THE EFFECTS OF INSTRUMENTAL TRAINING ON THE MUSIC NOTATION READING ABILITIES OF HIGH SCHOOL CHORAL MUSICIANS

by
BARBARA A. KLEMP

A Dissertation presented to
The Graduate Committee in the Mason Gross School of the Arts
Rutgers, The State University of New Jersey
in partial fulfillment of the requirements for the degree

DOCTOR OF MUSICAL ARTS
Graduate Program in Music Education
written under the direction of Dr. Rhonda Hackworth and approved by

_____	_____
Rhonda S. Hackworth, Ph.D.	Date
_____	_____
William Berz, Ph.D.	Date
_____	_____
Richard Chrisman, Ph.D.	Date
_____	_____
Judith Nicosia, M.M.	Date
_____	_____
Jeffrey Kunkel, Ed.D.	Date

New Brunswick, New Jersey
December 2009

Abstract

This study examined the effects of instrumental training on the music notation reading abilities of high school choral musicians. Subjects (N = 46) were members of two curricular choral ensembles who engaged in contrasting treatments between pretest and posttest assessments. Survey results indicated musical backgrounds and experiences of the sample, in addition to a demographic profile with regard to age, grade level, and gender. Subjects were placed in subgroups dependent upon 1) their instrumental ensemble experience and 2) whether they had at least one year of private piano study. Throughout the 6-week 300-minute treatment, members of the control group experienced a vocal-only approach to sight-singing, and the experimental group a vocal-instrumental approach, using keyboards. Pretest to posttest score comparisons were made in various configurations within the sample.

Significant differences were found to exist between pretest scores of subjects with and without at least one year of private piano study, but not between students with and without instrumental ensemble experience. There was a significant improvement from pretest to posttest scores within the two groups, but not between. Control group subjects without instrumental ensemble experience and with at least one year of private piano study showed significant improvement in pretest to posttest scores. In the experimental group, subjects with instrumental ensemble experience, and those with *and* without at least one year of private piano study showed significant improvement from pretest to posttest scores.

Examination of statistical results and raw score analysis indicated the vocal-instrumental method to be more effective in training high school choral musicians to sight-sing. Background factors, particularly piano experience, were found to have a positive effect on sight-singing achievement. Further research investigating the impact of antecedent factors to sight-singing achievement may assist educators, parents, and curriculum specialists in designing comprehensive school music programs that realize the potential of student ability in the area of reading music notation.

CONTENTS

Tables and Figures

Table

Figure

CHAPTER 1

The Effects of Instrumental Training on the Music Notation Reading Abilities of High School Choral Musicians

The acquired skill of interpreting music notation is a necessary component of student musicianship. Students who participate in performing ensembles typically display strengths in areas native to their instrument of choice. As students progress, skills taught in the early stages of their training become the building blocks for future achievement. Students who participate in instrumental *and* choral experiences may demonstrate different skill levels, with regard to their accuracy in interpreting music notation, than those of their single ensemble peers.

Choral and instrumental music present similar challenges. Performance goals include blend, balance, intonation, phrasing, breathing, and articulation; dynamic elements range from very soft to very loud. The same principles of melodic and rhythmic notation, Italian terminology, and mathematical relationships are used. Despite these similarities, the areas of instrumental and choral music are often incorrectly considered two separate content areas, *music* and *singing*. Those who play instruments are called *musicians*, and others (who study the vocal instrument) are *singers*. Whereas the Oxford Dictionary defines musicianship as one's "skill as a musician or composer," the Merriam-Webster Dictionary qualifies this definition as relating to "especially instrumentalists." This is quite possibly due to the contrasting methods of instruction often used in the early stages of choral and instrumental music. Whereas music is considered to be a skilled creation or re-creation of notation with the aid of an instrument, singing is often considered an activity based in rote learning, where an ability to read

music notation is not a necessary component. Those students who have participated in instrumental *and* choral ensembles have the advantage of learning to read music notation while training their ears.

Much in the same manner as one capable of reading and writing is considered literate, singers and instrumentalists display musical literacy through the same skill set; notating the music they hear and by hearing notated music internally. Instrumentalists may be able to achieve higher levels of musicianship by integrating the principles of vocal music into their personal practice and ensemble rehearsal regimen. The research available clearly defines the final goal of comprehensive musicianship as attainable with the inclusion of a multifaceted approach, specifically utilizing the oral-aural theory of music learning. Instrumental teachers who employ the principles of vocalization in their ensemble rehearsals on a daily basis may find better intonation and overall musicianship. Davis (1981) found vocalization techniques to have a significant effect on instrumental performance and instruction, as students who simultaneously participated in instrumental and choral ensembles tended to score higher on measures of musical achievement (sight singing and ear training). Instrumental students who vocalized were also found to have greater executive skill development (fingering, bowing, articulation, embouchure, posture, etc.), developmental aptitude, and a better overall attitude toward learning. Although the groundwork for overall musicianship is laid early in a child's music education, these findings were not limited to the beginning instrumentalist. Instrumental training can also be beneficial to choral musicians, as an emphasis is placed upon music notation in the early stages of learning an instrument. This is in opposition to elementary choral training, where children learn to sing mainly by rote imitation (Phillips, 1996).

Hale A. VanderCook (1864-1949), noted musician, composer, and founder of the VanderCook College of Music, theorized when players have a vivid awareness of the correct note, the subconscious brain directs information about the pitch and its desired nuances to the lips as air moves through the lips in order to create sound. VanderCook emphasized the need for instrumentalists of every level to sing the desired pitch in their minds while playing in order to establish the best possible sound. When the subconscious brain responds, the sounds coming from the instrument will directly reflect the conscious awareness, or lack thereof, of those sounds in the brain (Rocco, 1995, p. 18). VanderCook's interpretation of accurate sound production aligns with the music learning theory (Gordon, 2008) of Edwin Gordon, which will be discussed in greater detail in chapter two.

Although most performers and music educators agree that developing one's sense of pitch is necessary for overall musicianship, many wind players are deficient in pitch acuity (Elliott, 1974). String players, however, experience a mental process similar to that of the singer with regard to pitch and tuning. String specialists who employ the use of vocalization acknowledge the regular practice of singing to be an influential factor in their students' development of a sense of pitch (Smith, 1995).

Band and orchestra directors often employ the principles of choral instruction unknowingly, as they sing and gesture to their respective ensembles in order to demonstrate desired phrasing. In an interview with Eastman Wind Ensemble and Wind Orchestra Director Donald Hunsberger (b. 1932), the importance of instrumental directors studying and incorporating the gestures of the choral conductor into their communication with instrumental ensembles was noted. Hunsberger comments that every

musical line should "sing, have beauty, be noble, and above all, be musical" (Lenzini, 1998, p. 16).

The benefits of integrating the school vocal and instrumental curricula are significant in considering the complete music education of our students.

> Whereas players have the capability of playing cognitively without really "hearing" what they are playing, it is a fact that vocalists must "hear" everything they sing, which is a challenge and a blessing at the same time, as they are more naturally connected to their innate musicality. (Weir, 1998, p. 72)

Curricular decisions to exclude singing from the instrumental curricula are inconsistent with the development of student musicianship. "For many extraordinary instrumentalists, the voice has served as a theoretical tool, a pedagogical aid, a sound ideal. Non-technical vocal skills are developed for use in daily musical life in the relatively private spheres of rehearsal, workshop, and conversation" (Cartwright, 1995, p. 30).

Student musicianship potential may not be fully realized without the existence of a cooperative vocal-instrumental curriculum. MENC: The National Association for Music Education acknowledges one the characteristics of a strong school music program to be the extent to which its differentiated activities become integrated, as each serves to strengthen the others (1967, p. 165). In developing student musicianship, we must teach all of music. Instrumentalists must be encouraged to employ vocalization techniques in their efforts to achieve aurally as well as technically, while the choral musician should seek instrumental experiences in order to strengthen their existing knowledge base. Dr. John Stanley Ross, Director of Bands at Appalachian State University, noted his observations of students with multiple ensemble experiences:

> I have found that students who are successful in both choral and instrumental ensembles have more acute ears – they listen louder than they perform. They are able to listen as an ensemble member much better than a pianist or harpist for example. The latter often perform soloistically, and when they are placed in an ensemble setting, they are often a bit out of place. I also find that choral and string musicians often have a linearity of phrase that is sometimes lacking in wind and brass players, since their articulations are often pointed for clarity. With sight-reading, if a student can sight-read well first as an individual, then they will be able to easily transfer those skills into an ensemble sight reading experience. Students often do not like to sight read because they do not do it particularly well. With practice, improvement, and confidence, the sight-reading process can become a very fun activity within the rehearsal setting. There are many ways to establish a sight-reading protocol – each is determined by the needs and abilities of your current students. (John Stanley Ross, personal communication, September 29, 2009)

A strong proponent of incorporating vocal methods in the instrumental classroom, Dr. Ross considers the benefits of a combined choral-instrumental approach to instrumental ensemble training.

> As instrumentalists, we attempt to emulate the human voice – both in tone and phrase. The inclusion of this technique (singing) has made all the difference in my ensembles. When we can help an instrumentalist simultaneously feel and hear air, phrase, and direction, only then might they employ that in their playing. During the rehearsal, the conductor should sing often to demonstrate a phrase, tone, dynamic, articulation, note length, release, etc. Immediately following the demonstration, the ensemble should sing, emulating that which the conductor just sang. Once the singing is correct, then they should play – achieving the same tone and technique achieved while singing. (John Stanley Ross, personal communication, August 20, 2009)

Statement of Purpose

This study investigated the effects of instrumental training on the sight-singing abilities of high school choral musicians. In order to accomplish this task, singers from two of the researcher's curricular choral ensembles first responded to a survey. The purpose of the survey was both demographic (in that it defined the population's age, grade level, and gender) and descriptive (in that it described the population's musical background and experiences). Student achievement (acceptance into County, Regional,

All-State Choirs) and their levels of study (involvement in multiple or single ensembles, private study, and instrumental backgrounds) were used to define the individual musical experiences of the sample. Students were also questioned as to whether their future plans involved a career choice or casual involvement in music.

Following a sight-singing pretest (assessment of skills prior to treatment), subjects began their class meetings with warm up and sight-singing activities. Over a 6-week period, 300 minutes of instructional time were dedicated to sight-singing activities. In the control group, subjects did not deviate from previous methods of training including solfège, rhythmic counting, and use of published sight-singing method books and teacher-designed exercises. In the experimental group, students utilized the same instructional materials as the control group, but also engaged in the use of an instrumental component (keyboards). At the conclusion of the 300-minute treatment, a posttest was given to the sample in order to determine the difference (if any) of sight-singing ability as evidenced through the pretest and posttest scores. Student scores were analyzed between and within ensembles, and also to subgroups within ensembles. The relationships of instrumental ensemble experience and private piano study to the subjects' comparative pretest and posttest scores were the factors guiding the development of hypotheses and research questions.

Hypotheses

In order to focus the intent of the study, the following null hypotheses were formulated:

Ho#1: There will be no significant difference in music notation reading ability evident in pretest scores between subjects with instrumental ensemble

experience and those without.

Ho#2: There will be no significant difference in music notation reading ability evident in pretest scores between students with at least one year of private piano study and those without.

Ho#3: There will be no significant difference in music notation reading ability evident between pretest and posttest scores for either group (control or experimental).

Ho#4: There will be no significant difference in music notation reading ability evident between pretest and posttest scores for subjects with or without instrumental ensemble experience.

Ho#5: There will be no significant difference in music notation reading ability evident between pretest and posttest scores for subjects with or without at least one year of piano study.

