessing what the instrument is. The student who guesses correctly becomes "It".

4. Spin-An-Instrument
Equipment: Spin an Instrument Chart
Number of Players: Small or Large Group
Directions: The "Spinner" has the job of spinning the dial on the chart. The

"Player(s) names the instrument indicated. If the player name the instrument correctly then he/she becomes the spinner. If the player answers incorrectly, the spinner continues with a new player.

a. Transfer Variation: Use alphabet pictures.

5. Draw an Instrument

Equipment: Pencil and Paper

Number of Players: Large Group

Directions: The players are divided into four teams with captains selected for each team. Each players task is to draw the musical instrument of his/her choice. He/she should identify the instrument to no one. At the end of the allotted time the Captains collect the papers from their respective teams. The captains display the drawings one at a time to their team. The team receives one point for each correct identification. The team with the highest score is the winner.

a. Transfer Variation: Students draw the alphabet of their choice.

6. Classified Ads

Equipment: Prepared game sheet with pictures of Instruments

Number of Players: Individual

Directions: Each player has a prepared game sheet. His/her job is to guess what instrument is being described.

Example: Lost. Musical Instrument: Wooden, with four strings and a bow.
Answer: Violin

a. Transfer Variation: Students use game sheets with alphabets

7. Picture-Picture Match

Equipment: Prepared game sheet with four-six instrument pictures in one column and four to six instrument pictures in the other

Number of Players: Individual, Small or Large Group

Directions: The student matches a picture in one column with its matching picture in the opposite column by drawing a line between the two.

a. Transfer Variation: Students use alphabet pictures.

8. Instrument Bingo

Equipment: Playing Pieces/Markers: Beans, plastic discs, piece of paper Instrument Bingo Card.

Number of players: Large or small group

Directions: Instrument are listed five in a row under the letter MUSIC. For young children, play under one letter at a time. Teacher calls out the name of the instrument. If the child has it he/she covers the picture with a marker, the first student(s) to over five in a row is the winner

a. Transfer Variation: Students use alphabet pictures.

9. Instrument Tic Tac Toe

Equipment: Nine Instrument Cards, Five yellow X's Five red O's

Number of Players: Small or Large Group

Directions: Each team chooses either X's or O's. Instrument cards are placed on the floor in three rows with three card in a row. The players are divided into two teams. The first player chooses an instrument card and names it. If he names it correctly he/she gets to cover it with an X or O which represents his team. The play passes to a member of the opposite team who selects a card and identifies the instrument and if correct covers it with the color which represents his/her team. The first team to cover three in a row (vertically, horizontally, or diagonally), is the winner of the game.

a. Transfer Variation: Use alphabet cards.

10. Instrument Bee

Equipment: Instrument Cards

Number of Players: Small or Large Group

Directions: This game is patterned after an old fashioned "Spelling Bee". Players stand in a line. The teacher shows in each player in turn a picture of an instrument. If the player correctly names the instrument, he/she remains standing. If the student misses he/she must be seated. The student who remains standing the longest is the winner.

a. Transfer Variation: Teacher uses alphabet and instrument pictures.

Objectives and Activities
Classified by Skill

Sound Symbol Association

Objective # 1: Students are introduced to the concept that every musical sound has a corresponding picture.
Objective # 2: Students match instrument sounds with their appropriate picture.
Objective # 3: Student are introduced to the concept that musical sounds and alphabet sounds both have corresponding pictures.
Objective # 4: Students match alphabet sounds with their appropriate pictures.

Activities:

1. Which Instrument is this??
Number of Players: Large Group
Equipment: Classroom Instruments
Directions: Four familiar percussion instruments are hidden behind a screen or the piano. "It" goes behind the piano or screen plays one instrument. The child who correctly identifies the instrument earns the privilege of being "It". This game may be varied by having band students play while the class has its back turned.
a. Transfer Variation: Use alphabet pictures and sounds

2. Blindfold Panel
Number of Players: Large Groups
Equipment: Classroom Instruments
Directions: Three student are chosen to be the blindfolded panel. Another child is chosen to select and play a classroom instrument. The Panel is asked to tell the class the name of the instrument. The panel then gets to select three more children as the next panel.
a. Transfer Variation: Students use alphabet sounds.

3. What Instrument Do You Hear??
Number of Players: Large Group
Equipment: Tape/CD Players and Recordings of Selected Instruments
Directions: The class is divided into two teams. Each player is asked to hear and identify the instrument on the recording. Each correct response earns a point for their team. The team with the highest score wins.
a. Transfer Variation: Students use recorded alphabet sounds.

4. Instrument Bingo
Number of Players: Large or Small Group
Equipment: Markers(see description in Visual representation section), Instrument Bingo Cards.

Directions: Each of the 5 columns are numbered MUSIC. There are 3-5 Instrument pictures under each letter. Beginning players use one column at a time, then progress to more columns until they can successfully play all five. The teachers plays a recording of each instrument before she calls its name. The students cover the instrument if it is present on their card. The first player to fill the rows in any direction makes a winner. After students are familiar with instrument sounds and names they can take turns leading the game.

a. Transfer Variation: Use alphabet pictures and their matching sounds.

5. Going to New York

Number of Players: Small or Large Groups

Equipment: Instrument Charts

Directions: The first player says "I'm going to New York and I'm going to take a violin. He selects one student to point to the violin on the instrument chart. That student says what the first player has said and adds a new instrument. He/she in turn picks a new student to point to the two pictures of the instrument named and then the game continues. If someone misses, the game must start over. The player who names the most instruments in the winner

a. Transfer variation: Use alphabet pictures and sounds.

Daily Logs

Treatment Schedule : Daily Log 2/8-2/12

Day/Group Time Distribution	Group 1 (8:20-9:05) M,W Time Distribution	Group 2 (8:20-9:05) T, Th Time Distribution	Group 3 (9:05-9:50) M (8:20-9:05) F Time Distribution	Group 4 (9:05-9:50) T, Th Time Distribution	Group 5 (9:05-9:50) W, F Time Distribution
Monday 2/8	8:22-8:27 Intro: 8:28-9:00 **Class. Music 9:00-9:05 Closure **N. M.*		9:07-9:12 Intro: 9:13-9:33 Treatm. Activ: 9:34-9:45 Song: 9:45-9:50 Closure *J. L.*		
Tuesday 2/9		8:23-8:29 Intro: 8:30-9:00 Class. Music 9:00-9:05 Closure *L. N.*		9:08-9:12 Intro: 9:13-9:30 Treatm. Activ: 9:32-9:39 Transf Activity 9:40-9:46 Song: 9:47-9:50 Closure *K.N.*	
Wednesday 2/10	8:23-8:26 Intro: 8:27-9:00 Class. Music 9:00-9:05 Closure *N. M.*				9:06-9:10 Intro: 9:10-9:35 Treatm. Activ: 9:36-9:45 Song: 9:45-9:50 Closure *T. N.*
Thursday 2/11		8:22-8:28 Intro: 8:30-9:00 Class. Music 9:00-9:05 Closure *L. N.*		9:07-9:13 Intro: 9:14-9:32 Treatm. Activ: 9:32-9:40 Transf Activity 9:41-9:47 Song: 9:47-9:50 Closure *K. N.*	
Friday 2/12			8:22-8:27 Intro: 8:28-8:50 Treatm. Activ: 8:51-9:00 Song: 9:00-9:05 Closure J. L		9:07-9:12 Intro: 9:13-9:35 Treatm. Activ: 9:35-9:45 Song: 9:45-9:50 Closure *T. N.*

Treatment Schedule: Daily Log 11/16-11/20

Day/Group Time Distribution	Group 1 (8:20-9:05) M,W Time Distribution	Group 2 (8:20-9:05) T, Th Time Distribution	Group 3 (9:05-9:50) M (8:20-9:05) F Time Distribution	Group 4 (9:05-9:50) T, Th Time Distribution	Group 5 (9:05-9:50) W, F Time Distribution
Monday 11/16	8:22-8:27 Intro: 8:28-8:40 Treatm. Activ: 8:41-9:00 Song: 9:00-9:05 Closure *N. M.*		9:07-9:10 Intro: 9:10-9:33 Treatm. Activ: 9:34-9:45 Song: 9:45-9:50 Closure *J. L.*		
Tuesday 11/17		8:23-8:28 Intro: 8:29-8:50 Treatm. Activ: 8:51-9:00 Song: 9:00-9:05 Closure *L. N.*		9:08-9:13 Intro: 9:14-9:28 Treatm. Activ: 9:29-9:37 Transf Activity 9:38-9:45 Song: 9:45-9:50 Closure *K.N.*	
Wednesday 11/18	8:23-8:26 Intro: 8:27-8:45 Treatm. Activ: 8:47-9:00 Song: 9:00-9:05 Closure *N. M.*				9:05-9:10 Intro: 9:10-9:33 Treatm. Activ: 9:35-9:45 Song: 9:45-9:50 Closure *T. N.*
Thursday 11/19		8:21-8:25 Intro: 8:26-8:48 Treatm. Activ: 8:49-9:00 Song: 9:00-9:05 Closure *L. N.*		9:07-9:12 Intro: 9:13-9:29 Treatm. Activ: 9:30-9:38 Transf Activity 9:39-9:46 Song: 9:47-9:50 Closure	
Friday 11/20			8:22-8:27 Intro: 8:28-8:49 Treatm. Activ: 8:50-9:00 Song: 9:00-9:05 Closure		9:08-9:12 Intro: 9:13-9:34 Treatm. Activ: 9:35-9:46 Song: 9:47-9:50 Closure

The Reading Readiness Curriculum

Reading Readiness Curriculum

The purpose of reading instruction as stated in the Louisiana State Standards for Reading Education 1997, is to provide students with a foundation for developing competent literacy skills. The state standards form the basis for district and local school curriculums throughout the state. The state standards are further delineated by benchmarks. Benchmarks may be defined as measurable student behaviors which serve as indicators of student progress toward the achievement of a standard. Benchmarks may further be described as a summary of typical learning behaviors exhibited at certain stages in the students school development. The new curriculum is still in its planning stages, however the proposal is to measure the achievement of these bench marks through standardized tests at the 4th, 8th, and 12th grade levels (Louisiana State Content Standards for Language Arts, 1997).

Adherence to the state standards is not mandated in many local school districts. Administrators are directed to design curriculums based on the needs of their student population, therefore there is no standardization of instruction at the district or individual school level. The parish in which the study was conducted does however, use the state standard as guidelines for instructional development. Outlined below are the state standards of instruction. Because there are a lengthy set of benchmarks for each standard, they have been included at the end of this section. The standards for Language Arts instruction are as follows: (a) Students read comprehend and respond to a range of materials using a variety of strategies for different purposes; (b) Students write competently for a variety of purposes and audiences; (c) Students communicate using standard English, grammar, usage, sentence structure, pronunciation, capitalization, spelling and handwriting; (d) students demonstrate competence in speaking and listening tools for learning and communicating; (e) students locate select and synthesize information from a variety of texts, media references and technological sources to acquire and communicate knowledge; (f) students read analyze and respond to literature as a record of life experiences; (g) students apply reasoning and problem solving skills to their reading, writing , speaking, listening and visually representing.

Based on information acquired by this researcher in the developmental reading literature review, the standards seem to address the following skills areas: (a) Standard 1-decoding skills and comprehension skills; (b) Standards 2 and 3-writing skills; (c) Standard 4-aural(listening) and oral(verbal) communication skills; (d) Standard 5-memory and study skills; (e) Standards 6 and 7-synthesis and analysis skills (Fry, 1977).

The purpose of this study is to explore the possible relationship of timbre discriminations skills to the pre- reading skills of phoneme/alphabet discrimination. In order to accurately measure this relationship it was necessary for the researcher to determine exactly what skills were being taught at the research sites, Because there is no standardization of pre- reading instruction at the district or school site levels, the researcher elected to conduct informal observations in the Fall of 1997, to ascertain the component's of each school's instructional plan in reading preparation. For 18 weeks once or twice a week the researcher sat in on reading instruction in the pre-kindergarten, and kindergarten classrooms. What was found was a great diversity in teaching techniques but not much variation in what skills and information were being taught. The following skills were consistently emphasized throughout pre- reading instruction. The following skills were consistently a part of instruction: (a) Decoding skills/phonics-the students at both schools spent 35-45 minutes a day practicing letter recognition and their corresponding phoneme sounds; (b) Decoding/structural analysis- toward the end of the first semester, students spent as much as 15-20 minutes of their reading time learning to use letter sounds to decode two and three letter words; (c) Comprehension and Literature Appreciation-In classes observed at both schools the teacher spent at least two thirty minute periods reading books and stories to the students. These books represented different literature styles and cultures. The reading was consistently interrupted with teacher questions about the meaning/content of the story being read. Thirty additional minutes once a week was spent listening to additional stories during library time. (d) Oral and Written Language skills- Each class had at least 30 minutes in the mornings set aside to develop oral language skills. Often the time was used for morning exercises in which children participated in the morning announcements by reciting various pledges, poetry and meditations. In some classes teachers took time to talk about the meanings of words they perceived the child not to understand. Usually the morning exercises were followed by circle time, in which the children were allowed to express themselves about a given topic of the day. Children were encouraged to speak in complete sentences and were consistently corrected when non-standard English was used. Teachers reported that several classes had 15 minutes of circle time to close the day as well There was an inconsistent amount of time spent on writing skills. Some teachers spent 30-40 minutes a day teaching the children to trace, write and color shapes and letters, while others reported spending little time at all due to the large numbers of children in the class. (e) Study skills- in several kindergarten and in all of the first grade classes children were given worksheet to complete at home. Most of the sheets were designed to reinforce the skills learned during the school day. (f) Vocabulary- Teachers spent a varied amount of time on formal vocabulary instruction. Most of the time it took the form of defining unfamiliar words in a story or poem.

Based on these observations, this researcher concluded that the actual time spent on developing phonetic/alphabet discrimination skills was approximately 1-one and one half hr. per day. In informal discussions with classroom teachers all agreed on the importance of phonics as a decoding tool in reading, however they also suggested based on their many experiences in working with children that phonetic skills must be used in conjunction with the other language arts skills to insure reading achievement. Their observations are supported by research findings of Chall (1988) who suggests that phonics must be used in conjunction with context clues and other decoding skill to significantly impact reading achievement.

Conclusions

1. Based on observations by the researcher during the 1997 - 1998 school year, phonetic instruction is a significant part of the instructional day.

2. Although identified by the classroom teachers observed as an important factor in reading success, phonetic skills must be developed concurrently with a host of other auditory, visual, oral and kinesthetic skills to insure reading achievement.

The General Music Curriculum

The General Music Curriculum

The music curriculum for the school district in which the study took place is currently being developed. It is based on the initial draft of the Louisiana State Arts Curriculum Draft for Music Instruction (1997). The state curriculum is based on the four fundamental concepts of Discipline based arts education (Eisner, 1988): (a) Creative Expression; (b) Historical and Cultural Perspective; (c) Aesthetic Perception; and (d) Critical Analysis. each component is defined by a standard of achievement and further defined by benchmarks or broad behavioral objectives designed to define competency at the fourth, eighth and twelfth grade levels. The benchmarks may be found at the end of this section. Each school district and school site is responsible for designing a curriculum with specific goals and objective designed to fit the needs of their student population. The state standards for music instruction are stated as follows: (a) Creative Expression- the student will demonstrate the ability to interpret ideas throughout the application of knowledge, ideas,, skills and organizational abilities to the production and expression of art forms; (b) Historical and Cultural Perspective- the student will demonstrate understanding of historical and cultural perspective by recognizing the arts throughout history as a cultural expression and record of human experience with a past, present and future; (c) Aesthetic Perception- students will demonstrate the ability to understand and interpret expressive ideas, experiences, and the beauty of the environment. They will make informed judgments about the meaning in works of art; (d) Critical Analysis- the student will be able to interpret, analyze and make informed judgments about meaning in the arts based on appropriate criteria such as quality, impact, purpose and value (Louisiana State Arts Curriculum Draft for Music Instruction, 1997).

The district curriculum is also under development and will be piloted during the 1998-1999 school year. Curriculum writers have elected to base their specific behavioral objectives on the National Standards for Music Education published by Music Educators

National Conference, 1996. The local document is not yet complete so a detailed description is not yet available. A summary of the national standards used are as follows: Each student in the district public schools will participate in experiences which include: (a) singing alone and with others a variety of music; (b) Performing on instruments alone and with others a variety of music; (c) improvisation of melodies and accompaniments; (d) composing and arranging music within specific guidelines; (e) reading and notation music; (f) listening to analyzing and describing music; (g) evaluating music and music performances; (h) understanding the relationship between music and other arts and disciplines; and (i) understanding music in relation to history and culture (Correlation of the Music Connection to the National Standards for Music Education, Silver Burdette, Ginn, 1997).

When analyzed by the curriculum committee, the MENC standards coincide with the state standards as follows: (a) MENC standards (a, b, c, and d) coincide with DBAE standard of Creative Expression; (b) MENC standard (g) falls under Aesthetic perception; (c) MENC standard (h) correlates with Historical and Cultural Perspective; and (d) MENC standards (e and f) falls under Critical Analysis. There is considerable overlap between categories.

Based on the skills outlined above a typical classroom music lesson would include experiences in singing, playing instruments, music literacy instruction, listening and analysis experiences and performance experience with music of various cultures and background. There would also be a correlation of music with other subject area. The classes designed for the study are based on these standards. Details of instruction are outlined in the unit lesson plans which follow this section.

The State Standards

LOUISIANA
ARTS
CONTENT STANDARDS

DRAFT

04/18/97

INTRODUCTION

The arts, dance, theatre arts, visual arts, and music are fundamental to the intellectual, social, emotional, and physical development of Louisiana students for the 21st century. The arts draw on a range of intelligence and learning styles not addressed in most educational environments.

Students of the arts are encouraged to use their imaginations, to develop personal discipline, and to find multiple solutions to problems. They learn to respond to events and experiences with confidence and to communicate their feelings and viewpoints through appropriate creative outlets.

Business demands workers who possess an ability to communicate, to be flexible, and to diagnose problems and find creative solutions. The arts preceded speech as man's first language; they assist in the development of the skills of communication and the integration of basic skills of reading, writing, science, and mathematics. These skills help students shape their lives, their communities, and their nation. The arts make all subjects come alive.

The Louisiana Content Standards bring together the basic content of the four disciplines of dance, theatre arts, visual arts, and music into one common set of standards essential for a comprehensive arts education. The 21st century, the age of information, will require more from the next generation of students. The relevance of education in a rapidly changing society will depend on converging the aims of education and the workforce for well-rounded, educated students who will be productive members of society. The arts will assist in the achievement of these aims with the implementation of these rigorous and challenging content standards.

LOUISIANA ARTS CONTENT STANDARDS

CREATIVE EXPRESSION

Students develop creative expression through the application of knowledge, ideas, skills, and organizational abilities.

AESTHETIC PERCEPTION

Students develop aesthetic perception through the knowledge of art forms and respect for commonalities and differences.

HISTORICAL AND CULTURAL PERCEPTION

Students develop historical and cultural perception by recognizing and understanding that the arts throughout history are a record of human experience with a past, present, and future.

CRITICAL ANALYSIS

Students make informed judgments about the arts by developing critical analysis skills through study of and exposure to the arts.

COMPONENTS OF ARTS EDUCATION

The Content Standards writing team, consisting of arts educators from across the state and representing the four disciplines, has written standards based on the four fundamental components of Discipline-Based Art Education (DBAE)

CREATIVE EXPRESSION

The ability to develop, organize, and interpret ideas for expression in the production of art forms which involve inspiration, analysis, and problem solving.

AESTHETIC PERCEPTION

The ability to understand and respond to ideas and experiences: to be aware of beauty and the unique characteristics of the natural and built environments; and to make informed judgments about the meaning in works of art.

HISTORICAL AND CULTURAL PERCEPTION

The ability to recognize and appreciate the visual arts as a form of individual and cultural expression and to appreciate the basic aspects of past history and human experience.

CRITICAL ANALYSIS

The ability to interpret and analyze works of art and to arrive at reasoned judgments based on sufficient and appropriate criteria, such as quality, impact, purpose, and value.

SECTION 4: MUSIC

CREATIVE EXPRESSION

What students know and are able to do includes:

GRADE CLUSTER	K-4	5-8	9-12
Benchmark 1	listening to, recognizing, and imitating elementary tones and rhythmic patterns for voice, musical instruments, and other sound sources; (1, 4)	listening to and identifying melodic and rhythmic patterns for voice and musical instruments, individually and in groups; (1, 4)	creating and improvising advanced musical forms individually and in groups, utilizing the voice and/or musical instruments; (1, 2, 4)
Benchmark 2	identifying elementary notational symbols and vocabulary that convey precise musical meaning; (2, 4)	interpreting elementary symbols and vocabulary that convey precise musical meaning; (2, 3, 4)	applying with greater technical accuracy notational symbols and vocabulary that convey precise musical meaning; (2, 3, 4)
Benchmark 3	performing and composing elementary musical ideas; (1, 2, 3)	performing and composing written music; (1, 2, 3)	performing and composing more complex compositions; (1, 2, 3)
Benchmark 4	exploring elementary elements of music utilizing available mediums, such as voice, musical instrument, and/or electronic technology; (3)	identifying and demonstrating elements of music, utilizing available mediums, such as voice, musical instrument, and/or electronic technology; (1, 4)	interpreting and applying the elements of music through utilizing preferred medium of choice; (1, 4, 5)
Benchmark 5	participating in organized activities including singing, playing, and movement; (1, 5)	performing in organized activities including singing, playing, and movement; (1, 5)	performing in organized activities using a performance medium; (1, 5)
Benchmark 6	identifying and responding to elements of music through listening activities; (1)	exploring the elements of music through listening to a variety of musical examples; (1, 4)	analyzing the elements of music through listening to a variety of musical examples; (2, 4)
Benchmark 7	understanding relationships among music, other arts, and disciplines outside the arts. (2, 3, 4)	investigating relationships among music, other arts, and disciplines outside the arts. (2, 3, 4)	identifying commonalities and differences between music and other content disciplines. (2, 3, 4)

SECTION 4: MUSIC

AESTHETIC PERCEPTION

What students know and are able to do include:

GRADE CLUSTER	K-4	5-8	9-12
Benchmark 1	using elementary vocabulary of music to critique individual work and that of others; (1, 2, 4)	using music elements and principles for responding to the aesthetic qualities of musical compositions; (1, 2, 3, 4)	using an expanded vocabulary when responding to the expressive qualities of music; (1, 4)
Benchmark 2	developing and communicating an awareness of the ideas and creations of others through the study of music; (1, 5)	recognizing that the concept of beauty differs from culture to culture; (4, 5)	analyzing the unique characteristics of music used for different purposes in various cultures; (2, 4, 5)
Benchmark 3	discussing how music is used in daily life, in the workplace, and within the community; (1, 4, 5)	identifying and exploring the meaning of music and the roles of musicians in their cultures and environments; (3, 4, 5)	expressing the impact of music on our senses, intellects, and emotions; (1, 4, 5)
Benchmark 4	communicating an awareness of the many choices available in the creative process of music; (1, 3, 4)	communicating new ideas, possibilities, options, and situations pertaining to the music world; (1, 3, 4)	assimilating and communicating the multiple possibilities and options available for artistic expression in music; (1, 3, 4)
Benchmark 5	recognizing musical elements in compositions. (2, 4)	reflecting and distinguishing differences heard in melody, rhythm, timbre, and form. (2, 4)	questioning, weighing evidence and information, examining intuitive reactions, and drawing personal conclusions about music. (2, 4)

SECTION 4: MUSIC

HISTORICAL AND CULTURAL PERCEPTION

What students know and are able to do includes:

GRADE CLUSTER	K-4	5-8	9-12
Benchmark 1	identifying musical styles representative of various cultures; (4)	understanding characteristics of musical styles representative of various historical periods and cultures; (2, 4)	demonstrating knowledge of musical styles that represent various historical periods and cultures; (1, 3)
Benchmark 2	exploring and discussing music designed for various purposes within historical and cultural contexts; (1, 3, 4)	distinguishing the differences in music designed for various purposes in different historical and cultural contexts; (2, 4)	analyzing the role of music as it relates to the needs of society; (2, 5)
Benchmark 3	recognizing instruments used by musicians in various cultures. (2)	understanding the role of musicians in various cultures. (3, 4)	analyzing various roles of musicians and identifying representative individuals who have functioned in these roles. (2, 4)

SECTION 4: MUSIC

CRITICAL ANALYSIS

What students know and are able to do includes:

GRADE CLUSTER	K-4	5-8	9-12
Benchmark 1	participating in musical experiences with an awareness of simple musical elements, forms, and styles; (1, 5)	demonstrating and discussing behavior appropriate for the context and style of music performed, both as audience and performer; (1, 4)	making judgments about musical experiences and applying the appropriate vocabulary to describe that experience; (1, 2, 4, 5)
Benchmark 2	demonstrating behavior appropriate for the content and style of music performed, both as audience and performer; (1, 4, 5)	describing musical experiences using basic elements, forms, and styles; (1, 4, 5)	experiencing and evaluating behavior appropriate for the context and style of music performed, both as audience and performer; (1, 2, 4, 5)
Benchmark 3	exploring music as a part of celebrations, ceremonies, and many other special occasions; (3, 4)	recognizing and identifying music as to function, purpose, and appropriateness in relation to celebrations, ceremonies, and other events; (3, 4, 5)	analyzing appropriate choices of music according to function; (3, 4, 5)
Benchmark 4	exploring music as a universal art derived from diverse backgrounds. (3, 4, 5)	recognizing historical or cultural characteristics that determine the source of a musical style. (2, 3, 4)	defending choices for musical selections. (1, 5)

LOUISIANA ENGLISH LANGUAGE ARTS CONTENT STANDARDS CHARTS

STANDARD ONE

Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-1-E5 reading, comprehending, and responding to written, spoken, and visual texts in extended passages; (1, 3, 4)	**ELA-1-M3** reading, comprehending, and responding to written, spoken, and visual texts in extended passages; (1, 3, 4)	**ELA-1-H3** reading, critiquing, and responding to extended, complex written, spoken, and visual texts; (1, 2, 3, 4)
ELA-1-E6 interpreting texts to generate connections to real-life situations; (1, 2, 4)	**ELA-1-M4** interpreting texts with supportive explanations to generate connections to real-life situations and other texts (e.g., business, technical, scientific); (1, 2, 4, 5)	**ELA-1-H4** interpreting complex texts with supported explanations to generate connections to real-life situations and other texts (e.g., business, technical, scientific); (1, 2, 4, 5)
ELA-1-E7 reading with fluency for various purposes (e.g., enjoying, learning, problem solving). (1, 2, 4)	**ELA-1-M5** using purposes for reading (e.g., enjoying, learning, researching, problem solving) to achieve a variety of objectives. (1, 2, 4, 5)	**ELA-1-H5** using various purposes for reading (e.g., enjoying, learning, researching, problem solving) to complete complex projects. (1, 2, 4)

STANDARD ONE

Students read, comprehend, and respond to a range of materials, using a variety of strategies for different purposes.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-1-E1 gaining meaning from print using a full range of strategies (e.g., self-monitoring and correcting, searching, cross checking) evidenced by reading behaviors while using the cuing systems (e.g., phonics, sentence structure, meaning) (1, 4)	**ELA-1-M1** using knowledge of word meaning and developing basic and technical vocabulary using various strategies (e.g., context clues, affixes, etymology, dictionary); (1, 4)	**ELA-1-H1** using knowledge of word meaning and extending basic and technical vocabulary, employing a variety of strategies (e.g., context clues, affixes, etymology, dictionary, thesaurus); (1, 4)
ELA-1-E2 using the conventions of print (e.g., left-to-right directionality, top-to-bottom, one-to-one matching); (1, 4)		
ELA-1-E3 adjusting speed of reading to suit the difficulty of materials and the purpose for reading; (1, 4)		
ELA-1-E4 identifying story elements (e.g., setting, plot, character, theme) and literary devices (e.g., figurative language, dialogue) within a selection; (1, 4)	**ELA-1-M2** analyzing literary devices (e.g., figurative language, flashback, foreshadowing, dialogue) and story elements (e.g., setting, plot, character, theme, mood) within a selection; (1, 4)	**ELA-1-H2** analyzing the effects of complex literary devices (e.g., figurative language, flashback, foreshadowing, dialogue, irony) and complex elements (e.g., setting, plot, character, theme, mood, style) on a selection; (1, 2, 4)

STANDARD TWO

Students write competently for a variety of purposes and audiences.

What students know and are able to do includes:

K-4	5-8	9-12
<u>ELA-2-E1</u> dictating or writing a composition that clearly states or implies a central idea with supporting details in logical, sequential order; (1, 4)	<u>ELA-2-M1</u> writing a composition that clearly implies a central idea with supporting details in a logical, sequential order; (1, 4)	<u>ELA-2-H1</u> writing a composition of increasing complexity that clearly implies a central idea with supporting details in a logical, sequential order; (1, 4)
<u>ELA-2-E2</u> focusing on language, concepts, and ideas that show an awareness of the intended audience and/or purpose (e.g., classroom, real-life, workplace) in developing compositions; (1, 2, 4)	<u>ELA-2-M2</u> using language, concepts, and ideas that show an awareness of the intended audience and/or purpose (e.g., classroom, real-life, workplace) in developing complex compositions; (1, 2, 4)	<u>ELA-2-H2</u> using language, concepts, and ideas that show an awareness of the intended audience and/or purpose (e.g., classroom, real-life, workplace) in developing complex compositions; (1, 2, 4)

STANDARD TWO

Students write competently for a variety of purposes and audiences.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-2-E3 creating written text using the writing process; (1, 4)	ELA-2-M3 applying the steps of the writing process; (1, 4)	ELA-2-H3 applying the steps of the writing process, emphasizing revising and editing in final drafts; (1, 4)
ELA-2-E4 using narration, description, exposition, and persuasion to develop compositions (e.g., notes, stories, letters, poems, logs); (1, 4)	ELA-2-M4 using narration, description, exposition, and persuasion to develop various modes of writing (e.g., notes, stories, poems, letters, essays, logs); (1, 4)	ELA-2-H4 using narration, description, exposition, and persuasion to develop various modes of writing (e.g., notes, stories, poems, letters, essays, editorials, critical analyses, logs); (1, 4)
ELA-2-E5 recognizing and applying literary devices (e.g., figurative language); (1, 4)	ELA-2-M5 recognizing and applying literary devices (e.g., figurative language, symbolism, dialogue); (1, 4)	ELA-2-H5 recognizing and applying literary devices (e.g., figurative language, symbolism, dialogue) and various stylistic elements (e.g., diction, sentence structure, voice, tone); (1, 4)
ELA-2-E6 writing as a response to texts and life experiences (e.g., journals, letters, lists). (1, 2, 4)	ELA-2-M6 writing as a response to texts and life experiences (e.g., letters, journals, lists). (1, 2, 4)	ELA-2-H6 writing as a response to texts and life experiences (e.g., technical writing, resumes). (1, 2, 4, 5)