Research Questions

This study sought to answer the following research questions:

1. Do students who participate in choral *and* instrumental ensembles display greater accuracy interpreting music notation than choral students without instrumental ensemble experience?
2. Do students who have at least one year of private piano study display greater accuracy interpreting music notation than students without at least one year of private piano study?
3. Did students trained to sight-sing with the aid of the piano throughout the treatment period demonstrated greater improvement in sight-singing

ability than students who were not trained with piano?

Assumptions

1. It was assumed that subjects who participated in the study would provide honest and accurate demographic and descriptive information.
2. It was assumed that a purposeful selection of two curricular choral ensembles of relatively equal ability level would provide the population necessary for the study to be meaningful and valid.
3. It was assumed that all components of the study (survey, pretest, 300-minute treatment, and posttest) would be completed in their entirety by each participant.
4. It was assumed that subjects who had identified themselves as having instrumental ensemble experience and/or at least one year of private piano study would have learned to read basic music notation in their first year of study.

Limitations

The limitations of this study could be related to the size of the population, numbers of males versus females (35 female, 11 male), imbalance of desired student experiences in forming subgroups, prior vocal and/or instrumental lessons, and varied instrumental backgrounds of the population.

Definition of Terms

1. Audiation: The ability to imagine music or hear sound in the mind with understanding.
2. Chorister: a student who participates in a choral ensemble only.

3. Comprehensive musicianship: a means of engaging students in musical learning with a goal of creating greater independence, accomplished by creating a rehearsal setting where performance and knowledge are equally valued and students learn music concepts through a variety of learning experiences (Orzolek, 2004).
4. Demographic survey: a survey which has results that define the age and gender of a population.
5. Descriptive survey: a survey which describes the experiences of a population.
6. Rote learning: The practice of learning by repetition, based on the idea that one will be able to accurately recall the material the more it is repeated.
7. Sight-singing: the ability to sing a piece of music without hearing it first.
8. Tonal memory: the ability to sing a piece of music after hearing it.

Need for the Study

There appears to be a gap in research with regard to the benefits of instrumental training for choral musicians, as most of the literature found to date has concerned the effects of choral training on instrumentalists. The investigation of instrumental training on the music notation reading achievement level of choral musicians appears to be a relatively new body of research. Studies relative to backgrounds of pianists/choral singers are extant, but supporting literature regarding the effects of band or orchestra participation on the notation reading abilities of choral musicians is limited. Numerous studies have investigated the notation reading ability of single ensemble members, but not in relation to those who participate in multiple ensemble experiences. Conclusions

may have curricular implications relevant to the music education profession, as secondary music education programs and post-secondary music teacher preparation programs could ultimately be fashioned to support complementary performance experiences through multiple ensemble membership, in addition to the encouragement of private piano study.

CHAPTER 2

Review of Literature

> Very young children can receive extremely different levels of exposure to and engagement with music simply as a result of the informal music activities of their immediate family members. By the time they start school, these differences can lead to wide disparities in ability to do a variety of musical tasks. (Sloboda, 2005, p. 299)

Elementary Music Instruction: Prologue to Instrumental Methods

Although children experience music throughout infancy and early childhood, for most the process of music education begins in the elementary school. District arts philosophies and teacher visions determine the approach taken, as general music is typically the first formal musical experience students will have. *General* music is often considered interchangeable with *vocal* music and concentrates on the basics of singing, rhythmic understanding, world music, and exposure to elementary repertoire. After students experience general music in their lower elementary years, they often have the opportunity to pursue instrumental and choral ensembles as upper-elementary students.

With the acquisition of musical knowledge and performance skills in the general music experience, students can gain greater musical independence via ensemble membership. Through the activities of singing, listening, and creating music, children become intelligent music makers (Merrill, 2002, p. 37). Further, "the incorporation of singing into the directed listening study process at the elementary school level will result in students developing a higher degree of aural perception and a greater preference for the repertoire studied" (McLean, 1999, p. 239). Development of performance skills involves an integration of psychomotor and cognitive actions, and acquisition of musical knowledge offers students the opportunity for musical growth. As music is an aural art

where the brain receives and interprets musical information via the ear, the development of aural skills is necessary in order to deal intelligibly with music. To process this information is to *think* music; to conceptualize it is to *know* music (Dodson, 1989, p. 27). Hodges (1980) states "of all man's senses, vision brings him the most information about his environment, but hearing is the most pervasive. Although the other senses can be regulated somewhat, man can never escape from sound" (p. 57).

"To be internalized, music learning must begin with the child's own natural instrument, the voice" (Choksy, 1981, p. 6). The practice of singing affords students the opportunity to discover good tone production and intervallic relationships. Elementary methodologies such as Curwen, Dalcroze, Kodály, and Orff, are also useful resources for the elementary, middle and high school instrumental teacher, as approaches can be designed to insure a smooth transition from one level of instrumental teaching to the next (Garner, 2009). For example, the use of echo response in teaching beginning articulation and canonic playing is considered to be a valuable tool in advancing beginning instrumentalists. Although many elementary students have been singing using the Curwen hand signs, this technique is rarely observed in the beginning instrumental class (Burnsed & Fiocca, 1990). Utilization of this method assists in the development of aural perception while enabling the teacher to conduct tone and intonation exercises without printed materials. Performance terms and styles that are part of the instrumental curriculum may also be introduced in the elementary general music classroom, so their later presentation becomes a continuation of concepts previously learned.

Knowledge of elementary general music can be a tremendous asset to the beginning instrumental teacher, and it is advantageous for instrumental directors to

maintain a dialogue with their general music specialists. Familiarity with elementary curriculum guides and materials will allow the instrumental teacher to combine previously learned concepts with the presentation of instrumental performance techniques. Given the opportunity, well-trained music students are able to sing the simple melodies of the beginning instrumental methods text with confidence, a skill that can continue to grow with the musician. In sum, the instrumental teacher who takes their students' musical experiences into consideration prior to beginning an instrument is one who will perhaps make greater strides in connecting knowledge among beginning instrumentalists.

The Kodály philosophy and the elementary instrumental ensemble. Among the most respected approaches to music education is the Kodály philosophy, which includes teaching methods helpful to sight-singing mastery and music literacy (Choksy, 1974). Named after Hungarian composer and music pedagogue Zoltán Kodály (1882-1967), the approach is structured, sequenced, and relates to a child's physical, emotional, aesthetic, and intellectual development. Kodály's philosophy is applicable to the present study, as he believed that "true music learning occurs only with the kind of active music making made possible by music literacy" (Sinor, 1986, p. 36), and that "only where it is based on singing does a musical culture develop" (Kodály, 1971, p. 4).

Madden's (1984) interpretation of Kodály's perspective implies that a highly structured instrumental program must be based upon a strong foundation of music literacy, which includes fundamental singing and listening skills. Kodály thought it was not enough for a child to simply perform music, but that understanding and appreciation of the musical art were the ultimate goals. He championed music as being for everyone

and necessary for healthy human development, and that singing (not instrumental proficiency) was the foundation for broad musical literacy (Howard, 1996, p. 27). Kodály considered comprehensive training in rhythm, solfège, sight-singing, listening, writing, performing, and creating to be necessary for children to learn to appreciate music (Madden, 1984).

Burnsed and Fiocca (1990) found successful beginning instrumental study to call for many of the skills developed in elementary general music programs. Instrumental teachers who familiarize themselves with elementary methods tended to make the successful beginning instrumental experience a continuation of the general (vocal) music curriculum (p. 45). The Kodály elementary program integrates the development of aural skills, which are of enormous value to the developing instrumentalist. Under the Kodály philosophy, children are not encouraged to participate in instrumental music until they are able to demonstrate considerable aural and sight-singing skills (Mann, 1991). Once students have developed aural skills, there is a smoother transition to the presentation of visual material such as printed notation.

Conductor/teacher/violinist Harris Danziger believed too many instrumentalists considered notes strictly in terms of the physical action required to make the pitch sound. The Kodály philosophy, however, is based on the ability to hear as opposed to the mechanics of sound production. Many instrumental ensemble directors will attest to the validity of the Kodály vision, but often dismiss it as elementary**.** The Kodály philosophy implies that directors who incorporate the singing voice into their lessons could greatly advance the musical development and overall performance of their beginning instrumental ensembles (Mann, 1991).

The Gordon theory of music learning. The basic premise of music learning theorist Edwin Gordon is *audiation,* which is described as a foundational musicianship skill that occurs "when we hear and comprehend music for which the sound is not physically present (as in recall), is no longer present (as in listening), or may never have been physically present (as in creativity and improvisation)" (Gordon, 1989, p. 16). Gordon claims the process of audiation occurs when listening to music, performing from notation, playing "by ear," improvising, composing, or notating music. Simply stated, audiation is the ability to imagine sound or hear music in the mind with understanding. He considers audiation the musical equivalent of thinking in language; a cognitive process by which the brain gives meaning to musical sounds. In learning language, children do not speak without hearing speech first, gaining vocabulary and verbal facility over time. The same is true of music, as children gain an aural familiarity with melodies prior to vocalizing the sound (Schleuter, 1984, p. 35). As in early language where the large repertoire of familiar stories serve as readiness for formal reading instruction, the repertoire of songs a child learns to audiate is considered an important measure of musical achievement.

Gordon determines listening and singing as the two skills necessary to develop the ability to audiate. The ability to "hear" that which is not present and the ability to sight-sing (sing music at sight which is only heard mentally, not through a physical reproduction of sound) are useful skills for both instrumentalists and singers. Through the development of audiation skills, vocalists and instrumentalists learn to understand and appreciate music. Gordon differentiates audiation from aural perception, which occurs simultaneously with the reception of sound through the ears. Although musicians audiate

all aspects of sound including timbre, volume, and style, Gordon's music learning theory is concerned specifically with the tonal and rhythmic fundamentals of music (Gordon, 2008).

Music learning theory champions the use of singing, improvising, playing accompaniments, and using tonal and rhythmic solfège in the instrumental classroom. Dalby (1999) believes many band and orchestra directors choose to dismiss Gordon's method because it either incorporates so many skills they have not developed within themselves, or that they consider the approach to be too elementary-based for their students. Dalby acknowledges the trepidation of the typical instrumental teacher, and encourages a gradual incorporation of Gordon's audiation-based approach to the instrumental classroom. Dalby suggests putting away the electric tuner and training students in the principles of good intonation through singing, tuning by the ear instead of the eye.

Richard Grunow, faculty member of the Eastman School of Music and proponent of Gordon's music learning theory, lists twenty-five teaching strategies recommended for beginning instrumentalists in order to train the ear (Gordon, 2005). Most notably, Grunow encourages teachers to have their students sing everything before they play it, to sing while holding their instrument and using the corresponding fingering, and to concentrate on training the ear for three to six months through audiation strategies before printed notation is introduced. Grunow also recommends having the beginning instrumental ensemble learn the repertoire for their first concert by ear, without having been taught music notation. Grunow acknowledges traditional instrumental instruction, in that a performance is typically given within months of beginning training on an

instrument (giving parents a "tangible product" for their investment). The rush to give a performance places the focus on notation reading and technical skills, regardless of student readiness (Grunow, 1999). This practice virtually eliminates any aural skill development (singing) from the instructional process, and the instrument becomes a mechanical tool with no connection to audiation (Grunow, 2005). To the contrary, Grunow finds students to develop musicianship skills faster when trained with an audiation-based approach (Grunow, 2009).