STANDARD THREE

Students communicate using standard English grammar, usage, sentence structure, punctuation, capitalization, spelling, and handwriting.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-3-E1 writing legibly; (1, 4)	ELA-3-M1 writing legibly; (1, 4)	ELA-3-H1 writing legibly; (1, 4)
ELA-3-E2 demonstrating use of punctuation (e.g., comma, apostrophe, period, question mark, exclamation mark), capitalization, and abbreviations in final drafts of writing assignments; (1, 4)	ELA-3-M2 demonstrating use of punctuation (e.g., comma, apostrophe, colon, semicolon, quotation marks, dashes, parentheses), capitalization, and abbreviations; (1, 4, 5)	ELA-3-H2 using the grammatical and mechanical conventions of standard English; (1, 4, 5)
ELA-3-E3 demonstrating standard English structure and usage; (1, 4)	ELA-3-M3 demonstrating standard English structure and usage; (1, 4)	
ELA-3-E4 using knowledge of the parts of speech to make choices for writing; (1, 4)	ELA-3-M4 demonstrating understanding of the parts of speech to make choices for writing; (1, 4)	
ELA-3-E5 spelling accurately using strategies (e.g., letter-sound correspondence, hearing and recording sounds in sequence, spelling patterns, pronunciation) and resources (e.g., glossary, dictionary) when necessary. (1, 4)	ELA-3-M5 spelling accurately using strategies and resources (e.g., glossary, dictionary, thesaurus, spell check) when necessary. (1, 3, 4)	ELA-3-H3 spelling accurately using strategies and resources (e.g., glossary, dictionary, thesaurus, spell check) when necessary. (1, 3, 4)

STANDARD FOUR

Students demonstrate competence in speaking and listening as tools for learning and communicating.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-4-E5 speaking and listening for a variety of audiences (e.g., classroom, real-life, workplace) and purposes (e.g., awareness, concentration, enjoyment, information, problem solving); (1, 2, 5)	ELA-4-M4 speaking and listening for a variety of audiences (e.g., classroom, real-life, workplace) and purposes (e.g., awareness, concentration, enjoyment, information, problem solving); (1, 2, 4, 5)	ELA-4-H4 speaking and listening for a variety of audiences (e.g., classroom, real-life, workplace) and purposes (e.g., awareness, concentration, enjoyment, information, problem solving); (1, 2, 4, 5)
ELA-4-E6 listening and responding to a wide variety of media (e.g., music, TV, film, speech); (1, 3, 4, 5)	ELA-4-M5 listening and responding to a wide variety of media (e.g., music, TV, film, speech); (1, 3, 4, 5)	ELA-4-H5 listening and responding to a wide variety of media (e.g., music, TV, film, speech, CD-ROM); (1, 3, 4)
ELA-4-E7 participating in a variety of roles in group discussions (e.g., active listener, contributor, discussion leader). (1, 4, 5)	ELA-4-M6 participating in a variety of roles in group discussion (e.g., active listener, contributor, discussion leader, facilitator, recorder). (1, 4, 5)	ELA-4-H6 participating in a variety of roles in group discussion (e.g., active listener, contributor, discussion leader, facilitator, recorder, mediator). (1, 4, 5)

STANDARD FOUR

Students demonstrate competence in speaking and listening as tools for learning and communicating.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-4-E1 speaking intelligibly, using standard English pronunciation; (1, 4)	ELA-4-M1 speaking intelligibly, using standard English pronunciation and diction; (1, 4)	ELA-4-H1 speaking intelligibly, using standard English pronunciation and diction; (1, 4)
ELA-4-E2 giving and following directions/procedures; (1, 4)	ELA-4-M2 giving and following directions/procedures; (1, 4)	ELA-4-H2 giving and following directions/procedures; (1, 4)
ELA-4-E3 telling or retelling stories in sequence; (1, 4)		
ELA-4-E4 giving rehearsed and unrehearsed presentations; (1, 4)	ELA-4-M3 using the features of speaking (e.g., audience analysis, message construction, delivery, interpretation of feedback) when giving rehearsed and unrehearsed presentations; (1, 2, 4)	ELA-4-H3 using the features of speaking (e.g., audience analysis, message construction, delivery, interpretation of feedback) when giving prepared and impromptu presentations; (1, 2, 4)

STANDARD FIVE

Students locate, select, and synthesize information from a variety of texts, media, reference, and technological sources to acquire and communicate knowledge.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-5-E1 recognizing and using organizational features of printed text, other media, and electronic information (e.g., parts of a text, alphabetizing, captions, legends, pull-down menus, key word searches, icons, passwords, entry menu features); (1, 3, 4)	ELA-5-M1 recognizing and using organizational features of printed text, other media, and electronic information (e.g., parts of a text, alphabetizing, captions, legends, microprint, laser discs, hypertext, CD-ROM, pull-down menus, keyword searches, icons, passwords, entry menu features); (1, 3, 4)	ELA-5-H1 recognizing and using organizational features of printed text, other media, and electronic information (e.g., parts of a text, citations, endnotes, bibliographic references, microprint, laser discs, hypertext, CD-ROM, keyword searches, bulletin boards, e-mail); (1, 3, 4)
ELA-5-E2 locating and evaluating information sources (e.g., print materials, databases, CD-ROM references, Internet information, electronic reference works, community and government data, television and radio resources, audio and visual materials); (1, 3, 4, 5)	ELA-5-M2 locating and evaluating information sources (e.g., print materials, databases, CD-ROM references, Internet information, electronic reference works, community and government data, television and radio resources, audio and visual materials); (1, 3, 4, 5)	ELA-5-H2 locating and evaluating information sources (e.g., print materials, databases, CD-ROM references, Internet information, electronic reference works, community and government data, television and radio resources, audio and visual materials); (1, 3, 4, 5)

STANDARD FIVE

Students locate, select, and synthesize information from a variety of texts, media, reference, and technological sources to acquire and communicate knowledge.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-5-E1 recognizing and using organizational features of printed text, other media, and electronic information (e.g., parts of a text, alphabetizing, captions, legends, pull-down menus, key word searches, icons, passwords, entry menu features); (1, 3, 4)	ELA-5-M1 recognizing and using organizational features of printed text, other media, and electronic information (e.g., parts of a text, alphabetizing, captions, legends, microprint, laser discs, hypertext, CD-ROM, pull-down menus, keyword searches, icons, passwords, entry menu features); (1, 3, 4)	ELA-5-H1 recognizing and using organizational features of printed text, other media, and electronic information (e.g., parts of a text, citations, endnotes, bibliographic references, microprint, laser discs, hypertext, CD-ROM, keyword searches, bulletin boards, e-mail); (1, 3, 4)
ELA-5-E2 locating and evaluating information sources (e.g., print materials, databases, CD-ROM references, Internet information, electronic reference works, community and government data, television and radio resources, audio and visual materials); (1, 3, 4, 5)	ELA-5-M2 locating and evaluating information sources (e.g., print materials, databases, CD-ROM references, Internet information, electronic reference works, community and government data, television and radio resources, audio and visual materials); (1, 3, 4, 5)	ELA-5-H2 locating and evaluating information sources (e.g., print materials, databases, CD-ROM references, Internet information, electronic reference works, community and government data, television and radio resources, audio and visual materials); (1, 3, 4, 5)

STANDARD FIVE

Students locate, select, and synthesize information from a variety of texts, media, references, and technological sources to acquire and communicate knowledge.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-5-E3 locating, gathering, and selecting information using graphic organizers, simple outlining, note taking, and summarizing to produce texts and graphics; (1, 3, 4)	ELA-5-M3 locating, gathering, and selecting information using graphic organizers, outlining, note taking, summarizing, interviewing, and surveying to produce documented texts and graphics; (1, 3, 4)	ELA-5-H3 accessing information and conducting research using graphic organizers, outlining, note taking, summarizing, interviewing, and surveying to produce documented texts and graphics; (1, 2, 3, 4)
ELA-5-E4 using available technology to produce, revise, and publish a variety of works; (1, 3, 4)	ELA-5-M4 using available technology to produce, revise, and publish a variety of works; (1, 3, 4)	ELA-5-H4 using available technology to produce, revise, and publish a variety of works; (1, 3, 4)
ELA-5-E5 giving credit for borrowed information by telling or listing sources; (1, 4)	ELA-5-M5 citing references using various formats (e.g., endnotes, bibliography); (1, 4)	ELA-5-H5 citing references using various formats (e.g., parenthetical citations, endnotes, bibliography); (1, 4)
ELA-5-E6 interpreting graphic organizers (e.g., charts/graphs, tables/schedules, diagrams/maps). (1, 2, 3, 4)	ELA-5-M6 interpreting graphic organizers (e.g., charts/graphs, tables/schedules, diagrams/maps, flowcharts). (1, 2, 3, 4, 5)	ELA-5-H6 interpreting graphic organizers (e.g., charts/graphs, tables/schedules, diagrams/maps, organizational charts/flowcharts. (1, 2, 3, 4, 5)

STANDARD SIX

Students read, analyze, and respond to literature as a record of life experiences.

What students know and are able to do includes:

K-4	5-8	9-12
<u>ELA-6-E1</u> identifying, recognizing, and responding to United States and world literature that represents the experiences and traditions of diverse ethnic groups; (1, 4, 5)	<u>ELA-6-M1</u> identifying, comparing, and responding to United States and world literature that represents the experiences and traditions of diverse ethnic groups; (1, 4, 5)	<u>ELA-6-H1</u> identifying, analyzing, and responding to United States and world literature that represents the experiences and traditions of diverse ethnic groups; (1, 2, 4, 5)
		<u>ELA-6-H2</u> analyzing distinctive elements (e.g., recurrent themes, historical significance, literary techniques) of ancient, American, British, and world literature; (1, 2, 4, 5)
<u>ELA-6-E2</u> identifying, recognizing, and responding to a variety of classic and contemporary literature from many genres (e.g., folktales, legends, myths, biography, autobiography, poetry, fiction, nonfiction); (1, 4, 5)	<u>ELA-6-M2</u> identifying, comparing, and responding to a variety of classic and contemporary literature from many genres (e.g., folktales, legends, myths, biography, autobiography, poetry, fiction, nonfiction, novels, drama); (1, 2, 4, 5)	<u>ELA-6-H3</u> identifying, analyzing, and responding to classic and contemporary literature from many genres (e.g., folktales, legends, myths, poetry, fiction, biography, autobiography, nonfiction, novels, drama, epic); (1, 2, 4, 5)
<u>ELA-6-E3</u> identifying key differences of various genres. (1, 2, 4, 5)	<u>ELA-6-M3</u> classifying various genres according to their unique characteristics. (1, 2, 4)	<u>ELA-6-H4</u> analyzing various genres as records of life experiences. (1, 3, 4, 5)

STANDARD SEVEN

Students apply reasoning and problem solving skills to their reading, writing, speaking, listening, viewing, and visually representing.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-7-E1 using comprehension strategies (e.g., sequencing, predicting, drawing conclusions, comparing and contrasting, making inferences, determining main ideas) in contexts; (1, 2, 4)	ELA-7-M1 using comprehension strategies (e.g., sequencing, predicting, drawing conclusions, comparing and contrasting, making inferences, determining main ideas, summarizing, recognizing literary devices, paraphrasing) in contexts; (1, 2, 4)	ELA-7-H1 using comprehension strategies (e.g., predicting, drawing conclusions, comparing and contrasting, making inferences, determining main ideas, summarizing, recognizing literary devices, paraphrasing) in contexts; (1, 2, 4)
ELA-7-E2 problem solving by using reasoning skills, life experiences, and available information; (1, 2, 4)	ELA-7-M2 problem solving by using reasoning skills, life experiences, accumulated knowledge, and related available information; (1, 2, 4)	ELA-7-H2 problem solving by analyzing, prioritizing, categorizing, and evaluating; incorporating life experiences; and using available information; (1, 2, 4, 5)
ELA-7-E3 recognizing an author's purpose and point of view; (1, 2, 4)	ELA-7-M3 analyzing the effects of an author's purpose and point of view; (1, 2, 4)	ELA-7-H3 analyzing the effects of an author's life, culture, and philosophical assumptions and an author's purpose and point of view; (1, 2, 4, 5)

STANDARD SEVEN

Students apply reasoning and problem solving skills to their reading, writing, speaking, listening, viewing, and visually representing.

What students know and are able to do includes:

K-4	5-8	9-12
ELA-7-E4 **distinguishing fact from opinion, skimming and scanning for facts, determining cause and effect, generating inquiry, and making connections to real-life situations. (1, 2, 4, 5)**	**ELA-7-M4** **distinguishing fact from opinion and probability, skimming and scanning for facts, determining cause and effect, inductive and deductive reasoning, generating inquiry, and making connections to real-life situations across texts. (1, 2, 4, 5)**	**ELA-7-H4** **distinguishing fact from opinion, skimming and scanning for facts, determining cause and effect, generating inquiry, and making connections to real-life situations across texts. (1, 2, 4, 5)**

APPENDIX C

TRAINING PROCEDURES FOR RESEARCH ASSISTANTS

Training Procedures for Research Assistants

Research Assistants received four 45-minute training sessions in testing procedures. Session One included: (a) a discussion of the propose and rationale of the study, (b) the significance of the tests to the study, and (c) the possible impact of the subject's developmental level and inexperience with testing situations on the actual administration of the test.

A discussion of appropriate behavior for test administrators included guidelines for their interactions with the subjects. They were instructed to (a) make the subject feel as comfortable as possible, (b) abort the test if the subject was uncooperative, crying or frightened, and (c) avoid coaching or rewarding the subject during the test.

Session Two included a review of the SESAT Directions for Administering the Test. A copy of the directions and the actual testing instrument may be obtained though Harcourt Brace Educational Measurements Inc. Testing administrators were directed to: (a) Read examples to the student exactly as printed in the booklet; (b) Read each question twice to the student; (c) Accept the first student response to each question; (d) Not coach or offer help to the students at any time during the testing; (e) In light of their developmental level, students should not be engaged in testing activities for longer than 15 minutes.

Session Two also included a review of the testing procedures for the researcher designed Timbre Discrimination Test. Copies of the Timbre Discrimination Test may be found in Appendix A. Highlights of the directions were as follows: (a) Each example must be read to the student exactly as printed in the booklet; (b) Each question must be read twice to the student; (d) The taped examples of instrument sounds should only be played twice; (d) Test administrators must accept the first student response to each question; (e) Test administrators must not coach or offer help to the students at any time during the testing; (f) In light of their developmental level, students should not be engaged in testing activities for longer than 15 minutes.

Before Session Three classroom teachers at the research site were asked to volunteer their pre-school children ages 4 through 6, who attended pre-school elsewhere to act as practice subjects for the test administrators. 14 pre school children were volunteered. Their mean age was 5.2 months. Research Assistants administered the 14th Week Sound-Symbol portion of the SESAT Alphabet Discrimination Test. At the end of the testing session, students were dismissed to their parents. Research assistants were instructed in scoring procedures for the SESAT. Scoring procedures used for this study may be found in the SESAT Directions for scoring (Harcourt Brace, 1999). The actual length of the testing session was 12-15 minutes.

Session Four was designed to give the assistants practice in the administration on the 14ht Week Sound-Symbol Timbre Discrimination Tests. The same volunteer subjects were used. The actual testing time was 10-12 minutes. At the end of the testing session, students were dismissed to their parents.

The 5th Week same-different and 10th Week visual recognition alphabet and timbre discrimination tests were administered in later sessions during the initial two weeks of school. Students were then re-tested at each skill level in four after-school session two weeks later. Test and Re-Test scores were recorded by the research assistants and used as statistical data for this study. Students were rewarded at the conclusion of the last testing session with gift certificates

APPENDIX D

LETTERS OF AUTHORIZATION

University of North Texas
Sponsored Projects Administration

September 24, 1998

Julia Blair Battle
6934 Cove Drive
New Orleans, LA 70126

Re: Human Subjects Application No. 98-179

Dear Ms. Battle:

As permitted by federal law and regulations governing the use of human subjects in research projects (45 CFR 46), I have conducted an expedited review of your proposed project titled "An Investigation Of The Effects of Three Levels of Musical Timbre Discrimination Training on Alphabet Sound Discrimination in Pre-Kindergarten and Kindergarten Children." The risks inherent in this research are minimal, and the potential benefits to the subjects outweigh those risks. The submitted protocol and informed consent form is hereby approved for use of human subjects on this project.

The UNT IRB must re-review this project prior to any modifications you make in the approved project. Please contact me if you wish to make such changes or need additional information.

If you have any questions, please contact me.

Sincerely,

W C Zacharias

Walter C. Zacharias, Jr., Ed.D.
Chair, Institutional Review Board

WZ:sb

cc: IRB Members

P.O. Box 305250 • Denton, Texas 76203-5250
(940) 565-3940 • Fax (940) 565-4277 • TDD (800) 735-2989
e-mail: lane@abn.unt.edu

APPLICATION FOR APPROVAL OF INVESTIGATION INVOLVING THE USE OF HUMAN SUBJECTS

University of North Texas Institutional Review Board
for the Protection of Human Subjects in Research (IRB)

This application should be submitted to the Office of Sponsored Projects and Grant Accounting, Room 134, Administration Building.

1. Principal Investigator's Name: Julia Blair Battle

Department Name & Campus Address: College of Music

Campus Phone No.: (940)-565-2791 Home No.: (504)-246-8586

2. If you are a student, please provide the following:

Home Address of Student: 6934 Cove Drive, New Orleans, Louisiana 70126

Name of Faculty Sponsor: Dr. Hildegard Froehlich Phone Ext: 565-2791

3. Title of Project: An Investigation of the Effects of Three Levels of Musical
imbre Discrimination Training on Alphabet Sound Discrimination in Pre-Kindergarten and
indergarten Children

. Total Project Period: From: October 1, 1998 To: February 15, 1999

. Is a proposal for external support being submitted? Yes___ No x

If "Yes," you must submit one complete copy of that proposal as soon as it is available and complete the following:

a) Is notification of Human Subject Approval Required? Yes___ No___

b) Is this a renewal application? Yes___ No___

c) Funding agency's name:___

. In making this application, I certify that I have read and understand the guidelines and procedures developed y the University for the protection of human subjects, and I fully intend to comply with the letter and spirit of ıe University's Assurance and policy. I further acknowledge my responsibility to report any significant changes ı the protocol, and to obtain written approval for these changes, in accordance with the procedures, prior to ıaking these changes. I understand that I cannot initiate any contact with human subjects before I have received pproval and/or complied with any contingencies made in connection with that approval.

ignature of Principal Investigator Date

___ ___

. Approval by Faculty Sponsor (required for all students): I affirm the accuracy of this application, and accept ıe responsibility for the conduct of this research and supervision of human subjects as required by law.

ignature of Faculty Sponsor Date

___ ___

SHERWOOD FOREST ELEMENTARY SCHOOL
4801 Maid Marian Drive
New Orleans, Louisiana 70128
(504) 243-5800

NEW ORLEANS PUBLIC SCHOOLS
WORKING TOGETHER TO BUILD
RESPECT for LIFE PROPERTY & LEARNING

Antoinette L. Boissiere
Principal

Authorization to Conduct Research At Sherwood Forest Elementary School

This is to verify that Julia Blair Battle, Music Teacher has permission to conduct research at Sherwood Forest Elementary School. I am aware of the purpose, hypothesis and the procedures to be used in the project and the measures taken to ensure the confidentiality and safety of our students. I have approved the informed consent letter to be sent to the parents. I have reviewed the application to the district for research approval.

Approved *Antoinette L. Boissiere* Date *1998-9-10*

Antoinette Boissiere, Principal 9-10-98

AWAKEN, STRENGTHEN AND NURTURE THE WHOLE CHILD

SHERWOOD FOREST ELEMENTARY SCHOOL
4801 Maid Marian Drive
New Orleans, Louisiana 70128
(504) 243-5800

Antoinette L. Boissiere
Principal

September 21, 1998

Dear Parents

I will be conducting a research project designed to study how learning to tell the difference between musical instrument sounds may help pre-school children to tell the difference between alphabet sounds. The study will be a part of your child's regular music instruction and will consist of two 45 minute music classes per week. In addition to the regular singing and dancing that is a part of music class, your child will receive special instruction in how to hear the difference between same and different musical instrument sounds; tell the difference between pictures of different musical instruments; and, how each musical instrument has its own special sound. The goal of this study is to determine whether or not this type of musical instruction will help them to tell the difference between same and different alphabet sounds; tell the difference between pictures of letters; and, how each alphabet has its own special sound. The length of the study is 18 weeks.

Because music is a regular part of the school day all pre-kindergarten and kindergarten children are invited to participate in this project. The classroom atmosphere will be positive as usual and no undue stress will be placed on your child to perform. Children usually love music. I expect that they will be excited and enthusiastic about participating. The children will be tested periodically in small groups by my research assistants during the study to check their progress. The testing will be structured so the children think of it as just a normal part of the class. The assistants will be selected education majors from different universities around the city and trained to work with your children under my supervision. In the final research report, test scores will be referred to as group results only. To preserve confidentiality names of students, their individual test scores, or the school's name and location will not be reported. Your decision whether or not to allow your child to participate will in no way affect your child's standing in his or her class/school. At the conclusion of the study, a summary of the findings will be made available to all interested parents or teachers. Should the outcome of the study be positive, we will have found a rewarding and beneficial way to effectively help children learn. Should you have any questions or desire further information, please call me at home: 246-8586 or work: 243-5800. Thank you in advance for your continued cooperation and support.

Sincerely,
Julia B. Battle
Julia B. Battle,
Music Teacher

THIS PROJECT HAS BEEN REVIEWED BY THE UNIVERSITY OF NORTH TEXAS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (940-565-3940) AND HAS BEEN APPROVED BY THE ORLEANS PARISH SCHOOL BOARD (504-365-8800).

Please Return This Form Immediately

-----------------------------Cut Here-----------------------------

I do grant permission for my child ______________________________ to participate in this project.

I do not grant permission for my child ______________________________ to participate in this project.

Signature of Parent of Guardian ______________________________

Date __________

Approved Antoinette L. Boissiere Date 1998-9-10
Antoinette L. Boissiere, Principal 9-10-98

Today's Effort
for
'omorrow's Success

TTLE WOODS
EMENTARY SCHOOL

!00 Curran Boulevard
:w Orleans, LA 70127

(504) 243-5747
(504) 243-5748
Fax (504) 243-5750

NARD M. PARKER, JR.
Principal

Authorization to Conduct Research At Little Woods Elementary School

This is to verify that Julia Blair Battle, Music Teacher has permission to conduct research at Little Woods Elementary School. I am aware of the purpose, hypothesis and the procedures to be used in the project and the measures taken to ensure the confidentiality and safety of our students. I have approved the informed consent letter to be sent to the parents. I have reviewed the application to the district for research approval.

Approved Leonard M. Parker, Jr. Date 11-30-98

11-30-98

Today's Effort
for
'omorrow's Success

TTLE WOODS
EMENTARY SCHOOL

200 Curran Boulevard
ew Orleans, LA 70127

(504) 243-5747
(504) 243-5748

Fax (504) 243-5750

NARD M. PARKER, JR.
Principal

November 30, 1998

Dear Parents:

I will be conducting a research project designed to study how learning to tell the difference between musical instrument sounds may help pre-school children to tell the difference between alphabet sounds. The goal of this study is to determine whether or not this type of musical instruction will help them to tell the difference between same and different alphabet sounds; tell the difference between pictures of letters; and, how each alphabet has its own special sound.

In order to design the best test possible to determine the results of the study, I must "try it out" on several groups of students to determine how reliable the test is. Your school principal has agreed to allow me to conduct this test in you child's classroom. Test results will remain confidential and the papers will be destroyed as soon as the results are calculated. Thank you for your cooperation

Sincerely
Julia B. Battle
Vocal Music Teacher
Sherwood Forest Elementary School

THIS PROJECT HAS BEEN REVIEWED BY THE UNIVERSITY OF NORTH TEXAS COMMITTEE FOR THE PROTECTION OF HUMAN SUBJECTS (940-565-3940) AND HAS BEEN APPROVED BY THE ORLEANS PARISH SCHOOL BOARD (504-365-8800).

Please Return This Form Immediately

------------------------------------Cut Here------------------------------------

I do grant permission for my child ______________________________ to participate in this project.

I do not grant permission for my child ______________________________ to participate in this project.

Signature of Parent of Guardian ______________________ Date __________

Approved Leonard M. Parker, Jr. Date 11-30-98

11-30-98

SHERWOOD FOREST ELEMENTARY SCHOOL
4801 Maid Marian Drive
New Orleans, Louisiana 70128
(504) 243-5800

toinette L. Boissiere
ncipal

September 10, 1998

Dr. Linda Fortenberry
Superintendent, Area II
3510 General DeGaulle Drive
New Orleans, Louisiana 70114

9-15-98
Forward to: Mrs. Julia Battle
From: Dr. Linda T. Fortenberry
Area II
Approved: Linda T. Fortenberry
c: Mrs. Boissiere

Dear Dr. Fortenberry,

I would like to thank you again for your help in facilitating the completion of my dissertation research project. I would also like to invite you to become a part of the project in anyway you might desire. Please feel free to come and sit (join in) in with the classes at anytime. Your observations, expertise, and suggestions would certainly be appreciated.

I am well aware that you have been down the road to the Ph.D. before me. I neglected to add that any advice, insights or just plain encouragement that you can offer will be gratefully accepted. I will provide you with a copy of the first three chapters as soon as I receive them from the editor. I just can't see the little mistakes anymore!

Thank you again for your time. I would love to hear from you when you get the chance.

Sincerely

Julia B. Battle

Julia B. Battle
Sherwood Forest
Elementary School

lia —
his looks awesome!
lease come by & discuss.
'm real interested in your
thodology.
Linda

AWAKEN, STRENGTHEN AND NURTURE THE WHOLE CHILD

SHERWOOD FOREST ELEMENTARY SCHOOL
4801 Maid Marian Drive
New Orleans, Louisiana 70128
(504) 243-5800

Antoinette L. Boissiere
Principal

September 10, 1998

Dr. Linda Fortenberry

Superintendent, Area II

3510 General DeGaulle Drive

New Orleans, Louisiana 70114

Dear Dr. Fortenberry:

I am formally submitting a request to conduct my dissertation research project in the New Orleans Public Schools. The selected research site is Sherwood Forest Elementary School. This is my fifth year as a member of the Sherwood Forest family and I am very excited about the prospect of conducting research there. Mrs. Boissere and I have discussed the project and she wholeheartedly approves its implementation. Upon your approval, the parents of the children selected to participate will be notified via a letter of informed consent. The letter is attached to this request. The title of my project is: *An Investigation of the Effects of Three Levels of Skill Training in Musical Timbre Discrimination on Alphabet Sound Discrimination in Pre-Kindergarten and Kindergarten Children.*

The project is designed to study how learning to tell the difference between musical instrument sounds may help pre-school children to tell the difference between alphabet sounds. The study will be a part of the students' regular music instruction and will consist of two 45 minute music classes per week. In addition to the regular singing and dancing that is a part of the music class, the children will receive special instruction in how to hear the difference between same and different musical instrument sounds; tell the difference between pictures of different musical instruments; and, how each musical instrument has its own special sound.

The goal of this study is to determine whether or not this type of musical instruction will help them to tell the difference between same and different alphabet sounds; tell the difference between pictures of letters; and, how each alphabet has its own special sound. The duration of the study is 18 weeks.

A detailed description of the study is also attached to this request. It is a copy of the request for approval sent to the University of North Texas at Denton. I would like to get this project underway within the next two weeks. I know this is short notice, but I have just recieved a tentative proposal date from my Committee. I would like to get started with pre-testing proceedures by September 21, 1998.

Thank you for you consideration in this matter. I appreciate your help.

Sincerely,

Julia Blair Battle

Julia Blair Battle,

Music Teacher

Approved Antoinette L. Boissiere Date 1998-9-10

Antoinette L. Boissiere, Principal 9-10-98

THE
PSYCHOLOGICAL
CORPORATION®

The Psychological Corporation
555 Academic Court
San Antonio, Texas 78204-2498
Tel 210-299-1061
Telex 5106015629 TPCSAT
Fax 210-299-2755

October 7, 1999

Ms. Julia Battle
Sherwood Forest Elementary School
4801 Maid Marian Drive
New Orleans, LA 70128

Dear Ms. Battle:

Thank you for your letter regarding your use of the *Stanford Early School Achievement Test: Fourth Edition (SESAT)* in your dissertation research entitled "An Investigation of the Effects of Three Levels of Skill Training in Musical Timbre Discrimination on Alphabet Sound Discrimination in Kindergarten Children with approximately 225 subjects.

As a responsible test publisher, we believe it is our duty to protect the security and integrity of our test instruments. Therefore, we cannot allow copies of the test to be included with or stapled in your dissertation manuscript. If available, sample items may be included, but actual test items cannot. Also, all testing must be conducted in your presence or that of another qualified individual so that all test materials remain secure.

We will gladly grant permission for the use of this test instrument if the above restrictions will be followed. Please indicate your agreement to these terms by signing and returning this letter for our files.

Also, please forward a copy of your final dissertation for our library.

Thank you for your interest in our test materials. If you have further questions or needs, please contact us. Good luck with your research.

Sincerely,

Catherine A. Baker

Catherine Amaro Baker
Contract Specialist
Legal Affairs

AGREED:

Julia Blair Battle

A Subsidiary of Harcourt Brace & Company

SHERWOOD FOREST ELEMENTARY SCHOOL
4801 Maid Marian Drive
New Orleans, Louisiana 70128
(504) 243-5800

NEW ORLEANS PUBLIC SCHOOLS
WORKING TOGETHER TO BUILD
RESPECT for LIFE PROPERTY & LEARNING

Antoinette L. Boissiere
Principal

Legal Services

Harcourt Brace Educational Measurement

P.O. Box 839954

San Antonio, Texas 78283-3954

September 14, 1999

To Whom it May Concern:

I am requesting permission to use the SESAT Sound and Letters Sub Test as a measurement instrument for my dissertation project. The study is entitled: *An Investigation of the Effects of Three Levels of Skill Training in Musical Timbre Discrimination on Alphabet Sound Discrimination in Kindergarten Children.*

The primary purpose of the project is to investigate how teaching preschool children to learn the difference between musical instruments sounds will impact their ability to tell the difference between alphabet sounds. The hypothesis of this research suggests students taught to associate musical discrimination skills with similar alphabet discrimination skills will demonstrate stronger alphabet sound /symbol discrimination skills than those who are not. The study will be a part of the students' regular music instruction and will consist of two 45-minute music classes per week. In addition to the regular singing and dancing that is a part of the music class, the children will receive special instruction in how to: (a) hear the difference between same and different alphabet and musical instrument sounds; (b) tell the difference between pictures of different musical instruments; and, (c) how each musical instrument has its own special sound.

The duration of the study is 18 weeks. I have selected the SESAT Sound and Letters SubTest (Fall/Kindergarten), because after reviewing it with the kindergarten, pre kindergarten faculty, school administration, and the dissertation committee, it was determined to be the most appropriate measurement instrument for evaluating the same/different, visual recognition and sound symbol association skills being explored in this study.

Students will benefit by their participation in an interesting and unique approach to the discrimination of musical and alphabet sounds. Subjects who have been targeted for transfer instruction will at the beginning of their academic careers, will have been introduced to the process of knowledge acquisition the through the conscious association of skill and concept similarities in one content area with skill and concept similarities in another content area. It is the desire of this researcher that the technique of conscious learning generalization will enable subjects to no longer view newly learned skills in isolation but to see them in terms a larger learning picture.