An audiation-based approach to instrumental instruction differs from traditional methods in three primary ways: (1) teaching a "rote before note" method, (2) teaching patterns instead of individual notes, and (3) replacing letter names with tonal and rhythmic solfège. In his application of the principles of audiation to instrumental music instruction, Gordon makes specific reference to vocalization, stating that when students are able to "sing" through their instrument, they play with better intonation, phrasing, expression, and rhythmic flow" (Gordon, 2008). Prior to beginning instruction on an instrument, students who have experienced a general music curriculum that embraces the Gordon philosophy will have built a foundation of audiation skills such as singing, chanting, and rhythmic movement (Gordon, 2008). The groundwork laid by the elementary general music specialist is integral to the effectiveness of the approach of the instrumental teacher. However, not all elementary programs incorporate audiation practices. For Gordon-based instrumental programs, each piece of music is learned initially through singing and executive skill development commences prior to actually playing the instrument. Learning the elements of articulation is presented sequentially by using the voice, breath, mouthpiece, and finally the assembled instrument. In fingering an

imaginary instrument, students sing the tonal and melodic patterns they will later learn on their actual instrument.

Gordon's method encourages a "sound before sight" approach, teaching the student to anticipate a sound prior to actually hearing it. The typical beginning instrumentalist makes sounds on the instrument and plays one note at a time, encouraged to read and play simultaneously. This process does nothing to actually develop audiation skills and connect the inner audiation instrument to the physical instrument being played. Gordon's theory indicates an interrelationship between choral and instrumental music, not only in a technical sense but in an expressive one as well. Gordon believes that the sequence in which music is taught is critical in the development of musical skills, in addition to the ability a child has in learning to fully appreciate music on multiple levels (Gordon, 2008).

Music learning theory may be a method the traditionally trained teacher approaches with excitement, yet is unsure of with regard to implementation. Gordon's method has the potential to improve all aspects of overall musicianship through musical understanding. Instrumental teachers who desire to maximize their students' learning experience may search for their comfort zone with Gordon's techniques, pacing themselves according to their own skills and knowledge. Jordan-DeCarbo (1997) finds Gordon's "sound-to-symbol" approach to have the potential for developing musicianship and music literacy (p. 54).

The Suzuki method. Elements of the Gordon philosophy are evident in methods which preceded his own. Developed in the 1930s, the Suzuki Method is based on the principle that all children possess musical ability, and that this ability can be developed

through a nurturing environment. Suzuki first applied his ideas to the teaching of violin, but the approach of learning by ear (sound before sight) has since been applied to many other instruments, nursery school teaching, and the general music classroom. (International Suzuki Organization, 2009).

The Orff approach. German composer Carl Orff (1895-1982) developed his method of music instruction during the 1920's and 30's. Also known as *Orff-Schulwerk* or *Music for Children*, musical concepts are learned through singing, chanting, dance, movement, drama and the playing of percussion instruments. Songs are memorized using solfège and hand signs, and the use of percussion instruments assists in developing aural perception and visual relationships between intervals (Leeson, 2009). Both an instrumental and vocal model for educators, Orff emphasized the use of simple percussion instruments while building upon a child's natural singing voice. Consistent with previously discussed elementary methods, children who are exposed to the Orff approach are encouraged to create music by ear, without the aid of notation (Hargreaves, 1986).

Music Literacy

The Kodály philosophy champions music literacy as the basis of musical understanding, which includes the ability to read and interpret the symbols in which music is written [Kodály (Young), 1963, Introduction]. Literacy is about the fluent use of a language, whatever that language may be. Like any language, musical notation must be read and translated into sound and meaning (Hershenson, 1988). Shehan (1987) described music literacy as "being among the principle goals of school music programs" (p. 117). A sophisticated language with its own grammar, logic, and syntax, pedagogy has evolved in

order to teach the skills of reading and writing music, with its own methodologies and developmental scope and sequence. Readiness for learning this language and developing music literacy begins in a child's early musical experiences. "Many parallels may be drawn between the teaching of the reading of words and the reading of music" (Heffernan, 1968, p. 9). Through imitation of what they hear, children learn to call objects by name. Soon, they connect thoughts and speak in sentences. As vocabulary expands, children converse and begin to read printed words (Heffernan, 1968). As the aural experience is important for them to learn and use language, "children also need to have certain musical experiences prior to studying notation" (Howard, 1996, p. 28), as frequent opportunities as active participants in music-making provide children with the chance to expand upon their existing skills.

"Music literacy is addressed in the first and fifth standards of the National Music Content Standards, grades 1-12: *Singing alone and with others a varied repertoire of music; reading and notating music,* respectively" (Snider, 2007, p. 1). The proficiency standard for sight-reading in grades 9-12 states "students should be able to sight-read, accurately and expressively, music with level of difficulty of 3 on a scale of 1-6" (Music Educators National Conference, 1994b, p. 61). Conway (2008) considered issues with the implementation of the standards, as a lack of the opportunity to perform individually could compromise the development of sight-singing skills.

> It would seem that singing is one of the standards that most music teachers would agree is an important skill for the music student. However, even in elementary general music settings I have observed what I would consider a misinterpretation of the spirit of this standard. Teaching children to sing must start with an understanding of how one learns to sing and this knowledge is needed by all music teachers - not just those in general music or choral music programs. Most children need some guidance in finding their singing voice and will need a sequence for learning to sing with good intonation. In the same way that not all

> instrumental music programs encourage students to sing, it may be said that not all vocal music programs encourage students to play (although I would suggest that many vocal students do have opportunities to perform on Orff instruments and percussion). Another issue to consider with both Standards 1 and 2 (singing and playing) is the suggestion that students sing or play alone and with others. The spirit of this idea is that students have opportunities to sing or play by themselves and that teachers are knowledgeable of student achievement in singing or playing alone. Unfortunately, I am aware of many vocal and instrumental music programs where students are never asked to sing or play alone. I don't think this represents the spirit of the standard. (Conway, 2008, p. 34)

Leonhard (1953) stated "Pleasure in music is greatly enhanced by the ability to read it" (p. vii). Demorest (2001) is among the music educators (McCoy, 1989; Fitchhorn, 1983; Gregory, 1972) who have found the development of confident sight-singing to help foster musical independence (p. 3), a skill set which exceeds the basic requirements of the proficiency standards.

Before the Standards: Historical Perspectives on Reading Music

Heffernan (1968) considered the beginnings of American music education and the rote-versus-note argument, which has been and continues to be an ongoing issue in music education. American music education had its beginning in the eighteenth century, when singing schools flourished in the colonies. The primary purpose of the singing schools was to teach people to read music for worship, a focus that continued through the public school music curriculum well into the twentieth century. Pedagogues created an astonishing array of methodological devices, many of which are only today being rediscovered (Heffernan, 1968, p. 1). Unlike methods that had preceded his, music educator and innovator Lowell Mason (1792-1872) developed a sound-based approach to music that incorporated the practice of rote singing.

> Before attempting to give children regular instruction in the elements of music, they must be taught to sing easy songs or tunes by rote, or by imitation. This may be done at a very early age, in the family, or in infant schools, in which but little more than this should be attempted. (Mason, 1837, p. 25)

After the American music curriculum expanded (ca. 1920) to include rhythmic activities, music appreciation, and the study of instruments, the six-fold program was established, which included singing, reading rhythms, reading notation, listening, instrumental music, and some attention to creative activities and music in drama. As music education became more fragmented with regard to content, "music reading was either exalted or neglected according to the particular interests of the authors and publishers of the period" (Heffernan, 1968, p. 2).

Sight-Singing in the Contemporary Classroom

Although choral directors value skilled sight-singing, it is apparent that they devote little time to it. Hodges (1992) believes the lack of unified methods, materials, and implementation to be at fault. "Explicit theories of music reading, theories that would organize knowledge and research about music reading into a system of assumptions, principles, and procedures, do not exist" (p. 469). Muzzi (1999) traces the poor development of sight-singing skills to a lack of connectivity to the foundation for music literacy laid in elementary programs.

> Music educators agree that the ability to sight-sing is a vital asset for both choral and instrumental musicians. It is also generally agreed that the teaching of sight-singing is underemphasized in middle and high school music classes. Although many ensembles demonstrate high levels of achievement in performance, individual students may be, and often are, very poor sight-readers. What reading may have begun in elementary school with Orff or Kodály methods is rarely reinforced or continued at the upper levels of public school. (p. 1)

Carey (1959) acknowledged the problem of developing capable sight-readers in the public school music program. "In public school music, there is perhaps no single

problem which is as universal in scope as that of sight reading" (p. 7). Dwiggins (1984) and Daniels (1988) each expressed a need for an improvement of methods for sight-singing, as their perspective of current sight-singing practices has been generalized as "inconsistently taught and haphazardly approached" in many school choral programs (Boyle & Lucas, 1990, p. 1). McClung (2001) reports several researchers to have found singers to be unsuccessful at reading the music they perform (Miller, 1980; Scott 1996), and agrees with Costanza and Russell (1992) that sight-singing instruction is "among the weakest components of choral music instruction" (p. 501). McClung considered these factors in considering the sight-singing systems used by all-state chorus members in six southeastern states. Findings indicated that in order to responsibly develop a common approach to sight-singing which would provide positive learning outcomes, additional research would be necessary (p. 7).

Bertalot (2004) emphasizes the encouragement of singers to think for themselves to be an important step in the process of learning to sight-sing (p. 10). Several authors and researchers (Bertalot, 2004; Scott, 1996; Snider, 2007, Guelker-Cone, 1998; Voth, 2006) report the overuse of the piano in rehearsals to be a hindrance in the development of sight-singing skill among singers. Choral directors who habitually use a piano in rehearsal (as opposed to challenging their singers to read notated music prior to hearing it) are essentially preventing their singers from decoding music notation. Instead, the director takes on the responsibility of doing all of the thinking for each of the non-readers in the ensemble (Bertalot, p. 10). "Consistent rehearsing without accompaniment can improve a choir's sight-singing, intonation, sense of ensemble, and ability to respond to conducting gestures" (Guelker-Cone, 1998, p. 17). Conductors must take on the

responsibility to develop good intonation without the consistent aid of the piano. Voth (2006) concurs with conductors who champion the merits of the unaccompanied choral rehearsal, as this scenario is thought to foster musical independence and develop an awareness of ensemble balance among the singers (p. 6).

Scott (1996) found the perception of time saved in employing rote teaching to be deceptive, and that a rote-only approach compromised rehearsal efficiency in the long run. "A choir's musical capabilities are fatally linked to the director's tendency to pound out parts" (Snider, 2007, p. 6). As rote learning and tonal memory have become more commonplace in the choral classroom, directors typically do not wish to discourage non-readers from choir membership. Instead, directors may choose to alter their rehearsal strategies to include a combination of rote learning, tonal memory, and sight-singing in order to accommodate the multiple skill levels found within their choirs.

Tonal Memory and Rote Learning

Singers engage in a complex cognitive process. For each note sung, the temporal lobe perceives the pitch, the frontal lobe plans the task, the primary motor cortex tells the muscles what to do in order to produce sound, the temporal lobe checks pitch accuracy, and the primary motor cortex instructs the vocal folds to make adjustments. If there is text involved, the occipital lobe is activated (Swanson, 2008). Petzold (1960) described the process of music reading as being "dependent upon the auditory perception of musical sound, visual perception of musical symbols, and the integrative internalized process through which individuals organize their perceptions of given stimuli" (p. 271). Dowling and Harwood (1986) stated memory for single pitches to be "markedly affected" by placing them into musical context (p. 130). When placed into a series of pitches,

musicians tend to “chunk” information, recalling it as a melodic whole as opposed to a series of individual notes (Levitin, 2008). Levitin references the term “chunking” as “tying together units of information into groups, and remembering the group as a whole rather than the individual pieces” (p. 218). This is the essence of tonal memory.