The findings of this research may yield an alternative means of instruction for the non-traditional learner. Practical classroom experience has made this investigator aware of the growing number of children who learn "differently". The treatments and their Corresponding activities are designed to address the needs of the kinesthetic, tactile, oral, as well as the auditory and visual learner. Should the data analysis yield support for the hypothesis of this research, (students taught to associate musical discrimination skills with similar alphabet discrimination skills will demonstrate a stronger skill alphabet sound /symbol discrimination than those who are not the educational community will have positive empirical evidence for the use of a unique means of imparting knowledge critical for language and music achievement, to young children.

Enclosed as requested per our phone conversation in August are (a) Approval from the University for this project; (b) Approval from the school district for the project; and (c) Approval from the school site administrator. As of 8/99, the school has already purchased 225 copies of the SESAT (Fall/Kindergarten) Test batteries, copies of the Norms and Technical Data Manuals, and Directions for Administration and Scoring. The Scores obtained will also be used to evaluate student achievement and academic progress during the school year.

I would like to complete this project by January, therefore, I need to start the study immediately to remain within my timeline. Hopefully, I have included all necessary information for approval. Thank you for your prompt attention to this matter.

Sincerely

Julia B. Battle

Julia B. Battle, Music Teacher,

Principal Investigator

January 12, 1999

Dear Ms. Adams and Sabbatical Committee,

This letter is to verify my approval of the research study "*An Investigation of the Effects of Three Different Levels of Skill Training in Musical Timbre Discrimination on Alphabet Sound Discrimination Pre Kindergarten and Kindergarten Children* currently being conducted by Julia B. Battle at Sherwood Forest Elementary School in New Orleans, Louisiana. Julia is currently enrolled as my student, in the last semester of her dissertation project (MUGC 6950) at the University of North Texas at Denton. We have worked together since Fall 1990. Julia has always been a conscientious, enthusiastic student, who has consistently produced work of the finest quality. Already a published author in national research journals, she is a meticulous and ethical researcher with a passionate desire to seek out more effective and innovative ways to help all children learn.

As her major professor, and chairperson of her doctoral committee, it is my professional opinion that Julia's current study is child centered, well designed and firmly grounded in the findings of many facets of the research literature. It's findings are potentially of great value to students, teachers and the research and educational communities at large. On behalf of the University of North Texas and her Doctoral Committee, it is my pleasure to strongly recommend that the sabbatical review committee approve Julia's sabbatical leave request to complete her independent study.

Sincerely

Hildegard Froehlich

Hildegard Froehlich,
Professor of Music Education,
Department Chair

P.O. Box 311367 • Denton, Texas 76203-1367
(940) 565-2791 • TDD (800) 735-2989

APPENDIX E

MUSICAL EXAMPLES USED IN THE LESSON

Musical Examples

Examples Used in the Lessons

Exam Excerpts

Musical Excerpts Used in this Study

Lesson	Example	Featured Instrument(s)	Musical Excerpts	Resource/CD/ Page Number
#1	1	Voice (children's)	<u>You'll Sing A Song</u> by Ella Jenkins	SB # 1/ CD 1:10 / p. 12
	2	Voice (ways of changing vocal color)	"Voices Around the World"	MM #2 /CD 1: 5/ pp. 6-7
	3	Voices (Changed Male, Female, unchanged child)	Recorded lesson "Exploring lighter and heavier registers	MM #2 / CD 1: 6/ pp. 6-7
	4	Voices (Changed Male, unchanged children)	"Kye Kye Kule" African folk chant	MM #2 / CD 1:7/ 1:8 pp. 6-7
	5	Voices (heavier vs. lighter)	"The Color of Your Voice"	MM #3 / CD1:10 pp. 14-17
	6	Voice (Adult Male)	"Don't Worry Be Happy" by Bobby Mc Ferrin	MM #5 / CD 1:8/ pp. 12-13
	7	Voice (Adult Male)	"Recorded Interview with Bobby Mc Ferrin	MM #5 / CD 1:9 / pp. 12-13
	8	Voices (Soprano, Alto, Tenor, Bass Children)	"Classification of Voices"	MM #5 / CD 2: 32/ pp. 104
	9	Voices (changed)	"Lift Every Voice and Sing" by J. Weldon and J. Rosemond Johnson	MM #5 / CD 2:33 pp. 105
	10	Voices (unchanged, children)	"Shabat Shalom"	MM #5 / CD 2:34 pp. 106-107

Lesson	Example	Featured Instrument(s)	Musical Excerpts	Resource/ CD/ Page Number
	11	Voices (unchanged, (children)	Bizet, Carmen Children's Chorus	MM #2 / CD 7:39 pp. 343 E, F
Lesson # 2	12	Unpitched percussion instruments	"Percussion Sounds"	SB #1/ CD 1:35/ pp. 52-53
	13	Triangle, woodblock, drums, tambourine, maracas	Identifying Families of unpitched Instru- ments"	MM #2 / CD 2:35 PP. 88-89
	14	Triangle, woodblock, tambourine	"Instruments have tone color too	MM #3 / CD 1:13 pp. 16-17
	15	Drums, tambourine, maracas and wood blocks	" A Sailor went to Sea Sea Sea"	MM #2 / CD 2:36 / pp. 90-91
	16	Snare drum, bass drum, cymbals	Battery by Linda Williams	SB #6 / CD 2:33 / pp. 56-57
	17	Pitched percussion instruments: Glockenspiel	Twinkle Twinkle Little Star Traditional	Taped teacher performance
	18	Chimes	Mussorgsky, Pictures at an Exhibition: Great Gate of Kiev	SB #6 / CD 2:35 pp. 56-57
	19	Xylophone	Ravel, Carnival of the Animals: Fossils	SB #6 / CD 2:34 pp. 56-57

Review from Lesson 1
Voice: Examples # 1, 5, 8, and 9

Lesson	Example	Featured Instrument(s)	Musical Example	Resource/ CD/ Page Number
# 3	20	Brass Instruments trumpet, trombone tuba. French horn	Instrument Sounds	Share the Music MacMillan/McGraw-Hill Video Library
	21	Trombone, trumpet Tuba, French horn	"Sounds of Brass Instruments"	MM #2 / CD 4: 14 pp. 194-195
	22	Trombone, trumpet French horn, tuba	"Frere Jacque"	MM # 2 / CD 4: 15 pp. 195-196
	23	Trombone, trumpet French horn, tuba	"Moving to Brass Instrument Sounds" Recorded Lesson	MM #2 / CD 4:17 pp. 195-196
	24	Brass Instruments from different countries	"A Montage of Horns"	MM #2 / CD 4: 1 p. 166
	25	Trombone, trumpet Tuba	The Music Man: Seventy Six Trombones (Listening Map)	MM #2 / CD 7:42 pp. 343 K-L
	26	Trumpet	Verdi, Aida: Grand March	SB #6 / CD 2:28
	27	Tuba	Mussorgsky, Pictures at at Exhibition: Bydlo	SB #6/ CD 2:30 pp. 54-55
	28	Trombone	Wagner, Tannhauser: Pilgrims' Chorus	SB #6 / CD 2:29 pp. 54-55
	29	French Horn	Strauss, Till Eulen-spiegel: Merry Pranks	SB #6 / CD 2: 27 pp. 54-55

Review:
Lesson 1: Examples # 1, 5, 8, and 9
Lesson 2: Examples # 11, 12, 15, and 16
Lesson 3: Examples # 19, 21, and 23

Lesson	Example	Featured Instrument(s)	Musical Excerpts	Resource/ CD/ Page Number
# 4	30	Woodwinds of the Orchestra: flute bassoon, oboe	Music Magic Wind Instruments Woodwinds	Siver Burdette Ginn
	31	Flute	Ravel, Daphnis and Chole: Suite No. 2	SB #5 / CD 2:21/ pp. 52-53
	32	Clarinet	Prokofiev, Peter and the Wolf 52-53	SB #5 / CD 2: 24/pp. `
	33	Bassoon	Dukas, Sorcerer's Apprentice 52-53	SB #5 / CD 2:25 /pp.
	34	Flute	Tchaikovsky, Chinese Dance	MM #2/ CD 2:33 / pp. 84-85
	35	Clarinet	Tchaikovsky, Waltz of the Flowers	MM #2/ CD 2:34/ pp. 84-85
	36	Clarinet, trumpet, trombone and drums (Dixielend Band)	"When the Saints Go Marchin' In"	SB #1/ CD 1:17 / pp. 26-27
	37	Clarinet, flute, drums trombone	"Some Instruments You will Hear"	SB #1 / CD 1:20/ pp. 30-31

Review:
Lesson 1: Examples # 1, 5, 8, and 9
Lesson 2: Examples # 11, 12, 15, and 16
Lesson 3: Examples # 19, 21, and 23
Lesson 4: Examples # 30, 31, and 32

Lesson	Example	Featured Instrument(s)	Musical Example	Resource/CD Page Number
#5	38	Piano	Theresa Jennings "Harmony"	MM #6 / CD 2:28, 2:29 pp. 90-91
	39	Piano	H. Charmichael "Heart and Soul" 90-91	MM #6 / CD 2:29/ 2:30 pp.
	40	Pipe Organ	Mozart, <u>Alleluia</u>	MM #6 / CD 2:33/ pp. 128
	41	Pipe Organ, piano	"The World of Keyboards" Recorded Lesson	MM #6/ CD 2:32/ pp. 90-91

<u>Review:</u>
Lesson 1: Examples # 1, 5, 8, and 9
Lesson 2: Examples # 11, 12, 15, and 16
Lesson 3: Examples # 19, 21, and 23
Lesson 4: Examples # 30, 31, and 32
Lesson 5: Examples #36, 39

Lesson	Example	Featured Instrument(s)	Musical Excerpt	Resource/ CD/Page
# 6	43	Violin, Cello, String Bass	String Instruments: Bowed Music Magic	Silver Burdett Ginn/Video Library
	44	Violin	"Russian Slumber Song" Traditional	SB #1/CD 1:18/ pp. 28-29
	45	Violin	J. Brahams, <u>Brahms Lulluby</u>	SB #1/CD 1:19/ pp. 28-29
	46	Violin, trumpet, clarinet flute, drums	Sound Collage: Some Sounds you will Hear	SB #1/ CD 1:20/ pp. 28-29
	47	String Bass(pizzicato) Orchestral	"All About the Double Bass"	MM #3/ CD 3:38 pp. 214-215
	48	String Bass(slap/jazz) Milt Hinton	Kalmar and Ruby <u>Jeepy: Three Little Words</u>	MM #3/ CD 3:39 pp. 214-215
	49	Harp	"El pajara campana" (The Bell Bird) Traditional	MM #3/CD 2:27,2:28 pp. 2:29,2:30
8				
	50	Harp (accompaniment)	"Oh Lord I Want Two Wings" (Spiritual)	MM #3/ CD 2:31 pp. 89

<u>Review:</u>
Lesson 1: Examples # 1, 5, 8, and 9
Lesson 2: Examples # 11, 12, 15, and 16
Lesson 3: Examples # 19, 21, and 23
Lesson 4: Examples # 30, 31, and 32
Lesson 5: Examples # 36 and 39
Lesson 6: Examples # 42, 46, and 47

Excerpts Chosen for Exam
Resource Masters
Other Assessments

Lesson	Exam (Items) Excerpts	Resource Masters	Other Assessments
# 1	# 1, 5,8 and 9 Changed and Unchanged Voices, Heavier and Lighter Voices	SB #1 pp. 12-16 Transparency: T. 19 Resource Master LA 4 Musical Instrument Master(s)	SB #5 pp. 105 "Singers"
# 2	# 11, 12, 15, 16 Triangle, woodblock, snare drums, cymbals bass drum	Resource Masters MM #2 pp. 10, 11, 12 Silver Burdette: Big Book pp. 90-91 Musical Instrument Master(s) Triangle, woodblock, cymbals bass drum	
# 3	# 19, 21, and 23 Trumpet, Tuba, and Trombone	Resource Masters MM # 2/ 5:3 Musical Instrument Masters Fr. Horn, Trumpet, Tuba and Trombone Transparency, T22 Resource Master, LA7	
# 4	# 30, 31, 32 Flute, clarinet and Bassoon	Musical Instrument Masters: Woodwinds	
# 5	# 36 and 39 Piano, Pipe Organ	Musical Instrument Masters: Piano Pipe Organ	
# 6	# 42, 46, and 47 Violin and String Bass	SB Big Book pp., 8-56 Musical Instrument Masters Violin and String Bass	

APPENDIX F

STATISTICAL DATA

Descriptive Statistics

Raw Scores

Means, Medians, Modes, and Standard Deviations

Inferential Statistics

Correlation

Analysis of Variance

Post Hoc Comparisons

Descriptive Statistics

Summary of Overall Descriptive Statistics for Test Data

Pretest SESAT		Pretest TDT		Same Different TDT	
Mean	2.416666667	Mean	3.990740741	Mean	6.37037
Standard Error	0.14155072	Standard Error	0.172755789	Standard Error	0.2064
Median	2	Median	4	Median	6.5
Mode	0	Mode	4	Mode	8
Standard Deviation	2.080362222	Standard Deviation	2.538981192	Standard Deviation	3.03343
Sample Variance	4.327906977	Sample Variance	6.446425495	Sample Variance	9.20172
Kurtosis	0.494911828	Kurtosis	-0.7654266	Kurtosis	-0.65703
Skewness	0.780690624	Skewness	0.015632082	Skewness	-0.16031
Range	9	Range	10	Range	12
Minimum	0	Minimum	0	Minimum	0
Maximum	9	Maximum	10	Maximum	12
Sum	522	Sum	862	Sum	1376
Count	216	Count	216	Count	216
Largest(1)	9	Largest(1)	10	Largest(1)	12
Smallest(1)	0	Smallest(1)	0	Smallest(1)	0
Confidence Level(95.0%)	0.279004526	Confidence Level(95.0%)	0.340511492	Confidence Level(95.0%)	0.40682

Summary of Overall Descriptive Statistics for Test Data

Same Different SESAT		Visual Recognition TDT		Visual Recognition SESAT	
Mean	7.166667	Mean	8.287037	Mean	8.5787
Standard Error	0.159672	Standard Error	0.1810466	Standard Error	0.16292
Median	7.5	Median	9	Median	9
Mode	8	Mode	10	Mode	9
Standard Deviation	2.346695	Standard Deviation	2.6608302	Standard Deviation	2.39443
Sample Variance	5.506977	Sample Variance	7.0800172	Sample Variance	5.73331
Kurtosis	-0.28875	Kurtosis	0.2677193	Kurtosis	0.11205
Skewness	-0.41377	Skewness	-0.897098	Skewness	-0.8532
Range	12	Range	12	Range	10
Minimum	0	Minimum	0	Minimum	2
Maximum	12	Maximum	12	Maximum	12
Sum	1548	Sum	1790	Sum	1853
Count	216	Count	216	Count	216
Largest(1)	12	Largest(1)	12	Largest(1)	12
Smallest(1)	0	Smallest(1)	0	Smallest(1)	2
Confidence Level(95.0%)	0.314723	Confidence Level(95.0%)	0.3568531	Confidence Level(95.0%)	0.32113

Summary of Overall Descriptive Statistics for Test Data

Sound Symbol Posttest SESAT		Sound Symbol Posttest TDT		Delayed Posttest SESAT	
Mean	8.902778	Mean	8.972222	Mean	8.907407
Standard Error	0.144893	Standard Error	0.145403	Standard Error	0.143338
Median	9	Median	9	Median	9
Mode	10	Mode	10	Mode	10
Standard Deviation	2.129481	Standard Deviation	2.136976	Standard Deviation	2.106632
Sample Variance	4.53469	Sample Variance	4.566667	Sample Variance	4.437898
Kurtosis	1.539931	Kurtosis	0.277909	Kurtosis	-0.15854
Skewness	-0.93073	Skewness	-0.72842	Skewness	-0.61804
Range	12	Range	10	Range	9
Minimum	0	Minimum	2	Minimum	3
Maximum	12	Maximum	12	Maximum	12
Sum	1923	Sum	1938	Sum	1924
Count	216	Count	216	Count	216
Largest(1)	12	Largest(1)	12	Largest(1)	12
Smallest(1)	0	Smallest(1)	2	Smallest(1)	3
Confidence Level(95.0%)	0.285592	Confidence Level(95.0%)	0.286597	Confidence Level(95.0%)	0.282528

Summary of Overall Descriptive Statistics for Test Data

	Delayed Posttest TDT
Mean	8.898148
Standard Error	0.147017
Median	9
Mode	10
Standard Deviation	2.160705
Sample Variance	4.668648
Kurtosis	0.956269
Skewness	-0.89218
Range	12
Minimum	0
Maximum	12
Sum	1922
Count	216
Largest(1)	12
Smallest(1)	0
Confidence Level(95.0%)	0.28978

Raw Scores – Groups 1-5

Raw Scores - Groups 1 - 5

ID	GR	Pretest SESAT	Pretest TDT	S/D SESAT	S/D TDT	V/R SESAT	V/R TDT	Posttest SESAT	Posttest S/S TDT	Delayed Posttest SESAT	Delayed Posttest TDT	SUMS
3	1	4	4	0	4	8	7	6	5	4	5	47
4	1	3	4	5	6	3	4	7	8	8	10	58
6	1	8	9	8	12	4	7	8	5	7	5	73
41	1	3	4	9	9	9	8	8	9	8	9	76
48	1	0	3	3	0	6	5	9	9	7	8	50
50	1	0	2	8	7	7	8	8	5	6	6	57
51	1	3	5	5	5	6	5	6	5	6	7	53
52	1	4	4	3	1	6	8	7	9	8	9	59
56	1	4	4	9	10	6	5	10	12	8	12	80
58	1	2	5	6	10	4	6	7	8	6	7	61
65	1	7	8	10	11	4	5	10	9	9	9	82
70	1	3	5	8	11	12	9	8	10	7	9	82
76	1	7	7	7	8	11	12	12	12	12	12	100
86	1	2	3	8	12	3	0	2	2	4	3	39
90	1	0	2	5	5	9	11	8	8	9	7	64
94	1	3	1	7	11	11	2	10	9	7	10	71
103	1	5	9	8	9	2	6	11	9	8	10	77
106	1	3	5	3	11	3	4	6	5	4	5	49
110	1	0	9	4	10	7	10	7	7	6	7	67
111	1	4	5	11	11	4	4	9	8	7	8	71
125	1	3	4	5	6	2	4	10	6	6	6	52
129	1	0	2	6	8	5	6	9	8	8	8	60
130	1	3	6	3	4	8	4	10	9	6	9	62
135	1	3	5	5	8	4	5	6	6	8	7	57
139	1	3	4	3	1	3	2	4	3	4	3	30
140	1	2	4	7	7	10	5	8	7	12	7	69
143	1	0	4	5	4	8	5	7	10	8	9	60
145	1	7	7	9	8	9	8	12	7	12	8	87
150	1	4	4	4	5	9	5	9	10	10	10	70
153	1	5	8	6	6	8	7	10	12	9	11	82
159	1	2	5	5	5	6	7	8	6	8	5	57
169	1	4	5	4	0	7	3	5	6	6	6	46
170	1	4	5	11	10	6	8	9	8	9	8	78
172	1	1	3	8	4	10	6	9	11	10	11	73
176	1	3	3	3	0	4	3	5	5	3	4	33
180	1	0	2	8	12	2	4	5	7	5	6	51
182	1	1	3	9	9	6	10	7	8	5	6	64
183	1	3	4	9	11	4	5	6	6	7	6	61

Raw Scores - Groups 1 - 5

ID	GR	Pretest SESAT	Pretest TDT	S/D SESAT	S/D TDT	V/R SESAT	V/R TDT	Posttest SESAT	Posttest S/S TDT	Delayed Posttest SESAT	Delayed Posttest TDT	SUMS
188	1	3	4	2	0	3	3	6	4	6	3	34
196	1	0	3	10	12	4	5	2	6	5	7	54
199	1	9	4	6	5	8	6	12	9	11	9	79
216	1	2	5	5	1	8	1	6	7	6	8	49
218	1	0	6	3	4	10	6	9	9	9	8	64
15	2	3	5	7	8	10	11	7	7	7	7	72
22	2	3	4	9	10	10	10	8	6	7	9	76
30	2	0	8	8	10	9	10	8	9	10	10	82
40	2	8	10	6	7	11	12	12	11	12	12	101
44	2	4	4	8	7	9	10	5	3	8	5	63
46	2	0	0	9	5	8	10	9	8	9	8	66
63	2	2	5	8	7	9	9	7	6	9	8	70
77	2	0	7	7	6	9	8	9	7	8	9	70
81	2	2	6	5	8	6	10	5	6	5	6	59
83	2	3	8	12	12	11	11	9	8	9	9	92
85	2	3	2	7	9	10	10	10	8	11	9	79
107	2	1	0	7	8	9	9	7	10	8	10	69
109	2	0	0	5	3	9	4	6	5	4	5	41
114	2	0	1	1	0	3	2	5	8	6	8	34
115	2	3	6	9	12	10	10	8	8	7	9	82
116	2	4	0	6	8	8	11	9	9	10	8	73
117	2	3	7	10	8	8	7	6	9	7	7	72
118	2	0	0	8	10	12	12	8	10	9	10	79
128	2	0	3	8	6	4	0	2	4	4	5	36
132	2	4	4	5	4	10	10	8	12	9	10	76
141	2	3	4	8	9	10	10	9	7	10	8	78
142	2	3	4	10	9	10	11	9	9	9	10	84
144	2	5	8	10	10	12	10	10	9	12	10	96
146	2	5	0	10	11	9	10	11	10	10	10	86
147	2	4	0	8	9	12	10	9	11	10	11	84
148	2	1	3	5	0	9	3	9	11	9	10	60
149	2	4	8	9	11	11	10	10	8	10	9	90
151	2	0	1	3	0	5	1	0	3	3	4	20
155	2	6	2	11	10	12	12	12	10	12	10	97
158	2	0	5	8	7	8	9	6	7	8	8	66
161	2	3	0	7	9	9	9	8	8	9	10	72
162	2	3	0	8	7	8	10	9	9	10	9	73
173	2	1	8	6	7	11	9	8	8	9	8	75

Raw Scores - Groups 1 - 5

ID	GR	Pretest SESAT	Pretest TDT	S/D SESAT	S/D TDT	V/R SESAT	V/R TDT	Posttest SESAT	Posttest S/S TDT	Delayed Posttest SESAT	Delayed Posttest TDT	SUMS
179	2	2	6	9	8	8	10	6	6	7	8	70
184	2	0	0	6	7	5	8	7	9	8	11	61
185	2	2	1	8	9	8	12	8	8	9	8	73
202	2	3	4	7	8	11	12	10	12	10	12	89
203	2	0	2	8	9	12	11	12	8	11	9	82
204	2	0	3	10	10	10	11	8	7	9	7	75
207	2	4	0	6	7	11	6	9	6	10	5	64
211	2	0	5	9	7	10	12	8	12	8	10	81
212	2	1	6	7	5	12	10	9	8	10	8	76
217	2	1	4	5	7	9	8	9	8	9	8	68
222	2	3	5	8	9	11	10	9	9	10	9	83
24	3	2	8	8	6	10	10	11	10	10	10	85
25	3	0	1	2	3	4	3	9	9	8	8	47
27	3	5	1	9	8	11	10	10	10	11	10	85
28	3	5	3	7	3	10	11	10	10	10	11	80
31	3	5	5	8	7	9	9	11	10	9	10	83
32	3	4	5	2	1	6	8	9	9	8	9	61
38	3	4	0	5	4	9	8	10	9	10	10	69
53	3	3	3	8	7	10	10	10	11	11	10	83
55	3	0	6	9	8	10	11	9	9	10	9	81
57	3	3	5	6	5	10	10	9	10	10	10	78
64	3	2	2	3	2	8	8	10	9	9	8	61
68	3	1	8	6	7	9	8	11	12	11	12	85
69	3	4	4	7	8	9	9	10	9	11	8	79
74	3	0	0	3	4	7	6	9	9	6	7	51
92	3	5	6	6	4	11	9	10	11	10	11	83
96	3	0	3	6	1	8	6	9	8	7	9	57
100	3	2	8	5	4	9	8	11	10	11	11	79
101	3	0	4	9	8	8	9	9	9	9	10	75
104	3	2	9	8	2	11	11	10	10	9	10	82
108	3	6	6	7	6	10	9	10	10	10	11	85
120	3	3	7	8	8	10	9	11	11	10	11	88
126	3	2	4	5	4	7	8	10	11	10	10	71
131	3	5	3	7	3	10	11	12	12	11	11	85
138	3	1	9	4	8	6	12	9	10	10	11	80
152	3	0	0	3	3	9	8	9	10	9	9	60
160	3	2	6	10	4	11	11	12	11	12	0	79
164	3	4	4	6	4	9	10	10	9	9	10	75

Raw Scores - Groups 1 - 5

ID	GR	Pretest SESAT	Pretest TDT	S/D SESAT	S/D TDT	V/R SESAT	V/R TDT	Posttest SESAT	Posttest S/S TDT	Delayed Posttest SESAT	Delayed Posttest TDT	SUMS
165	3	2	6	8	4	10	8	12	11	11	12	84
166	3	0	1	2	3	4	3	6	8	6	8	41
168	3	2	4	8	8	11	10	9	10	10	10	82
171	3	2	1	6	4	10	8	10	10	10	10	71
175	3	3	8	7	3	9	8	10	11	10	9	78
177	3	1	8	10	4	11	10	11	10	9	10	84
181	3	1	5	3	3	7	5	9	10	9	9	61
189	3	4	0	7	3	9	8	10	11	10	11	73
191	3	0	2	4	3	9	9	9	10	8	10	64
192	3	0	2	8	6	11	10	10	10	11	8	76
197	3	2	6	7	5	8	9	8	9	9	9	72
200	3	2	4	10	7	5	10	8	10	9	9	74
209	3	0	4	8	4	10	9	10	10	10	11	76
213	3	4	6	8	5	11	12	12	11	12	12	93
214	3	3	3	7	6	7	8	9	10	8	10	71
219	3	0	6	5	3	9	8	10	12	10	10	73
223	3	3	2	8	6	12	11	9	10	10	10	81
225	3	3	4	11	12	10	10	10	10	11	11	92
2	4	0	4	9	8	10	9	10	11	11	11	83
5	4	5	4	8	6	10	10	11	10	12	9	85
8	4	2	5	6	3	9	8	10	10	10	10	73
9	4	0	0	6	6	10	9	12	11	12	10	76
12	4	0	0	6	3	7	8	10	10	11	10	65
16	4	0	0	10	11	10	10	12	10	11	10	84
17	4	0	0	6	3	9	10	10	10	11	11	70
18	4	7	2	7	8	9	8	10	12	11	12	86
19	4	3	6	9	8	9	6	10	10	9	8	78
20	4	3	1	8	5	9	9	9	10	10	10	74
23	4	2	6	8	4	9	9	12	12	12	12	86
33	4	0	6	6	4	10	10	12	12	12	12	84
34	4	0	0	7	5	10	9	11	12	10	10	74
36	4	0	0	8	5	11	9	12	12	11	11	79
37	4	1	0	6	5	10	9	8	9	9	8	65
39	4	2	6	9	6	10	10	10	10	9	9	81
42	4	1	4	5	4	9	9	10	11	11	11	75
47	4	0	6	10	8	9	10	9	9	10	9	80
54	4	0	1	7	3	9	8	10	10	10	10	68
60	4	0	0	7	6	8	8	10	9	10	10	68

Raw Scores - Groups 1 - 5

ID	GR	Pretest SESAT	Pretest TDT	S/D SESAT	S/D TDT	V/R SESAT	V/R TDT	Posttest SESAT	Posttest S/S TDT	Delayed Posttest SESAT	Delayed Posttest TDT	SUMS
66	4	4	6	11	10	10	9	10	11	10	11	92
75	4	2	7	8	7	11	12	10	11	10	11	89
79	4	3	7	10	11	9	10	12	12	12	12	98
80	4	3	0	10	0	9	10	11	11	11	11	76
88	4	3	2	6	3	10	9	12	11	12	12	80
99	4	5	5	10	9	12	10	12	12	11	12	98
102	4	4	3	10	9	10	11	11	11	10	10	89
105	4	1	3	9	5	10	9	10	10	9	8	74
121	4	3	3	10	9	11	10	12	12	12	12	94
122	4	3	4	9	3	10	10	11	10	11	11	82
127	4	3	5	10	11	12	10	11	11	11	10	94
133	4	9	4	10	8	12	11	12	12	12	12	102
134	4	3	5	9	6	12	12	11	10	10	10	88
154	4	0	7	10	10	9	10	10	11	11	11	89
157	4	1	5	9	8	9	9	10	12	12	9	84
167	4	3	5	10	9	11	10	10	12	11	11	92
174	4	6	6	10	9	9	10	10	11	10	10	91
190	4	1	5	6	2	6	5	10	11	10	9	65
195	4	4	4	10	8	10	10	11	10	11	9	87
198	4	0	6	11	10	11	12	10	12	11	12	95
208	4	0	3	8	8	10	9	10	11	11	11	81
210	4	0	1	10	5	12	12	10	10	10	9	79
215	4	8	7	12	12	12	12	12	12	12	12	111
221	4	2	8	7	5	10	9	12	12	12	12	89
224	4	3	4	8	5	10	10	11	10	10	10	81
1	5	2	5	8	4	10	5	7	8	6	5	60
7	5	3	8	9	8	8	8	9	8	9	8	78
10	5	0	0	8	7	6	8	8	9	10	11	67
11	5	0	4	5	6	8	5	6	9	4	6	53
14	5	5	4	10	9	8	6	8	9	7	8	74
21	5	3	6	9	8	7	6	8	8	7	8	70
29	5	2	0	5	1	8	7	7	8	8	9	55
35	5	4	7	10	8	10	8	9	9	10	9	84
45	5	3	6	5	5	9	10	8	9	9	10	74
49	5	4	8	8	7	6	8	9	9	9	11	79
59	5	1	4	10	8	12	11	8	10	8	10	82
62	5	3	5	6	6	5	4	10	6	8	6	59
67	5	3	4	7	6	11	10	9	6	6	5	67

Raw Scores - Groups 1 - 5

ID	GR	Pretest SESAT	Pretest TDT	S/D SESAT	S/D TDT	V/R SESAT	V/R TDT	Posttest SESAT	Posttest S/S TDT	Delayed Posttest SESAT	Delayed Posttest TDT	SUMS
71	5	1	7	3	3	7	10	9	5	8	6	59
72	5	1	4	6	2	7	8	10	8	7	7	60
73	5	3	7	8	8	9	11	10	9	10	10	85
78	5	2	5	11	8	9	10	8	8	8	8	77
82	5	0	4	5	4	5	6	7	8	5	7	51
84	5	1	3	5	6	4	4	5	6	6	7	47
87	5	8	9	10	11	11	10	12	12	12	12	107
89	5	2	0	5	2	11	10	6	8	7	8	59
91	5	5	4	5	5	9	8	8	8	8	8	68
95	5	0	0	8	10	7	5	12	12	12	12	78
97	5	3	3	7	5	11	12	8	5	6	5	65
98	5	0	0	5	6	9	4	6	9	6	8	53
112	5	2	7	6	4	9	8	5	8	6	7	62
113	5	0	0	4	1	7	7	6	8	7	7	47
119	5	8	5	11	10	11	12	8	9	9	9	92
123	5	5	2	3	1	11	10	9	9	8	9	67
136	5	3	5	9	8	11	10	8	9	9	10	82
163	5	3	2	9	8	8	6	6	6	6	4	58
178	5	0	1	6	4	6	11	6	5	6	6	51
186	5	4	7	10	6	10	10	9	9	10	10	85
193	5	6	1	8	10	9	5	10	11	9	10	79
194	5	0	4	7	7	6	10	8	8	9	9	68
201	5	0	2	6	4	8	9	6	4	7	4	50
205	5	2	1	10	8	10	11	9	9	10	10	80
206	5	2	3	7	6	8	10	11	10	10	11	78
124	5	2	0	5	6	7	6	8	7	9	8	58