“Words are controlled by intelligence. Music, not to degenerate into a jumble of sounds, is guided by the ear” (Engel, 1920, p. 451). Gorow (2002) defined tonal memory as “the ability to recall a previously sounded tone” (p. 35). Haroutounian (2002) found tonal memory to assist with singing in tune, a skill that is developed through ear training (p. 74). Lamb (1988) defines tonal memory as “pitch retention” and believes this skill to be among the most reliable ways to ensure productive members of the choir. Tonal memory, Lamb claims, “indicates a student’s potential to learn to read music and to learn choral repertoire” (p. 163). Lamb also states that performance in tonal memory is indicative of a student’s ability to sing in tune (p. 163).

Many directors falsely believe their ensembles are reading notation, when they are actually either singing slightly after each pitch is played on the piano or making a guess as to the next pitch. Although most singers appear to be following their scores, many are reading the words only. In addition to reducing their reliance upon the piano in the rehearsal process, one author suggests for directors to abandon their reliance on tonal memory as a teaching method in an effort to focus their singers’ attention on written notation (Bertalot, 2004, p. 7). If the method of choice is tonal memory rather than reading notation, choir members may become too reliant upon their director. As a result, musical independence may suffer. Bennett (1984, p.66) found singers often become expert at tonal memory because it helps them avoid the struggles of music reading, and

that tonal memory skill can develop as well as mask abilities in music literacy. In a study of 204 high school and college choir members from five schools, Mowrer (1996) sought to compare two tonal memory tests' predictive power in assessing students' value to their respective choral ensembles. Mowrer concluded that choral directors who seek to more accurately predict the performance level of their prospective choirs should consider the inclusion of a tonal memory component in their audition processes. Norris (2000) reports practitioners of traditional choral methodology (Brinson, 1996, Lamb, 1988; Roe, 1983) to advocate tonal memory as a classroom tool, as its use could make directors better able to evaluate their singers' aural skills, ability to learn new music, and assess their potential for sight-singing achievement.

Rote teaching, which emphasizes memorization and repetition, is in part related to tonal memory. In the academic world, rote learning is considered to be a method that focuses on precise memorization of presented material as opposed to understanding the inner complexities of a subject. In the choral classroom, rote learning teaches students to rely upon a vocal or instrumental model to present new information, after which it is sung back with little to no understanding of music notation (Brown, 2003, p. 46). As a result, students do not experience reading or writing music. Buchanan (1946) expressed concern over the use of rote teaching, stating "what passes for sight-singing may be more accurately described as sight-guessing, aided by piano or voice, which provides a model to be imitated" (p. iii). In the United States today, rote teaching is considered an "ill-favored version of modeling and imitation that is used to teach melody and rhythm patterns in specific context, and is perceived to require little thought on the part of the students" (Haston, 2007, p. 26).

> Common practice of rote teaching in most American schools is to pass out the music and, taking sections one at a time, to play each part on the piano and ask the students to sing what they hear. The teacher often sings with them, and after several repetitions, it is memorized. As a result, students find little to no use for the printed music. (Cambiata Vocal Music Institute of America, Inc., 2008, paragraph 2)

Among the emerging issues regarding the effects of varied learning experiences on student musicianship, Demorest (2001) finds "the role of performance in comprehensive musicianship is not always clearly associated with the need for music-reading skills" (p. 15). For the population of choral directors looking to prepare a concert performance with limited time, rote learning is often the only option (although a choir of readers would read notation quickly, the process of actually learning to read notation may be time-consuming). Multiple Intelligences theorist Howard Gardner warns that if rote teaching is carried to extremes, modeling and imitation exercises could inhibit a child's creativity (Gardner, 1994)**.** In order to combine an aural *and* visual strategy, Haston suggests the director introduce the new musical concepts and performance skills *prior* to students viewing the printed music (p. 26). Major contributors to the field of music education, (i.e., Dalcroze, Orff, and Suzuki), have all stressed the Pestalozzian-based "sound before sight" approach to learning music, which equates to rote teaching prior to music reading. Although this is a practice preferred by many music educators, Grande (1989) acknowledges that the initially rote-taught child may not learn to read music notation fluently (p. 8).

Sight-reading and Sight-singing

Goins (1999) described "the ability to accurately read and perform music at first sight" as beneficial to all musicians, whether in chorus, band, or orchestra (p. 8). "Although players widely acknowledge the importance of vocal practicing to the

development of improvisational skills, accounts of it have been surprisingly absent from the literature, and of equal concern – from too many classrooms as well" (Cartwright, 1995, p. 27). Focusing upon the oral-aural approach serves all students, and curricular decisions that exclude singing from the instrumental curriculum are not in the best interest of developing student musicianship.

> Teachers should think of vocal and instrumental music as one discipline. Instrumental classes need to stress 'inner hearing.' Singing, before playing or reading music, is essential to good musicianship. The inclusion of Kodály techniques in instrumental class does take additional time. However, the incorporation of these concepts in the instrumental classroom will provide better understanding between (sic) vocal and instrumental teachers and greatly enhance the musicianship of the student. (Howard, 1996, p. 32)

"The most common goal of music reading is the production of a coherent musical performance. The reader converts the visual input into a set of prescriptions for performance – he finds out which notes to play, in which sequence and combination they are to occur, and much else" (Sloboda, 1984, p. 222). Colwell (1963) reports vocal instruction to be based in the acquisition of auditory-visual skills, as the singer typically relies upon their recollection of intervallic structure in performance. Instrumentalists tend to rely on their recollection of fingering patterns in order to perform what is notated in their score. This implies that unless the vocal experience has gone beyond rote learning, the musical score will mean little to the vocalist; for the instrumentalist, there will be a score dependency that makes aural acuity the lesser-emphasized skill.

"Good sight-reading ability is essential for all young musicians, particularly those who participate in ensembles which perform frequently and therefore must learn a great deal of new music during each school year" (Salzberg & Wang, 1989, p. 123). In a study of two instructional approaches, Kendall (1988) sought to determine if the introduction of

music reading activities in the early stages of instrumental instruction compromised a student's development of aural musicianship. The inclusion of such was found to contribute to the development of melodic and rhythmic sight-reading skills, and dividing students' attention between aural and visual activities did not compromise their development of aural musicianship (p. 215).

Music educators, scholars, and investigators have historically agreed that music students must possess a well-developed sense of tonality in order to be an accomplished reader of music notation (Leonhard & House, 1959; Heffernan, 1968; MacKnight, 1975; Krumhansl, 1979; Schleuter, 1984). Grutzmacher (1987) found the incorporation of vocalization activities for beginning instrumentalists to improve melodic sight-reading skills of beginning instrumentalists significantly more than the traditional approach to learning names of notes without vocalization. Grutzmacher also recommends pre-service instrumental teachers (1) enter the profession with an awareness of the benefits of vocalization in the instrumental classroom, and (2) be prepared to employ methods that will incorporate aural activity.

Deutsch (1999) defines sight-reading as "performing from a score without any preceding practice on the instrument of that score" (p. 509). Deutsch identifies sight-reading as a combination of reading and motor behaviors, as the reader is looking ahead to note patterns while performing those previously read. Earlier research (Bean, 1938; Lannert & Ullman, 1945; Lundin, 1985) characterized good sight-readers as good technical instrumentalists, and as rapid readers who are efficient in transforming the read pattern into appropriate musical acts (Deutsch, 1999, p. 509). Wolf (1976) acknowledged sight-reading and memorization to be different cognitive processes. An

examination of the tonal memory process reveals this approach to store information into long-term memory, causing the singer to work at a slower pace. To the contrary, sight-reading typically involves the chunking of information into short-term memory (Deutsch, 1999, p. 511). As tonal memory exceeds the limits of short-term memory, reading music notation becomes a necessary musicianship skill as students advance in their training (Deutsch, 1999). Minsel's (1995) study found that the longer tonal memory exercises are, the more inaccurately they will be performed. This study affirms the limits of memorization, and the importance of developing reading skills as opposed to the use of tonal memory exclusively as a rehearsal strategy.

Stauffer (2005) defines sight-reading as "the ability to translate musical symbols and terms into a musical performance using strict time limits" (p. 21). Heffernan (1968) considered the acquisition of notation reading skills. "The ability to read music, to change the page of printed music notation into sound, is a skill which is gradually acquired. Some people seem to grasp the idea easily while others, even after years of music study, are extremely poor readers" (p. 4). Whether it pertains to choral or instrumental music, there are four problems to be solved while reading music – "*when* to play the note, *how long* to sustain it, *what* note to play, and *how* to play it" (Heffernan, 1968, p. 7). Historically, the lack of ability for the choral musician to sing at sight has frustrated singers and directors alike. Bertalot (2004) describes sight-singing as "the ability to hear in one's head the pitch and rhythm of the next note" (p. 7). Unlike instrumental sight-reading, choral musicians do not have an instrument that physically manipulates pitch. Instead, singers must develop an internal sense of interval structure in order to accurately perform notated music at sight.

> Sight-singing is a problem that has plagued musicians for many years. While some recent research has explored specific factors involved in instrumental sight-reading, little research has been devoted to the development of sight-singing skills. Discoveries about instrumental sight-reading do not readily generalize to sight-singing, because the nature of the vocal task and the instrument requires different skills. (Boyle & Lucas, 1990, p. 1)

In order to successfully sight-sing, performers must rely on their own internal reference points to accurately produce the sound suggested by the written notation. Within a group, however, a singer can forego this individual responsibility by simply following the lead of those around him or her.

> Because the sound rather than the symbol is generating the sound, students are imitating rather than reading. Students trained through imitation rely on clues from each other in order to 'read' the music. While these clues may help simulate a successful 'music reading' experience, they may also mask the fact that music reading is *not* taking place. (Bennett, 1984 p. 62)

Singing in the Instrumental Classroom

Whereas singers can often forego the music reading process and rely upon their auditory skills, instrumentalists can often bypass the process of audiation.

> Because instrumentalists can avoid the auditory internalization necessary for sight-singing, the skill levels of their pitch reading may be even more camouflaged than those of singers. Instrumentalists often learn to 'read' by simply applying a manual reaction to the written musical symbol. No inner hearing is necessary. (Bennett, 1984, p. 63)

Brown (2003) compares the process of reading music in the instrumental and choral classrooms:

> In instrumental performance classes, students continually reinforce their music reading skills by fingering valves, keys, strings, or striking tone bars. Because the musical staff serves as a graph of pitch relationships, students develop visual and kinesthetic associations with music notation. When voice students learn music by rote, however, a conceptual framework of pitch relationships is less apparent to them unless it is reinforced by a singing system. Although students may understand the contours of the music and sing back a melodic line from tonal memory with great ease, they may have difficulty envisioning specific pitch movement or pitch relationships unless they label individual notes. (p. 48)

McIntosh-Johnson (1997) describes sight-singing as "one of the most important aspects of musicianship" (p. 30). In comparing singing to playing the piano, McIntosh-Johnson argues singing to be the one skill that best serves to strengthen other musical skills. The position taken is that singing not only assists students in learning letter names of notes, but also assists in the understanding of intervallic relationships. This understanding guides students toward a more secure sense of pitch. Further, singing also helps develop a sense of phrasing, dynamics, articulation, and confident playing.