Inferential Statistics

Correlations

Group PreTest and PostTest Comparisons

Test Score Correlations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	PT/A	PT/T		SD/A	SD/T		VR/A	VR/T		SS/A	SS/T		SS/A	SS/A/D		SS/T	SS/T/D		SS/A/D	SS/T/D
2	4	4		0	4		8	7		6	5		6	4		5	5		4	5
3	3	4		5	6		3	4		7	8		7	8		8	10		8	10
4	8	9		8	12		4	7		8	5		8	7		5	5		7	5
5	3	4		9	9		9	8		8	9		8	8		9	9		8	9
6	0	3		3	0		6	5		9	9		9	7		9	8		7	8
7	0	2		8	7		7	8		8	5		8	6		5	6		6	6
8	3	5		5	5		6	5		6	5		6	6		5	7		6	7
9	4	4		3	1		6	8		7	9		7	8		9	9		8	9
10	4	4		9	10		6	5		10	12		10	8		12	12		8	12
11	2	5		6	10		4	6		7	8		7	6		8	7		6	7
12	7	8		10	11		4	5		10	9		10	9		9	9		9	9
13	3	5		8	11		12	9		8	10		8	7		10	9		7	9
14	7	7		7	8		11	12		12	12		12	12		12	12		12	12
15	2	3		8	12		3	0		2	2		2	4		2	3		4	3
16	0	2		5	5		9	11		8	8		8	9		8	7		9	7
17	3	1		7	11		11	2		10	9		10	7		9	10		7	10
18	5	9		8	9		2	6		11	9		11	8		9	10		8	10
19	3	5		3	11		3	4		6	5		6	4		5	5		4	5
20	0	9		4	10		7	10		7	7		7	6		7	7		6	7
21	4	5		11	11		4	4		9	8		9	7		8	8		7	8
22	3	4		5	6		2	4		10	6		10	6		6	6		6	6
23	0	2		6	8		5	6		9	8		9	8		8	8		8	8
24	3	6		3	4		8	4		10	9		10	6		9	9		6	9
25	3	5		5	8		4	5		6	6		6	8		6	7		8	7
26	3	4		3	1		3	2		4	3		4	4		3	3		4	3
27	2	4		7	7		10	5		8	7		8	12		7	7		12	7
28	0	4		5	4		8	5		7	10		7	8		10	9		8	9
29	7	7		9	8		9	8		12	7		12	12		7	8		12	8
30	4	4		4	5		9	5		9	10		9	10		10	10		10	10
31	5	8		6	6		8	7		10	12		10	9		12	11		9	11
32	2	5		5	5		6	7		8	6		8	8		6	5		8	5
33	4	5		4	0		7	3		5	6		5	6		6	6		6	6
34	4	5		11	10		6	8		9	8		9	9		8	8		9	8
35	1	3		8	4		10	6		9	11		9	10		11	11		10	11
36	3	3		3	0		4	3		5	5		5	3		5	4		3	4
37	0	2		8	12		2	4		5	7		5	5		7	6		5	6
38	1	3		9	9		6	10		7	8		7	5		8	6		5	6
39	3	4		9	11		4	5		6	6		6	7		6	6		7	6
40	3	4		2	0		3	3		6	4		6	6		4	3		6	3
41	0	3		10	12		4	5		2	6		2	5		6	7		5	7
42	9	4		6	5		8	6		12	9		12	11		9	9		11	9
43	2	5		5	1		8	1		6	7		6	6		7	8		6	8
44	0	6		3	4		10	6		9	9		9	9		9	8		9	8
45	3	5		7	8		10	11		7	7		7	7		7	7		7	7
46	3	4		9	10		10	10		8	6		8	7		6	9		7	9

Test Score Correlations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
47	0	8		8	10		9	10		8	9		8	10		9	10		10	10
48	8	10		6	7		11	12		12	11		12	12		11	12		12	12
49	4	4		8	7		9	10		5	3		5	8		3	5		8	5
50	0	0		9	5		8	10		9	8		9	9		8	8		9	8
51	2	5		8	7		9	9		7	6		7	9		6	8		9	8
52	0	7		7	6		9	8		9	7		9	8		7	9		8	9
53	2	6		5	8		6	10		5	6		5	5		6	6		5	6
54	3	8		12	12		11	11		9	8		9	9		8	9		9	9
55	3	2		7	9		10	10		10	8		10	11		8	9		11	9
56	1	0		7	8		9	9		7	10		7	8		10	10		8	10
57	0	0		5	3		9	4		6	5		6	4		5	5		4	5
58	0	1		1	0		3	2		5	8		5	6		8	8		6	8
59	3	6		9	12		10	10		8	8		8	7		8	9		7	9
60	4	0		6	8		8	11		9	9		9	10		9	8		10	8
61	3	7		10	8		8	7		6	9		6	7		9	7		7	7
62	0	0		8	10		12	12		8	10		8	9		10	10		9	10
63	0	3		8	6		4	0		2	4		2	4		4	5		4	5
64	4	4		5	4		10	10		8	12		8	9		12	10		9	10
65	3	4		8	9		10	10		9	7		9	10		7	8		10	8
66	3	4		10	9		10	11		9	9		9	9		9	10		9	10
67	5	8		10	10		12	10		10	9		10	12		9	10		12	10
68	5	0		10	11		9	10		11	10		11	10		10	10		10	10
69	4	0		8	9		12	10		9	11		9	10		11	11		10	11
70	1	3		5	0		9	3		9	11		9	9		11	10		9	10
71	4	8		9	11		11	10		10	8		10	10		8	9		10	9
72	0	1		3	0		5	1		0	3		0	3		3	4		3	4
73	6	2		11	10		12	12		12	10		12	12		10	10		12	10
74	0	5		8	7		8	9		6	7		6	8		7	8		8	8
75	3	0		7	9		9	9		8	8		8	9		8	10		9	10
76	3	0		8	7		8	10		9	9		9	10		9	9		10	9
77	1	8		6	7		11	9		8	8		8	9		8	8		9	8
78	2	6		9	8		8	10		6	6		6	7		6	8		7	8
79	0	0		6	7		5	8		7	9		7	8		9	11		8	11
80	2	1		8	9		8	12		8	8		8	9		8	8		9	8
81	3	4		7	8		11	12		10	12		10	10		12	12		10	12
82	0	2		8	9		12	11		12	8		12	11		8	9		11	9
83	0	3		10	10		10	11		8	7		8	9		7	7		9	7
84	4	0		6	7		11	6		9	6		9	10		6	5		10	5
85	0	5		9	7		10	12		8	12		8	8		12	10		8	10
86	1	6		7	5		12	10		9	8		9	10		8	8		10	8
87	1	4		5	7		9	8		9	8		9	9		8	8		9	8
88	3	5		8	9		11	10		9	9		9	10		9	9		10	9
89	2	8		8	6		10	10		11	10		11	10		10	10		10	10
90	0	1		2	3		4	3		9	9		9	8		9	8		8	8
91	5	1		9	8		11	10		10	10		10	11		10	10		11	10
92	5	3		7	3		10	11		10	10		10	10		10	11		10	11

Test Score Correlations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
93	5	5		8	7		9	9		11	10		11	9		10	10		9	10
94	4	5		2	1		6	8		9	9		9	8		9	9		8	9
95	4	0		5	4		9	8		10	9		10	10		9	10		10	10
96	3	3		8	7		10	10		10	11		10	11		11	10		11	10
97	0	6		9	8		10	11		9	9		9	10		9	9		10	9
98	3	5		6	5		10	10		9	10		9	10		10	10		10	10
99	2	2		3	2		8	8		10	9		10	9		9	8		9	8
100	1	8		6	7		9	8		11	12		11	11		12	12		11	12
101	4	4		7	8		9	9		10	9		10	11		9	8		11	8
102	0	0		3	4		7	6		9	9		9	6		9	7		6	7
103	5	6		6	4		11	9		10	11		10	10		11	11		10	11
104	0	3		6	1		8	6		9	8		9	7		8	9		7	9
105	2	8		5	4		9	8		11	10		11	11		10	11		11	11
106	0	4		9	8		8	9		9	9		9	9		9	10		9	10
107	2	9		8	2		11	11		10	10		10	9		10	10		9	10
108	6	6		7	6		10	9		10	10		10	10		10	11		10	11
109	3	7		8	8		10	9		11	11		11	10		11	11		10	11
110	2	4		5	4		7	8		10	11		10	10		11	10		10	10
111	5	3		7	3		10	11		12	12		12	11		12	11		11	11
112	1	9		4	8		6	12		9	10		9	10		10	11		10	11
113	0	0		3	3		9	8		9	10		9	9		10	9		9	9
114	2	6		10	4		11	11		12	11		12	12		11	0		12	0
115	4	4		6	4		9	10		10	9		10	9		9	10		9	10
116	2	6		8	4		10	8		12	11		12	11		11	12		11	12
117	0	1		2	3		4	3		6	8		6	6		8	8		6	8
118	2	4		8	8		11	10		9	10		9	10		10	10		10	10
119	2	1		6	4		10	8		10	10		10	10		10	10		10	10
120	3	8		7	3		9	8		10	11		10	10		11	9		10	9
121	1	8		10	4		11	10		11	10		11	9		10	10		9	10
122	1	5		3	3		7	5		9	10		9	9		10	9		9	9
123	4	0		7	3		9	8		10	11		10	10		11	11		10	11
124	0	2		4	3		9	9		9	10		9	8		10	10		8	10
125	0	2		8	6		11	10		10	10		10	11		10	8		11	8
126	2	6		7	5		8	9		8	9		8	9		9	9		9	9
127	2	4		10	7		5	10		8	10		8	9		10	9		9	9
128	0	4		8	4		10	9		10	10		10	10		10	11		10	11
129	4	6		8	5		11	12		12	11		12	12		11	12		12	12
130	3	3		7	6		7	8		9	10		9	8		10	10		8	10
131	0	6		5	3		9	8		10	12		10	10		12	10		10	10
132	3	2		8	6		12	11		9	10		9	10		10	10		10	10
133	3	4		11	12		10	10		10	10		10	11		10	11		11	11
134	0	4		9	8		10	9		10	11		10	11		11	11		11	11
135	5	4		8	6		10	10		11	10		11	12		10	9		12	9
136	2	5		6	3		9	8		10	10		10	10		10	10		10	10
137	0	0		6	6		10	9		12	11		12	12		11	10		12	10
138	0	0		6	3		7	8		10	10		10	11		10	10		11	10

Test Score Correlations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
139	0	0		10	11		10	10		12	10		12	11		10	10		11	10
140	0	0		6	3		9	10		10	10		10	11		10	11		11	11
141	7	2		7	8		9	8		10	12		10	11		12	12		11	12
142	3	6		9	8		9	6		10	10		10	9		10	8		9	8
143	3	1		8	5		9	9		9	10		9	10		10	10		10	10
144	2	6		8	4		9	9		12	12		12	12		12	12		12	12
145	0	6		6	4		10	10		12	12		12	12		12	12		12	12
146	0	0		7	5		10	9		11	12		11	10		12	10		10	10
147	0	0		8	5		11	9		12	12		12	11		12	11		11	11
148	1	0		6	5		10	9		8	9		8	9		9	8		9	8
149	2	6		9	6		10	10		10	10		10	9		10	9		9	9
150	1	4		5	4		9	9		10	11		10	11		11	11		11	11
151	0	6		10	8		9	10		9	9		9	10		9	9		10	9
152	0	1		7	3		9	8		10	10		10	10		10	10		10	10
153	0	0		7	6		8	8		10	9		10	10		9	10		10	10
154	4	6		11	10		10	9		10	11		10	10		11	11		10	11
155	2	7		8	7		11	12		10	11		10	10		11	11		10	11
156	3	7		10	11		9	10		12	12		12	12		12	12		12	12
157	3	0		10	0		9	10		11	11		11	11		11	11		11	11
158	3	2		6	3		10	9		12	11		12	12		11	12		12	12
159	5	5		10	9		12	10		12	12		12	11		12	12		11	12
160	4	3		10	9		10	11		11	11		11	10		11	10		10	10
161	1	3		9	5		10	9		10	10		10	9		10	8		9	8
162	3	3		10	9		11	10		12	12		12	12		12	12		12	12
163	3	4		9	3		10	10		11	10		11	11		10	11		11	11
164	3	5		10	11		12	10		11	11		11	11		11	10		11	10
165	9	4		10	8		12	11		12	12		12	12		12	12		12	12
166	3	5		9	6		12	12		11	10		11	10		10	10		10	10
167	0	7		10	10		9	10		10	11		10	11		11	11		11	11
168	1	5		9	8		9	9		10	12		10	12		12	9		12	9
169	3	5		10	9		11	10		10	12		10	11		12	11		11	11
170	6	6		10	9		9	10		10	11		10	10		11	10		10	10
171	1	5		6	2		6	5		10	11		10	10		11	9		10	9
172	4	4		10	8		10	10		11	10		11	11		10	9		11	9
173	0	6		11	10		11	12		10	12		10	11		12	12		11	12
174	0	3		8	8		10	9		10	11		10	11		11	11		11	11
175	0	1		10	5		12	12		10	10		10	10		10	9		10	9
176	8	7		12	12		12	12		12	12		12	12		12	12		12	12
177	2	8		7	5		10	9		12	12		12	12		12	12		12	12
178	3	4		8	5		10	10		11	10		11	10		10	10		10	10
179	2	5		8	4		10	5		7	8		7	6		8	5		6	5
180	3	8		9	8		8	8		9	8		9	9		8	8		9	8
181	0	0		8	7		6	8		8	9		8	10		9	11		10	11
182	0	4		5	6		8	5		6	9		6	4		9	6		4	6
183	5	4		10	9		8	6		8	9		8	7		9	8		7	8
184	3	6		9	8		7	6		8	8		8	7		8	8		7	8