Wolbers (2002) describes singing as an opportunity for band students to "develop their aural perception and provide an alternative to the 'button-pushing' mentality" (p. 37). He emphasizes the importance of students developing the ability to hear the music they are producing, not to just see it. In a related article, Rawlins (2004) believes singing to have "everything to do with playing an instrument," as singing is "closely linked to hearing, and hearing is the essential skill of musical performance" (p. 1). Although Rawlins describes embouchure, breath control, and good technique to be important in the mastery of a wind instrument, he believes these elements cannot yield positive results without a trained ear. He goes on to say that the purpose of an instrumentalist singing is not a quality vocal performance, but to gain an ability to hear with one's eyes (without the aid of the instrument) as opposed to their ears. Rawlins finds singing to be the only way to see if instrumentalists can hear with the *mind's* ear (2005, p. 27). He cites the methods of music teachers circa 1940, when music students were required to gain proficiency in music reading and sight-sing prior to studying a musical instrument. In considering the post-secondary music program, Rawlins attributes the rapid progression of musical ability experienced by college freshmen to the new emphasis placed upon the development of

sight-singing and ear-training skills as opposed to the mastery of the technical aspects of one's instrument. He finds overall performance ability to excel as students' aural skills catch up to their technical abilities. "In the early stages of aural development, singing is such a valuable tool in developing the ear that it would be foolish to ignore it" (Rawlins, 2004, p. 2).

Several researchers have reported the effects of singing on secondary level wind instrumentalists. Krubsack (2006) investigated singing as a method to improve the performance achievement of wind instrumentalists. In his study, two bands were taught with contrasting methods: singing (experimental group) and non-singing (control group). Results indicated that students who sang as part of their instrumental study performed at a higher level than those who did not incorporate singing into their practice regimen. Additionally, students who sang agreed singing not only helped them to perform better, but they had also gained a positive attitude toward singing. Students also indicated they were now more inclined to use singing in their practice regimens. Harris (1991) sought to identify a correlation between festival sight-reading ratings and types of instructional behaviors and techniques exhibited by band directors. Subjects (N = 84) represented 25 middle, 5 junior high, 4 junior/senior high and 50 senior high school bands from four Florida Bandmasters Association districts. All of the superior scoring ensembles were found to have utilized singing in their regular rehearsal regimen, which led to less time being spent on general and individual instruction during ensemble training. In all instances, more time was spent on total ensemble issues, and a higher level of overall musicality was attained in the ensemble's concert rating. Jones (2003) also investigated the effect of vocalization on pitch discrimination of high school instrumentalists. Results

indicated the practice of vocalization to assist with the intonation of two of the four bands participating in the study. Schlacks (1981) investigated the effects of vocalization on the pitch accuracy skills of high school band students through an interval training program. Results indicated vocalization improved the pitch accuracy of high school instrumentalists, but not to a large degree.

Unlike band students, string players experience a mental process similar to singers with regard to intonation, and acknowledge the regular practice of singing to be a highly influential factor in developing their internal sense of pitch. In addition to reading music notation, the development of intonation is also of great concern to string teachers at all levels. Smith (1995) set out to measure the effects of an aural-oral pitch matching training program on string students' aural pitch discrimination and to examine what effects aural pitch discrimination had on performance pitch accuracy. In the 16-week study, 96 sixth graders were randomly assigned to either a group that was released from class for two 20-minute training sessions per week with a Pitch Master machine (vocal approach), or to a group that performed the same exercises in class (without vocalization). Pitch Master measures single voice pitches against pre-recorded reference pitches. Wearing headphones, each student sang into a microphone that transmitted their responses. At the conclusion of each response, visual and aural feedback was offered to assess each response. The pitch subtest of the *Colwell Music Achievement Test* (1967) was used to measure aural pitch discrimination. A panel of three public school string teachers assessed the subjects' taped responses on a scale of 5 (poor) to 1 (excellent), and the results indicated that the subjects who worked with Pitch Master demonstrated significant ($p < .001$) improvement in aural pitch discrimination. These

results suggest aural-oral pitch matching training can be effectively used in the development of aural pitch discrimination and performance pitch accuracy of instrumentalists.

Elliott (1974) concluded regular participation in band would result in improved pitch discrimination and tonal memory abilities, but those who also participated in a vocal ensemble would excel beyond the average band member with no vocal training. In a study of six beginning bands (equal in size, ability level, extra-curricular involvement, and achievement), three bands (control groups) were rehearsed without and three (experimental groups) with the incorporation of vocal methods. Although all groups demonstrated improved throughout the school year, significantly higher pretest-to-posttest scores determined the experimental groups to have more improved pitch discrimination and tonal memory abilities than the control groups. Brass and woodwind players were found to be equally affected by the vocalization procedure, and students with piano experience displayed stronger ability in visualizing music notation perceived aurally. It was also concluded that non-pianists who are members of an instrumental ensemble may somewhat compensate for their inability to visualize notation through the implementation of vocal training in their instrumental class. Elliott found the use of vocal methods in the instrumental classroom (and supporting vocal ensemble participation outside of the band class) not only aided in the development of aural pitch discrimination for band members, but also had an effect on those students who participated in both instrumental *and* vocal ensembles. Those students who participated in multiple ensemble experiences tended to score higher on tests of aural acuity than their single-ensemble peers.

Although most performers and music educators agree that developing one's internal sense of pitch is necessary for overall musicianship, many wind players do not have a good sense of pitch (Elliott, C., 1974). The Stecklin-Aliferis study (1957) utilized the *Aliferis Music Achievement Test* as a college entrance level assessment of musicianship skills. This test has consistently revealed the group of students with the better-developed sense of pitch to be those who participate in both a vocal *and* an instrumental ensemble. This is attributed primarily to the mechanical approach used with beginning wind instrumentalists, where the desired pitch is little more than a correct fingering. With few exceptions, intonation is not addressed to the same degree as mechanics in the production of tones on most wind instruments in the beginning band classroom.

> In instrumental music, the reading process involves recognizing the notes, which represent pitch; the meter symbols, which indicate time; and various other interpretive and expressive markings. At the same time, an instrumentalist must physically manipulate valves, bows, slides, and keys. (Hicks, 1980, p. 53)

Cornetist Hale VanderCook described the secret of success on brass instruments as "if you can sing it, you can play it" (Rocco**,** 1995, p. 18). Singing a passage as a student plays it is helpful, as singing and playing are controlled by the same part of the brain. "Players should sing notes in their minds while playing them on the instrument to establish the greatest possible awareness of the sound" (Rocco, 1995, p. 19). "Sound before sight and experience before theory are sound principles that should permeate good pedagogy at all levels of instrumental instruction" (Hicks, 1980, p. 54).

MacKnight (1975) found a higher level of musical understanding and greater instrumental proficiency to occur when instrumentalists are trained to identify tonal patterns, to be actively involved in listening activities, and to sing with tonal syllables and

chant with rhythm syllables. In a study of 90 beginning elementary wind instrumentalists, students were randomly placed in control and experimental groups (further broken down into 6-member lesson groups), and received 30-minute lessons each week for 32 weeks. The content covered in the control and experimental groups was identical, although the presentation to the control group involved the use of a method book only. The experimental group was taught through aural and auditory-visual representations of the material from the method book. MacKnight discovered that singing may improve melodic and harmonic intonation, as it helps students concentrate on the pitch they hear instead of being led astray by a combination of factors including the intonation characteristics of one's instrument, limits of technique, or acoustics of a particular performance space.

Brooks (2001) found singing to be a necessary tool in understanding phrasing, as it frees students from the mechanical demands of their instruments and affords them the opportunity to shape each phrase. Band and orchestra directors often employ the principles of choral direction unknowingly, as they are often heard singing and observed gesturing to their respective ensembles in order to demonstrate desired phrasing. Patrick Brooks**,** Director of Bands at Idaho State University, found "the best musicians are the best listeners" (Brooks, 2001, p. 55). As is the case with many successful band and orchestra directors across the country, Brooks encourages instrumentalists to sing their parts prior to playing them, encouraging them to internalize pitch to a greater degree. This process allows players to use their "internal ears" as opposed to "falsely relying on buttons and slides" in order to produce proper pitches with good tone quality (p. 55). This approach is consistent with the sound-to-symbol (Gordon) method of music learning,

described by Jordan-DeCarbo (1997) as a process that addresses the sequential process of music learning (p. 34).

Dodson (1989) suggests vocalization to be a contributing factor in the realization of musical intelligence. The audiation approach, Dodson explains, could quite possibly provide students with the best possible music education through a successful experience of collaborating musical skills and acquiring the ability to transfer them to new settings. When psychomotor and cognitive skills are effectively integrated in the rehearsal setting through the implementation of vocalization, student ensemble members can acquire greater musical independence.

> There is certainly nothing original about suggesting that band students sing. Those who employ this method, however, have discovered that their students play better in tune and are more successful at sight-reading. Vocalization aids the ability to audiate; in fact, singing forces one to "think music." The young instrumentalist, unfortunately, may function without thinking musically. With regular practice, students will discover that singing contributes greatly to their ability to perform musically. (p. 28)

"Extensive singing is probably the most important activity for developing a sense of tonality and instrument readiness" (Schleuter, 1984, p. 44). In a study of instrumentalists in grades 7 through 12, McPherson (1993) sought to determine the factors and abilities that influence sight-reading skills. McPherson concurred with Schleuter in proposing five essential performance skills for success on a musical instrument: playing by ear, sight-reading, playing from memory, performing rehearsed music proficiently, and improvising (Schleuter, 1984, p. 38). Schleuter finds all these skills to be interrelated in the development of the instrumentalist, but the development of the ear as being the fundamental skill upon which all others are built. McPherson (1993) also found the strongest predictor of sight-reading success to the ability to play by ear.

Many quantitative studies have expanded upon the benefits of singing in the instrumental classroom at all levels. At the elementary level, Davis (1981) studied the effects of structured singing activities and self-evaluation practice on the instrumental music performance, melodic tonal imagery, self-evaluation, and attitude of the elementary band student. In his study, 59 fifth and 34 sixth grade students from three elementary schools were divided into experimental and control groups. While the control group experienced no change in instructional approach, subjects who were engaged in structured singing activities as the sole experimental condition scored higher on instrumental music performance than did the control group, and had the highest mean attitude score. Davis found the combination of structured singing activities and self-evaluation practice to provide a more effective approach to developing instrumental performance skills, self-evaluation, and attitude.

Dunlap (1989) took the concept of vocalization to a different level in studying the effects of singing and solfège training on the musical achievement of beginning fifth grade instrumentalists. Dunlap's research objective was to determine whether fifth graders who engaged in singing and solfège activities in their instrumental classes developed greater aural, performance, and music reading skills than students who did not receive this training. During a 14-week study with 92 fifth graders participating, members of an experimental group vocalized regularly while the control group chanted rhythms, using only their held instrument as a melodic device. Other than this factor, instruction was identical. Although there were no differences between the groups on any of the achievement tests, similarities were found in other areas related to achievement. Dunlap concludes his study detailing the benefits of vocal and instrumental participation stating

that vocal accuracy is indeed related to melodic ear-to-hand coordination, melodic aural-visual discrimination, instrumental performance skills, and music aptitude. Dunlap also found the dual vocal and instrumental approach to enrich the aural, performance, and notation reading skills of students.

In a related study, Coveyduck (1998) examined the effects of singing on the developing intonation of beginning fifth-grade instrumentalists. Two groups were treated differently; the experimental group participated in vocal activities as part of their instrumental lessons, and the control group did not. It was concluded that students from both groups who had a singing background skewed results, as they were found to be consistently higher with regard to their intonation. When subjects with a vocal background were eliminated, no difference was found between the experimental and control groups.

Weaver (1996) reports the positive implications of vocalization for instrumentalists to be of even greater value as a student strives to attain a higher level of expertise. Weaver's study investigated the relationships between performance-based aural musicianship and music achievement of first-year college music majors. Results indicated many first-year undergraduate music majors had potentially serious deficiencies in performance-based aural musicianship. Weaver also concluded that instrumental ear-to-hand coordination may be improved through training, and that keyboard ear-to-hand training improves performance-based aural musicianship regardless of one's primary instrument.