Test Score Correlations

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
185	2	0		5	1		8	7		7	8		7	8		8	9		8	9
186	4	7		10	8		10	8		9	9		9	10		9	9		10	9
187	3	6		5	5		9	10		8	9		8	9		9	10		9	10
188	4	8		8	7		6	8		9	9		9	9		9	11		9	11
189	1	4		10	8		12	11		8	10		8	8		10	10		8	10
190	3	5		6	6		5	4		10	6		10	8		6	6		8	6
191	3	4		7	6		11	10		9	6		9	6		6	5		6	5
192	1	7		3	3		7	10		9	5		9	8		5	6		8	6
193	1	4		6	2		7	8		10	8		10	7		8	7		7	7
194	3	7		8	8		9	11		10	9		10	10		9	10		10	10
195	2	5		11	8		9	10		8	8		8	8		8	8		8	8
196	0	4		5	4		5	6		7	8		7	5		8	7		5	7
197	1	3		5	6		4	4		5	6		5	6		6	7		6	7
198	8	9		10	11		11	10		12	12		12	12		12	12		12	12
199	2	0		5	2		11	10		6	8		6	7		8	8		7	8
200	5	4		5	5		9	8		8	8		8	8		8	8		8	8
201	0	0		8	10		7	5		12	12		12	12		12	12		12	12
202	3	3		7	5		11	12		8	5		8	6		5	5		6	5
203	0	0		5	6		9	4		6	9		6	6		9	8		6	8
204	2	7		6	4		9	8		5	8		5	6		8	7		6	7
205	0	0		4	1		7	7		6	8		6	7		8	7		7	7
206	8	5		11	10		11	12		8	9		8	9		9	9		9	9
207	5	2		3	1		11	10		9	9		9	8		9	9		8	9
208	3	5		9	8		11	10		8	9		8	9		9	10		9	10
209	3	2		9	8		8	6		6	6		6	6		6	4		6	4
210	0	1		6	4		6	11		6	5		6	6		5	6		6	6
211	4	7		10	6		10	10		9	9		9	10		9	10		10	10
212	6	1		8	10		9	5		10	11		10	9		11	10		9	10
213	0	4		7	7		6	10		8	8		8	9		8	9		9	9
214	0	2		6	4		8	9		6	4		6	7		4	4		7	4
215	2	1		10	8		10	11		9	9		9	10		9	10		10	10
216	2	3		7	6		8	10		11	10		11	10		10	11		10	11
217	2	0		5	6		7	6		8	7		8	9		7	8		9	8
218	r=.32			r=.66			r=.68			r=.66			r=.83			r=.83			r=.71	
219																				
220																				

Analysis of Variance

Anova: Single Factor
Pre Test SESAT
p<.01

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1	43	127	2.953488372	5.188261351
2	44	97	2.204545455	3.747885835
3	45	102	2.266666667	3.109090909
4	45	100	2.222222222	5.222222222
5	39	96	2.461538462	4.412955466

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	17.16384688	4	4.290961719	0.991303059	0.4132	3.4093
Within Groups	913.3361531	211	4.328607361			
Total	930.5	215			p.364	

Anova: Single Factor
Same Different SESAT
p<.01 **5th Week Posttest**

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Group 1	43	263	6.1163	6.96234773
Group 2	44	331	7.5227	4.348308668
Group 3	45	294	6.5333	5.345454545
Group 4	45	381	8.4667	3.027272727
Group 5	39	279	7.1538	4.975708502

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	147.1271995	4	36.782	7.484968043	1E-05	3.4092977
Within Groups	1036.8728	211	4.9141			
Total	1184	215				p.365

Anova: Single Factor
Visual Recognition SESAT **10th Week Posttest**
p< .01

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Group 1	43	269	6.2558	7.623477298
Group 2	44	408	9.2727	4.575052854
Group 3	45	404	8.9778	3.567676768
Group 4	45	444	9.8667	1.618181818
Group 5	39	328	8.4103	3.985155196

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	336.1350426	4	84.034	19.77756789	7.676E-14	3.4093
Within Groups	896.5269945	211	4.2489			
Total	1232.662037	215				p.366

Anova: Single Factor
Post Test Sound Symbol SESAT
p<.01 **14th Week Posttest**

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1	43	333	7.744186047	5.57585825
2	44	353	8.022727273	5.41807611
3	45	442	9.822222222	1.33131313
4	45	479	10.64444444	1.00707071
5	39	316	8.102564103	2.98920378

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	291.3163816	4	72.8290954	22.4780517	2E-15	3.4093
Within Groups	683.6419517	211	3.24000925			
Total	974.9583333	215				p.367

Anova: Single Factor
Sound Symbol SESAT
18th Week Posttest
p< .01

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Group	43	314	7.302325581	4.930232558
Group	44	381	8.659090909	4.136892178
Group	45	434	9.644444444	1.77979798
Group	45	484	10.75555556	0.870707071
Group	39	311	7.974358974	3.341430499

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	325.5954359	4	81.39885897	27.3249306	2.78E-18	3.409297733
Within Groups	628.5527123	211	2.978922807			
Total	954.1481481	215			p.368	

Anova: Single Factor
Pre Test TDT
p<.01

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1	43	198	4.6047	3.76854928
2	44	159	3.6136	8.52167019
3	45	192	4.2667	6.654545455
4	45	166	3.6889	6.128282828
5	39	147	3.7692	7.024291498

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	31.90307216	4	7.9758	1.242828366	0.29384	3.4093
Within Groups	1354.078409	211	6.4174			
Total	1385.981481	215				p.369

Anova: Single Factor
Same Different TDT
p<.01 **5th Week Posttest**

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
1	43	293	6.813953488	14.72646733
2	44	333	7.568181818	7.971987315
3	45	221	4.911111111	5.31010101
4	45	293	6.511111111	7.982828283
5	39	236	6.051282051	6.839406208

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	172.2769631	4	43.06924078	5.031638878	0.000681844	3.41
Within Groups	1806.093407	211	8.559684394			
Total	1978.37037	215				

Anova: Single Factor
Visual Recognition TDT
$p<.01$ **10th Week Posttest**

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Group 1	43	244	5.674418605	6.558139535
Group 2	44	400	9.090909091	8.503171247
Group 3	45	398	8.844444444	3.861616162
Group 4	45	429	9.533333333	1.981818182
Group 5	39	319	8.179487179	5.730094467

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	406.2707787	4	101.5676947	19.20436533	2E-13	3.4093
Within Groups	1115.932925	211	5.288781635			
Total	1522.203704	215				p.371

Anova: Single Factor
Sound Symbol TDT
p<.01 **14th Week Posttest**

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Group 1	43	324	7.5349	5.445182724
Group 2	44	357	8.1136	4.614693446
Group 3	45	451	10.022	0.885858586
Group 4	45	488	10.844	0.907070707
Group 5	39	318	8.1538	3.186234818

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	354.7380288	4	88.685	29.8398519	1E-19	3.40929773
Within Groups	627.0953046	211	2.972			
Total	981.8333333	215			p.372	

Anova: Single Factor
Sound Symbol Timbre
18th Week Posttest
p< .01

Summary

	Count	*Sum*	*Average*	*Variance*
Group 1	43	323	7.511627907	5.255813953
Group 2	44	376	8.545454545	3.463002114
Group 3	45	435	9.666666667	3.5
Group 4	45	470	10.44444444	1.47979798
Group 5	39	318	8.153846154	4.502024291

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	243.9179481	4	60.97948703	16.93336697	4.67554E-12	3.409297733
Within Groups	759.8413111	211	3.601143655			
Total	1003.759259	215			p.373	

Post Hoc Comparisons

Tukey Kramer Comparison for Unequal Groups

Scheffe Multiple Comparison for Unequal Groups

Tukey - Kramer Post Hoc Comparison *Q* Statistics and Critical Values for the Alphabet Discrimination 5th Week Same/Different PostTest

Groups	*X*				$(X_1 - X_k)$
Group 1	6.11				
Group 3	6.53	.42			
Group 5	7.15	1.04	.62		
Group 2	7.52	1.41	.99	.37	
Group 4	8.46	2.35	1.93	1.31	.94
					Q
Group 1					
Group 3	1.27				
Group 5	*4.00	1.85			
Group 2	*4.27	3.00	1.05		
Group 4	**7.12	**5.48	**3.85	*2.84	

Critical Values of Q for *df = 211*

r =	2	3	4	5
*p< .05	2.77	3.31	3.63	3.86
**p< .01	3.64	4.12	4.40	4.60

Note: * = p< .05 **p<. 01

Tukey - Kramer Post Hoc Comparison *Q* Statistics and Critical Values for the Alphabet Discrimination 10th Week Visual Recognition PostTest

Groups	*X*				$(X_1 - X_k)$
Group 1	6.25				
Group 5	8.41	2.16			
Group 3	8.97	2.72	.56		
Group 2	9.72	3.02	.86	.30	
Group 4	9.86	3.61	1.45	.89	.59

				Q
Group 1				
Group 5	**6.75			
Group 3	**8.90	1.75		
Group 2	**9.24	2.68	.97	
Group 4	**11.65	**4.53	*2.87	1.90

Critical Values of Q for *df = 211*

r =	2	3	4	5
*p< .05	2.77	3.31	3.63	3.86
**p< .01	3.64	4.12	4.40	4.60

Note: * = p< .05 **p<. 01

Tukey - Kramer Post Hoc Comparison *Q* Statistics and Critical Values for the Alphabet Discrimination 14th Week Sound Symbol PostTest

Groups	X				$(X_1 - X_k)$
Group 1	7.74				
Group 2	8.02	.28			
Group 5	8.10	.36	.08		
Group 3	9.82	2.08	1.8	1.72	
Group 4	10.64	2.90	2.62	2.54	.82
				Q	
Group 1					
Group 2	.28				
Group 5	1.29	.28			
Group 3	*7.70	*6.66	*6.18		
Group 4	*10.74	*9.70	*9.40	**3.15	

Critical Values of Q for *df = 211*				
r =	2	3	4	5
p< .05	2.77	3.31	3.63	3.86
p< .01	3.64	4.12	4.40	4.60

Note: ** = $p < .05$, * = $p < .01$

Tukey - Kramer Post Hoc Comparison *Q* Statistics and Critical Values for the Alphabet Discrimination 18th Week Sound Symbol PostTest

Groups	X				$(X_1 - X_k)$
Group 1	7.30				
Group 5	7.97	.67			
Group 2	8.66	1.36	.69		
Group 3	9.64	2.34	1.67	.98	
Group 4	10.76	3.46	2.97	2.10	1.12

				Q
Group 1				
Group 2	2.48			
Group 5	1.87	2.56		
Group 3	*6.5	*6.19	.26	
Group 4	*13.3	*11.0	*7.7	*4.30

Critical Values of Q for *df = 211*				
r =	2	3	4	5
p< .05	2.77	3.31	3.63	3.86
p< .01	3.64	4.12	4.40	4.60

Note: * = p< .01

Tukey - Kramer Post Hoc Comparison *Q* Statistics and Respective Critical Values for the Timbre Discrimination 5th Week Same/Different PostTest

Groups	*X*				$(X_1 - X_k)$
Group 3	4.91				
Group 5	6.05	1.14			
Group 4	6.51	1.60	.46		
Group 1	6.81	1.90	.76	.30	
Group 2	7.56	2.65	1.51	1.05	.75
				Q	
Group 3					
Group 5	2.53				
Group 4	**3.72	1.00			
Group 1	**4.41	1.62	.68		
Group 2	**6.02	*3.21	2.39	1.70	

Critical Values of Q for *df = 211*

r =	2	3	4	5
*p< .05	2.77	3.31	3.63	3.86
**p< .01	3.64	4.12	4.40	4.60

Note: * = p< .05 **p<. 01

Tukey - Kramer Post Hoc Comparison *Q* Statistics and Critical Values for the for the Timbre Discrimination 10th week Visual Recognition PostTest.

Groups	*X*				$(X_1 - X_k)$
Group 1	5.67				
Group 5	8.17	2.50			
Group 3	8.84	3.17	.67		
Group 2	9.09	3.42	.92	.25	
Group 4	9.53	3.86	1.36	.69	.44

				Q
Group 1				
Group 5	**7.14			
Group 3	**9.32	1.75		
Group 2	**9.77	2.68	.74	
Group 4	**11.35	**3.78	2.03	1.29

Critical Values of Q for *df = 211*

r =	2	3	4	5
*p< .05	2.77	3.31	3.63	3.86
**p< .01	3.64	4.12	4.40	4.60

Note: * = p< .05 **p<. 01

Tukey - Kramer Post Hoc Comparisons *Q* Statistics and Respective Critical Values for the Timbre Discrimination 14th week Sound Symbol PostTest

Groups	X				$(X_1 - X_k)$
Group 1	7.53				
Group 2	8.11	.58			
Group 5	8.15	.62	.04		
Group 3	10.02	2.49	1.91	1.87	
Group 4	10.84	3.31	2.73	2.69	.82

				Q
Group 1				
Group 2	2.23			
Group 5	2.29	.15		
Group 3	**7.64	**7.19		
Group 4	**12.73	**10.5	**10.35	*3.15

Critical Values of Q for *df = 211*				
r =	2	3	4	5
*p< .05	2.77	3.31	3.63	3.86
**p< .01	3.64	4.12	4.40	4.60

Note: * = p< .05 p<. 01

Tukey - Kramer Post Hoc Comparisons *Q* Statistics and Critical Values for the Timbre Discrimination 18th week Sound Symbol PostTest

Groups	*X*				$(X_1 - X_k)$
1	7.52				
5	8.15	.63			
2	8.54	.92	.39		
3	9.67	2.15	1.52	1.13	
4	10.44	2.92	1.29	1.80	.80
				Q	
1					
5	2.33				
2	**3.68	1.44			
3	**8.27	**5.63	**4.52		
4	**11.68	**8.48	**7.60	*3.20	

Critical Values of Q for *df = 211*				
r =	2	3	4	5
*p< .05	2.77	3.31	3.63	3.86
**p< .01	3.64	4.12	4.40	4.60

Note: * = p< .05 p<. 01

Sheffee Complex Comparison for the Alphabet Discrimination 5th , 10th , 14th, and 18th Week Post Test Groups 1 through 5

5th Week Same Different PostTest

Groups	X_k	n_k	*Coefficients*
1	6.11	43	.2514
3	6.53	45	.263
5	7.15	39	.2280
2	7.52	44	.2573
4	8.46	45	-1.00
$p < .01$		$F = 19.92$	*Critical Value = 13.64*

10th Week Visual Recognition PostTest

Groups	X_k	n_k	*Coefficients*
1	6.261	43	.2514
5	8.41	39	.2280
3	8.97	45	.263
2	9.27	44	.2573
4	9.86	45	-1.00
$p < .01$		$F = 19.90$	*Critical Value = 13.64*

Sheffee Complex Comparison for the Alphabet Discrimination 5th , 10th , 14th, and 18th Week Post Test Groups 1 through 5 (con't)

14th Week Sound Symbol PostTest

Groups	X_k	n_k	*Adjusted Coefficients*
1	7.74	43	.2514
2	8.02	44	.2573
3	9.82	45	.263
4	10.64	45	-1.00
5	8.10	39	.2280

$p < .01$ *$F = 36.25$* *Critical Value = 13.64*

18th Week Sound Symbol PostTest

Groups	X_k	n_k	*Adjusted Coefficients*
1	7.30	43	.2514
2	8.66	44	.2573
3	9.64	45	.263
4	10.76	45	-1.00
5	7.97	39	.2280

$p< .01$ *$F = 66.61$* *Critical Value = 11.88*

Sheffee Complex Comparison for the Timbre Discrimination 5th , 10th , 14th, and 18th Week Post Test Groups 1 through 5

Timbre Discrimination 10th Week Visual Recognition PostTest

Groups	X_k	n_k	*Coefficients*
1	5.67	43	.2514
5	8.17	39	.2280
3	8.84	45	.263
2	9.09	44	.2573
4	9.53	45	-1.00
p< .01		*F = 18.46*	*Critical Value = 13.64*

Timbre Discrimination 14th Week Sound/Symbol PostTest

Groups	X_k	n_k	*Coefficients*
1	7.53	43	.2514
2	8.11	44	.2573
3	10.02	45	.263
4	10.84	45	-1.00
5	8.15	39	.2280
p< .01		*F = 68.52*	*Critical Value = 11.88*

Table 36: Sheffee Complex Comparison for the Timbre Discrimination 5th , 10th , 14th, and 18th week Post Test Groups 1 through 5 (con't)

Timbre Discrimination 18th Week Sound-Symbol PostTest

Groups	X_k	n_k	*Coefficients*
1	7.52	43	.2514
2	8.54	44	.2567
3	9.67	45	.263
4	10.44	45	-1.00
5	8.15	39	.2280
$p<.01$		$F= 42.88$	$CV = 11.88$

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