Bloedel Beery (1996) compared instructional approaches with regard to intonation, phrasing, and musical expression, and found the use of vocalization to be

effective in developing musical expression for instrumental students. Comelek (1985) also determined a close relationship between the study of wind instruments and the study of voice. Similarities in teaching methods and preparatory backgrounds also led to the realization that most authors assume successful wind instrumentalists to possess a functional knowledge of singing. Elliott (1982) investigated the relationships among instrumental sight-reading ability and seven selected variables, which included sight-singing ability. It was concluded that students who demonstrated ability as sight-singers were also better instrumental sight-readers.

Robinson (1996) viewed singing to be an accepted component of the music curriculum, as it assists in the development of student musicianship. Robinson considered three possible reasons why instrumental ensemble directors may be reluctant to incorporate vocalization activities into rehearsals: (1) the fear of "wasting time" on non-performance related activities, (2) the lack of the director's confidence in his or her abilities to successfully model singing for their students, and (3) fear that instrumentalists will respond negatively to singing (p. 17). Robinson found the advantages of singing activity in the instrumental rehearsal to include improved sight-reading ability, fewer intonation problems, superior instrumental skills, and more efficient rehearsals (p. 21). Regarding modeling, Robinson describes voice as our major instrument, and admits to the inevitability of error in performance. In order to successfully implement vocalization in the instrumental rehearsal, the director (regardless of experience) must accept the risk of error and establish an environment where students feel free to make mistakes, as risk-taking is essential to student growth. Although students (particularly at the middle and high school levels) are sometimes reluctant to participate in vocal activities, this behavior

typically stems from peer pressure or shyness, not a dislike of singing. As for the ensemble director with little to no experience singing in an instrumental ensemble class, Robinson reminds directors to incorporate vocalization techniques in a positive, non-threatening atmosphere. Appropriate, comfortable, secure vocal modeling on the director's part will eventually give way to positive response and a reaping of the benefits for both student and director. By incorporating vocal activity, students may become more musically literate (p. 21).

Introducing vocalization techniques at the beginning of instrumental rehearsals may improve musical and critical thinking skills of performers, yet they may not often be used. In a study seeking to determine the extent to which vocalization was incorporated into band rehearsals at the high school, junior college, and college levels, Burton (1986) found vocalization not to be a common approach. Results (N = 175) concluded the use of vocalization to be dependent upon the backgrounds of the participants and organization of their music programs. Most instrumental teachers claim not to utilize vocalization techniques in their classrooms, yet it is quite apparent that they do. Instrumental directors may choose to clarify troubling passages rhythmically or melodically through the use of vocal modeling. Further, they can also demonstrate desired articulations through vocal techniques. Singing is often used to explain the unexplainable, whether a theoretical concept or an issue of expressivity.

Sight-Singing in the Choral Classroom

Research has confirmed the development of sight-readers within the choral ensemble to be of value. "One of the goals of choral music education is to aid students in becoming musically independent singers" (Snider, 2007, p. 1). Demorest (1998a)

professes the ability to sing music at sight to be an important part of choral musicianship and choral music education (p. 1). He contends that some music educators, however, strongly advocate the development of aural perception before teaching notation, and continue to support the rote-before-note method of instruction. Concurring with music learning theorist Edwin Gordon, Shehan (1987, p. 118) found audiation to be the result of extensive aural training prior to the presentation of notation. Heffernan (1968) considers the cumulative musical experiences of a child in the process of becoming musically literate:

> Before any attempt is made to familiarize the child with the intricacies of printed music notation, it is absolutely essential that he experience a wide variety of musical activities. It is preposterous to expect a child to be interested in solving the printed score unless he has participated in and enjoyed many aspects of music. Programs of music reading are often begun too early, before the child has gained a sufficient variety and depth of musical experience. (p. 9)

Heffernan (1968) considered elementary music activities and their relationship to notation-reading skill development. As the process of learning to read music is not often considered to be a fun activity, the elementary classroom will often center on activities based in rote learning and tonal memory. "Music reading is often neglected in elementary school music classes. It is more immediately satisfying to have children learn songs by rote; teaching the rudiments is likely to be dismissed as dull, uncreative, and out-of-date. The ability to read music must be gained over a long, carefully planned period of development" (prologue v).

May (1993) sought to describe the methods, amount of class time, and literature used in order to teach sight-singing in 192 Texas high schools. Survey results indicated movable *do* to be the most commonly used melody reading system (82.3%), with 76.7% of the respondents practicing sight-singing with their students four or five days per week.

Performance literature was used most often in practicing sight-singing skills.

Killian and Henry (2005) state that teaching singers to sight-read from notation without allowing them to hear it first continues to be a perennial challenge for choral music educators (p. 52). In a study of 198 high school singers, two melodies were sung from notation; one with a practice session and one without. Overall, scores were higher for the melody sung with practice time. Video analysis showed higher scoring subjects to have used Curwen hand signs, sang out loud, and to have physically kept the beat during their practice time. Further, characteristics of the higher scoring subjects included membership in honor choirs, (region/all-state), piano and/or voice lessons, instrumental ensemble experience, and having directors who administered sight-singing tests.

Finding the time and energy to incorporate sight-reading into the regular rehearsal routine is a difficult task for the choral director (Goins, 1999). Demorest and May (1995) agree that sight-reading is often ignored in the high school choral classroom, and place partial blame upon the pressure to prepare performance repertoire: "Choral music education is often criticized for its emphasis on performance and rote teaching at the expense of developing music reading skills" (p. 156). Demorest (2001) emphasizes the performance pressures of the high school choral ensemble:

> Effective high school choral music teaching has, in recent history, focused more on outstanding performance of song literature than on musicianship skills such as sight-singing. The perception among choral music educators is that teaching sight-singing might hamper the quality of choral performance by taking away instructional time that could be spent preparing literature. (p. 26)

Cappers (1985) concurs with Demorest; "Once the students reach the elective choral program, teachers abandon 'elementary school' approaches in favor of the more expedient (yet, in the long run, less efficient) approach of rote learning. Music learning

stops and singing takes its place" (p. 46). Although a choir full of readers would enable faster learning of the literature in the long run, the "the encoding and decoding or aural and visual stimuli in the task of music reading is a complex perceptual process requiring extensive instruction" (Shehan, 1987, p. 117). Daniels (1988) also found the development of competency in sight-reading to be an area that is often neglected in the field of choral music education (p. 22).

McClung (2008) considered Kodály-based instructional strategies on high school choristers' abilities to sight-sing. In a study of 38 high school singers with extensive sight-singing training (Curwen hand signs and movable *do* solfège), subjects were asked to sight-sing two melodies: one while using Curwen hand signs, and one without. Although no significance was found between the two scores, McClung suggests future research to determine if a relationship exists between use of the Curwen hand signs and the subjects' preferred learning mode, particularly the kinesthetic. As part of the same study, McClung (2008) sought to determine the relationships between instrumental experience, grade, sight-singing experience, Curwen hand sign experience, and the relative scores of the subjects. Results indicated subjects with instrumental experience scored significantly higher while using Curwen hand signs, while subjects without instrumental experience scored significantly higher while *not* using hand signs.

Shehan (1987) found "For beginning musicians, blending visual and aural strategies may best facilitate the learning of rhythm patterns" (p. 123). Nevertheless, it should not be ignored that the understanding of musical structure will ultimately lead to more musical performances (Demorest, 1998a p. 58), and that "breadth of training seems to be an advantage in developing music literacy skills" (Demorest 1998b, p. 9).

Research on Singers with Instrumental Backgrounds

Tucker (1969) investigated factors related to music reading ability of high school choir members as determined by tests of related skills, and concluded that school instrumental experience was a better predictor of music reading ability than vocal experience. Further, no relationship between music reading ability and the number of years experience in choir was measured as significant on his tests. In comparing Tucker's research to his own with regard to background factors that may influence student skills, Demorest (1998b, p. 8) summarized Tucker's research as a hierarchy of experiences that may help develop sight-singing skills:

1. A wide variety of instrumental and vocal experience with approximately six years of piano experience
2. Instrumental experience with approximately six years piano experience
3. Vocal experience with approximately six years piano experience
4. Instrumental experience only
5. Vocal experience only
6. General music experience only
7. No musical experience

In a study of sight-reading characteristics of choral ensembles, Sunderland (1994) found students from stronger sight-reading ensembles to have more instrumental experience, be more inclined to watch notation instead of text, to enjoy sitting beside singers who sang a different vocal part, and to like classical music. Results of the study also indicated that ensembles with better sight-readers tended to rehearse and perform a larger and more varied repertoire. The sight-reading skill of the observed ensembles

appeared to be determined more by previous instructional experiences rather than direct instruction and specific teaching techniques, as all directors were observed to rely heavily on rote teaching techniques for pitch and rhythm. Scott (1996) measured individual sight-singing achievement among 120 high school sopranos and compared the results according to student backgrounds. Results indicated that those participants in their fourth year of choir performed better than first-year members, and, as in the case of Sunderland (1994), those who also had instrumental training performed with greater accuracy than those with choral training only.

Furby (2008) determined years of high school choral participation and years of instrumental ensemble participation to be significant predictors of sight-singing success. Subjects (N = 40) were self-selected from a population of first-year undergraduates auditioning for a large midwestern university choral ensemble. In addition to survey, video observation and audio evaluation of the sight-singing task were the instruments used for data collection. Survey results indicated 97.4% of respondents to have participated in high school choral ensembles, and 43.5% to have also participated in high school instrumental ensembles. A majority (59%) of subjects reported receiving instruction in sight-singing strategies. Data analysis concluded high scorers to have spent more time in silent activity prior to sight-singing. Although low scorers spent more time preparing to sing, they tended to restart the example more often than high scorers. Results indicated multiple musical experiences and prior instruction in sight-singing to be the best predictors of sight-singing success.

Mang (2007) also conducted a study that considered the effects of musical experience on the singing achievement of three groups of adults: instrumentalists,

choristers, and musically untrained. Subjects (N = 75) engaged in two criterion singing tasks, song performance and pitch matching. Results suggested different individual musical experiences to have varying effects on personal singing achievement.

Meyer (1981) considered the sight-singing achievement levels of 121 elementary education majors with varied musical backgrounds enrolled in a music fundamentals course. Subjects were grouped homogeneously according to their musical backgrounds. Two contrasting treatment methods were employed over a 12-week period of 33 fifty-minute class periods. The movable *do* system was used in the control group, and the experimental (instrumental-vocal treatment) group used soprano recorders and the *sol-fa* system. The two instructional approaches were shown to be equally effective in the development of sight-singing skills with this group of subjects.

Piano training. Instrumental music methods for grades 5 through 12 utilize sequential training in order to teach pitch and rhythmic concepts within the curriculum (Johnson, 1987). Johnson acknowledges the logical progression of skills presented to beginning instrumental students and suggests a comparable progression be offered to choral musicians. Johnson (1987) also acknowledges the instrumental-choral relationship, noting "instrumental and choral educators should work to implement successful techniques in both areas to maximize student achievement" (p. 20).

Early studies of the relationship of musical background to both sight-reading skills and musical achievement (Colwell, 1963; Hansen, 1961; Knuth, 1933; Luce, 1965; Tucker, 1969; and Zimmerman, 1962) found the choral-instrumental relationship to be a positive one, particularly when a student has had experience at the piano. Perhaps the most extensive was Colwell's (1963), a study that examined the musical achievement of

4000 students participating in vocal and instrumental music in grades 5 through 12 over the course of a school year. Although instrumental students consistently showed higher musical achievement than vocal students, those students receiving piano training (whether they were instrumentalists or vocalists) demonstrated a higher level of achievement than any other group.

Bozone (1986) considered the use of sight-singing in attempts to improve sight reading abilities of piano students. In a study that compared two second-semester college piano classes, one class (control) engaged in analytical pre-study (aural imagery), and the other (experimental) in analytical pre-study *and* sight-singing activities. Results indicated the class that sang to have a significantly higher mean score in all areas tested (pitch accuracy, rhythm accuracy, expression accuracy, and composite accuracy). Bozone concluded sight-singing to be a valuable tool in the improvement of piano sight-reading skills.

Moss (1987) and Demorest and May (1995) also considered the effects of piano training on choral musicians. Moss investigated the effects of electronic piano instruction on sixth-grade students' music reading abilities. Results indicated that piano instruction was more effective than vocal instruction over the ten-week period with regard to music reading skills. Demorest and May (1995) identified five variables that, in combination, predicted individual student sight-singing performance: 1) years of school choral experience, 2) years of piano instruction, 3) years of instrumental experience, 4) years of voice instruction, and 5) years of outside choral experience (Demorest & May, 1995, p. 161). Examination of these five variables indicated that although all were significant factors, years of school choral experience was the most important background factor. In

addition, piano study played a more important role than did the study of other instruments (including voice).

Daniels (1986) studied the relationship between the group sight-singing achievement of 20 high school choirs and background variables involving the school, the music curriculum, the teacher, and the choir members. The variables that best predicted group sight-singing were found to be (a) the percentage of students having a piano in their homes, (b) the percentage of students participating in all-state chorus, and (c) the percentage of students playing a musical instrument. Results also indicated the attitude of the choral director to have an effect on sight-reading ability of choir members, as teachers who value sight-reading ability in their singers will seek methods to develop these skills (p. 288).

Parks (2005) sought to determine "whether an aural or visual vocal method of sight-singing training that includes portable electronic piano keyboard experience was more effective and time efficient in teaching sight-singing skill to novice high school chorus students than a method that combines only aural and visual vocal training" (p. 3). Parks elaborates upon the uniqueness of the piano in training musicians:

> Of all types of musical instruments, keyboard instruments are among the most effective in engaging three of the five senses simultaneously. The keyboard allows a performer to see, touch, and hear tones and tonal relationships simultaneously. The relationship of tones sounding together in chords and the ability to sing and play at the same time is not physically possible with most other instruments. (p. 6)

In Parks' study, the experimental group utilized techniques associated with the Kodály philosophy while playing keyboards; the control group used Kodály methods only. From pretest to posttest, sight-singing improvement was noted in 96% of the participants, regardless of method. High aptitude students, however, were found to benefit more from

the supplemental keyboard instruction. Parks attributes this to the placement of sound from the keyboard into long-term memory for use in future sight-singing tasks.

> The keyboard experience is, therefore, a reinforcement experience that aids the formation of the aural imagery needed for sight-singing, not a training experience leading to an instrumental performance outcome. The keyboard serves as a visual representation of sound because every interval between pitches is displayed there. The spatial distance can be understood visually as well as aurally. (p. 5)

Wheeler (2007) states, "we must acknowledge that ear and eye skills are equal and complementary partners. The ultimate goal is to be able to see with the ears and hear with the eyes" (p. 35). As no other artistic venture is based upon a combination of sight and sound, Wheeler's statement affirms that aural *and* visual skills are foundational to the very essence of music-making. Voth (2006) concurs with previous research, finding the relationship between piano training and singing to be a positive one.

> Unlike instrumental music-making, in which production of sound is tied directly to outward physical motion and manipulation of an instrument separate from the human body, choral music-making relies upon the unseen human voice. For singers, this demands a sophisticated awareness of how pitches aurally distinguish themselves from one another. This is one of the reasons that choral music educators have often incorporated aids in their teaching to guide singers towards accurate vocal production. One such aid is the piano. (p. 1)

Fine, Berry, and Rosner (2006) acknowledge a fundamental difference between instrumentalists and singers: singers search for visual and auditory relationships in order to find pitch, whereas instrumentalists do not. "Singers must create the pitch internally through subtle kinesthetic processes. External pitch stimuli from other parts should therefore affect singers' ability to pitch notes" (p. 433). The authors sought to find the effects of simultaneous performance of other vocal ensemble parts on sight-singers and questioned the role of familiarity with experience in demonstrated sight-singing ability. The 22 participants all had considerable choral experience (M = 9.7 years, SD = 3.1

years) and considered themselves to be good sight-singers; none reported having absolute pitch. Their mean experience level with regard to playing the piano was 9.6 years (*SD* = 5.4 years), ranging from 0 to 17 years. The participants' choral and piano playing experience was found to be the only significant ($p <$. 05) relationship to exist between the interval test results and overall interval errors in the sight-singing tests. The authors stated their next research intention to be "a direct comparison of sight-reading by singers, pianists, and other instrumentalists with regard to their reliance on auditory representations" (p. 444).

Student Perceptions of Musical Achievement

As a precursor to the current research, Klemp (2006) conducted a qualitative pilot study, the purpose of which was to describe the experiences and perceptions of students who had participated in choral and/or instrumental ensembles. With data collected through the interviews of two student focus groups representative of choral and instrumental ensemble memberships, Klemp sought to describe the experiences and perceptions of students who are members of single and multiple ensemble experiences, assessing their perceptions of complete musicianship and the experiences that support this concept. Results indicated that students perceived their classmates with multiple musical experiences to have stronger musicianship skills with regard to notation reading ability, intonation, and conductor awareness than those who participated in a choral *or* instrumental ensemble. Further, students who participated in choral *and* instrumental music perceived their musical training to be more of a "complete" experience than that of their single ensemble peers. They articulated the skill set they define as necessary in order to be a 'complete' musician as being technically proficient on one's instrument,

having conductor awareness, possessing an adaptability to style, and an awareness of ensemble blend, balance, and intonation in performance.

Students who participated in choral ensembles expressed their belief that they were void in technical areas, but excelled beyond their instrumental-only peers with regard to musical interpretation and expression. Those students who only participated in instrumental ensembles expressed their need for a choral background in order to develop their listening skills minus the aid of their hand-held instrument. Admittedly, students believed a dual emphasis in choral and instrumental techniques to be the best way to achieve one's musicianship potential. It was agreed that ensemble members who play only what is on the page as opposed to interpreting conducting gestures are not good musicians, as interpreting direction is critical for musicality in any ensemble. Dawn, a 17-year-old senior with extensive experience as a band and chorus member, remarked:

> "My choral experiences with so many conductors has made me very aware of conducting in general. Every conductor is different, and I think I understand what conductors are looking for quicker because I've worked with many. In band, you can get away with just reading what's on the page…we really don't watch the conductor except for tempos. In choir, if we're not watching the conductor it just isn't…well…musical."

Students agreed that participation in multiple ensemble experiences was necessary in order to cultivate one's musicianship potential. Although the two focus groups also contained students who were not choral students in their school ensembles, they had the experience of additional music instruction where choral training had been emphasized.

Students interpreted a fully musical experience to include the emotional as well as the technical side of music. Dual emphasis students perceived this to be accomplished to a greater degree by participation in choral ensembles, as they perceived their instrumental experiences to be highly technical in nature with an emphasis on non-emotional aspects.

Choral musicians also found a greater emphasis on building multiple skills, particularly interpretive and emotional ones. They cited expressive differences in conducting choral and instrumental music as a possibility of why this was perceived. Students found their choral conductors to be more communicative regarding the emotional aspects of the music, whereas their experience with instrumental conductors was a more technical experience.

Participants in this study also voiced their opinions with regard to tuning, and agreed that the pre-concert ritual of instrumentalists at the electronic strobe tuner does little to encourage instrumentalists to assume responsibility for their own intonation in performance. Students expressed that a well-trained musician knows good intonation not only depends upon a single tuning note, but also on the ability to tune during performance *and* within harmonic context. An instrumental ensemble comprised of members who have some choral experience may be more likely to make adjustments accordingly, perform with better intonation, and use rehearsal time more efficiently, focusing on the expressive as opposed to the technical. In sum, participants in the study found a complete musician to be not only a technician, but also one who communicates the emotion of the music; it was believed by the students interviewed in this study that this is best attained through active participation in multiple performance ensemble experiences.

Summary

> Sight-singing can be defined as the ability to accurately read and sing the pitches, rhythms, and words of a musical piece at first sight. Achieving competent sight-singing skills is a component of becoming a complete musician. Research has shown that regular sight-singing practice, for even small amounts of time, will improve skills in all areas of musicianship. (Beck, Surnami, and Lewis, 2004, p. 5)

Three specific areas of literature informed this study regarding the benefits of comprehensive musicianship: the Kodály approach to music education, Gordon's music learning theory, and research regarding the benefits of a comprehensive vocal-instrumental experience.

Elliott (1995) states "musicianship equals musical understanding" (p. 68). Vocalization in the instrumental classroom is a necessary component of music education in the coupling of these ideas. The research available in this area, although not abundant, is consistent; student musicianship potential may not be realized without the existence of a cooperative vocal-instrumental curriculum. Although most instrumental teachers do not formally incorporate vocalization into their daily teaching, the research available clearly defines the final goal of comprehensive musicianship as attainable with the inclusion of the oral-aural theory of music learning. Numerous studies have revealed the incorporation of vocalization techniques into instrumental instruction to have a positive effect on student musicianship. Further, research has shown students who participate in choral and instrumental ensembles simultaneously to tend to score higher on measures of music achievement (sight-singing and ear training), have greater executive skill development (fingering, bowing, articulation, embouchure, posture, etc.) and developmental aptitude, and an overall better attitude. Instrumental teachers who employ the principles of vocalization in their ensemble rehearsals on a daily basis find a higher level of musicianship among their students. These findings are not limited to the beginning instrumentalist, though the groundwork for student musicianship is laid early in a child's music education. Although the research is sparse and primarily limited to the relationship between piano study and sight-singing, singers with an instrumental background have

been found to exhibit stronger music reading skills than singers without instrumental experience. Many studies (Parks, 2005; Daniels, 1986; Demorest & May, 1995; Henry & Demorest 1994; May & Elliott, 1980; Scott, 1996; Sunderland, 1994) have concluded keyboard instruction to have a positive impact on the acquisition of sight-singing skills. Several of the studies (Daniels, 1986; Demorest & May, 1995; Henry & Demorest, 1994) also found that simply the presence of a piano in one's home to be a significant factor in the development of sight-singing ability.

CHAPTER 3

Method

The purpose of this study was to investigate the effects of instrumental training on the music notation reading abilities of choral musicians within the realm of performance-based music education at the high school level.

Participants

Subjects (N = 48) for this study were students enrolled in a northern New Jersey high school choral program. Two a cappella choral ensembles participated in the study, each with a membership of 24 students ranging in age from fourteen to eighteen years. The subjects were selected for membership in a cappella ensembles based upon their interest in advancing to an upper-level ensemble, previously demonstrated vocal ability in the entry-level curricular choirs, quarterly vocal assessments, and citizenship within the choral program. In order to be considered for the a cappella ensembles, singers must have also demonstrated ability in tonal memory and participated confidently in entry-level group sight-singing activities. Authentic assessments for each of the district's four curricular choirs consistently occur at the end of each semester, with components including quartet performance of class repertoire, tonal memory, and a brief sight-singing exercise. The control group was a mixed ensemble (SATB; 12 male and 12 female), and the experimental group a treble ensemble (SSAA; 24 female). Males were placed in the mixed ensemble, and females were balanced by voice part and vocal timbre for blend and balance purposes. Neither group was considered to be a more advanced ensemble than the other. Junior and senior members were eligible to audition for honors credit. Students accepted to the honors music program completed additional

performances and projects in order to earn weighted (honors) credit. All students were eligible and encouraged to audition for honor choir experiences and/or participation in extra-curricular music activities.

The principal investigator of this research project was the director of all entry-level and upper-level choral ensembles at the test site. It was assumed that the purposeful selection of two curricular choral ensembles of relatively equal ability level provided the population necessary for this study to be meaningful and valid. Administrative permission was obtained from the site where the study occurred, and all ethical standards and procedures for the study were approved through the Rutgers University Institutional Review Board (see Appendices A – D).

Procedure

The study took place in late Spring 2009. A letter (Appendix A) and consent form (Appendix B) describing the research project were electronically sent to parents/guardians of each subject, and the signed consent forms were returned to the principal investigator. As participants were also audio-recorded, an additional consent form that permitted audio recording (Appendix C) required parent/guardian signatures. Subjects signed an assent form (Appendix D) in class following a discussion of the upcoming study, which afforded students the opportunity to question the researcher/principal investigator (their choral director).

Data Collection

Survey. Initial data collection included survey responses from all subjects. In addition to demographic information, descriptive items assisted the researcher in gathering information regarding each subject's musical background and experiences.

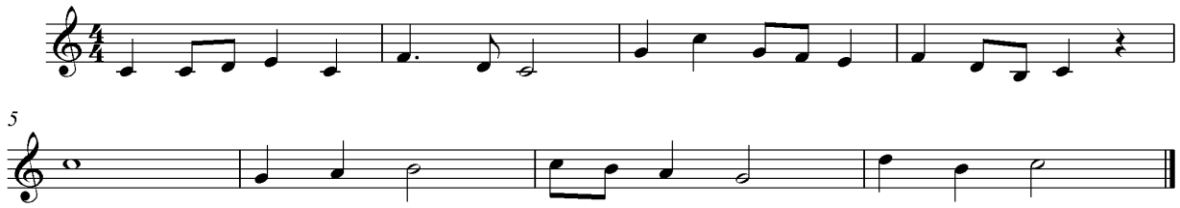
Both groups completed surveys (Appendix E) providing a profile of each subject's musical background and level of participation in performing music. Survey items determined the sample's experiences with regard to instrumental ensemble participation, private piano study, private voice study, participation in extra-curricular musical activities, acceptance into honor choirs, the completion of supplemental curricular music courses (piano and/or music theory), and whether their future plans included a career or casual involvement in music. The survey also provided a demographic examination of the participants with regard to gender, age, and grade level. Survey responses indicated a need for the creation of four subgroups within each ensemble; 1) subjects who had participated in choral *and* instrumental (band/orchestra) ensembles, hereafter referred to as choral plus instrumental (C + I); 2) subjects who had participated in choral ensembles *and* had at least one year of private piano study, hereafter referred to as choral plus piano (C + P); 3) subjects who had participated in choral ensembles who did *not* have instrumental ensemble experience, hereafter referred to as choral minus instrumental (C – I); and 4) subjects who had participated in choral ensembles and had *not* engaged in at least one year of private piano study, hereafter referred to as choral minus piano (C – P). For the purposes of this study, a subject with "instrumental ensemble experience" was defined as one who had studied a pitched instrument (including mallet percussion) *and* participated in band or orchestra for at least one year. This determination was made in accordance with the curricular implications of the test site, in that beginning instrumentalists (students who elected to participate in band and orchestra) would learn to read basic music notation in their first year of instrumental study. The same assumption was made for subjects who identified themselves as having

at least one year of private piano study, as method books typically reinforce notation-reading skills as beginners gain facility. Following the survey, both groups engaged in pretest, treatment, and posttest activities which assisted the researcher in considering the effects of instrumental training on the music notation reading abilities of high school choral musicians.

To assure each subject's anonymity, participants were identified by an alphanumeric code known only to the researcher. The researcher recorded the pretest and posttest performances of each subject.

Pretest. Prior to treatment, student sight-singing ability was assessed through a pretest. Each of the 48 subjects was audio-recorded performing the same 8-measure teacher-designed sight-singing exercise (Figure 1). The exercise was composed in the key of C Major, in common time, and contained whole, half, quarter, and eighth note rhythms. One dotted rhythm was used in the exercise, and the harmonic composition was tonic, subdominant, and dominant throughout the exercise. The exercise was presented to students in treble and bass clefs, and no tempo marking was provided.

Figure 1. Sight-Singing Pretest



Using a MicroTrack II M-Audio digital recording device, participants privately recorded their performances of the sight-singing pretest in the familiar practice rooms

adjacent to the school choral room. Each subject was given the opportunity to review the exercise by sight for an unspecified amount of time, after which they recited their alphanumeric identity code, were given the first pitch, and performed their interpretation of the sight-singing pretest. Since all subjects had been trained in solfège for different lengths of time, they were given the option of singing on a neutral syllable or in solfège. At the conclusion of the collection of the 48 pretests, data was transferred to create 48 audio computer files.

Treatment. Throughout the treatment period, students trained according to the sight-singing approach assigned to their group (vocal-only or vocal-instrumental). The 300-minute treatment was administered during the first 15 minutes of twenty 57-minute class periods over six weeks. During the course of the treatment period, one subject from each group was not able to complete the study in its entirety, and the sample was therefore reduced to $N = 46$ ($n = 23$, $n = 23$). Over the 6-week treatment, the participants in the control group (vocal-only treatment) experienced no difference in their approach to sight-singing activities, most of which incorporated movable *do* solfège and rhythmic counting systems. Subjects began rehearsals with warm-up activities relating to blend, balance, vocal technique, and sight-singing/tonal memory. Materials included published method books, teacher-designed exercises, student-run activities, and repertoire rehearsal. Class work included a balance of accompanied and a cappella activities.

In addition to the methods used with the control group, the experimental group experienced an intervention that augmented traditional sight-singing strategies through the implementation of an instrumental component. Over the same 6-week treatment period, subjects in the experimental group experienced a vocal-instrumental approach to

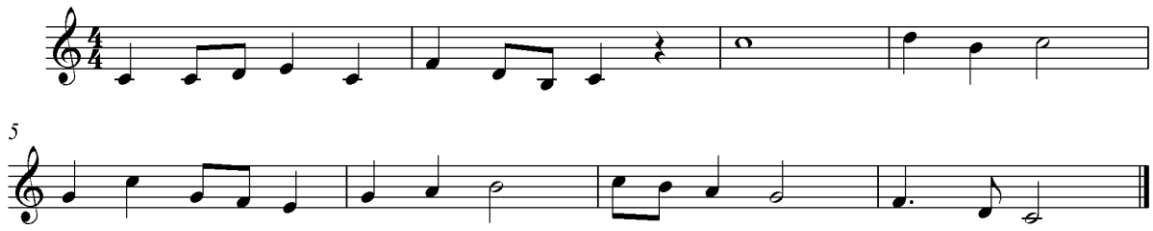
sight-singing activities. In addition to warm-up activities relating to blend, balance, vocal technique, and tonal memory, subjects incorporated digital keyboards (Korg X5D) into their sight-singing activities. The test site had a 16-station music technology lab, where the experimental group met to begin class for the treatment sessions. Subjects with no experience at the piano were paired with those who had piano experience at 7 stations, playing in separate octaves on the same keyboard. Materials used during treatment were selected by the researcher and arranged in order of use at each station. Each of the 16 computers had been loaded with MiBAC music notation reading software (Music Lessons), which added a visual/spatial element to the learning process (virtual keyboard). In addition, Curwen hand signs were downloaded into a desktop file for students to use as a visual reference while sight-singing. Subjects were seated at their stations with headphones, and received direction from the researcher. With the use of a remote desktop feature, the researcher was able to monitor the individual progress of each subject throughout the treatment period.

As was the case for the control group, experimental group materials included published method books, teacher-designed exercises, student-run warm-up activities, and repertoire rehearsal. Throughout treatment, experimental group subjects were introduced to activities that would assist them in developing a spatial relationship with pitch, a physical relationship with rhythm, and the ability to recognize relationships within music notation at sight. Activities were a mixture of accompanied and a cappella in design and implementation. Keyboards, interactive software applications, and Curwen hand signs were the primary methods used in developing special and auditory pitch relationships, and rhythm was addressed via software and from a physical approach (clapping,

swaying, stomping, etc.). Throughout the treatment period, the emphasis for both groups was on the application of previously learned performance skills.

Posttest. At the conclusion of the 6-week, 300-minute treatment, subjects were asked to perform an 8-measure sight-singing posttest (Figure 2), a re-arrangement of the pretest designed to maintain an equitable level of ability in performance (pretest and posttest). The original tonic, subdominant, and dominant harmonic elements from the pretest were preserved in the creation of the posttest exercise. Each subject was given the opportunity to review the exercise by sight for an unspecified amount of time, after which they recited their identity code, were given the first pitch, and performed their interpretation of the sight-singing posttest. As was the case for the pretest, the posttest was presented to subjects in treble and bass clefs, no tempo marking was provided, and participants were given the choice to use either a neutral syllable or solfège for their performances.

Figure 2. Sight-Singing Posttest



The format of the posttest data collection and scoring process was identical to that of the pretest, in that subjects were scored exclusively on their accuracy of pitch and rhythm (without regard to vocal quality or expressive elements). Each subject's score ranged from 0 to 8, indicating the number of measures that were sung accurately. A score of 0 indicated errors in every measure, and a score of 8 indicated that no errors had

occurred. Following posttest data collection, all pretest and posttest data were transferred to a compact disc and thrice duplicated for scoring purposes. Following the creation of the compact disc, the 94 computer files containing the student tracks (48 pretests and 46 posttests) were deleted from the computer hard drive. Two pretest tracks (from subjects unable to complete the study) were excluded from the compact disc supplied to evaluators. The master copy of the compact disc was secured by the researcher throughout the study.

Scoring and Data Security

In order to avoid bias in scoring, the pretests and posttests were scored by three evaluators not affiliated with the test site or subjects. The judges were all experienced high school choral directors who were not privy to the purpose of the study; their charge was to score the pretests and posttests as outside listeners only. Judges were provided with a binder containing the compact disc compilation of the pretest and posttest data, 46 paper copies of the pretest, 46 paper copies of the posttest (labeled by student identity codes in the order they were recorded), and a list of directions to guide them through the scoring process (Appendix F). The researcher entered the preliminary information (judge number and student identity code) for each pretest and posttest, and forms were arranged in the binder in the order that the corresponding subject's track occurred on the compact disc. Judges were asked to clearly draw an "X" through each measure that was sung incorrectly, count the number of measures sung correctly, and record that number (score) beneath each subject's identity code. Upon receipt, the researcher confirmed the scores of the judges by re-checking their correct measure counts. In comparing the scores of the judges, it was found that all three judges were in agreement, as their scores were

identical. At the conclusion of the data collection process, raw scores were recorded into tables. Following the data review process by the researcher, all data was secured in a locked file cabinet. All data (compact discs and judges' score sheets) were destroyed following the data analysis process.

Evaluation of Data

A statistician not affiliated with the researcher, test site, or participants was procured so as to assure that the appropriate statistical tests were performed. The statistician reviewed the intent of the study through an examination of the hypotheses and research questions created by the researcher. Independent sample and paired samples *t*-tests were determined to be the best statistical instruments to compare pretest scores among subjects with varied experiences. The same tests were determined to be appropriate for the pretest-to-posttest score analysis which would assess the effectiveness of both treatment methods.

Survey responses were compiled by the researcher and put into a preliminary table illustrating each subject's experience with regard to: 1) years of instrumental ensemble experience, 2) years of private piano study, 3) years of private voice study, 4) participation in the curricular honors music program, 5) membership in County, Regional, or All-State Choirs, 6) membership in extra-curricular music, 7) plans for music beyond high school, and 8) family support for participation in music. Subjects were ordered according to their survey responses regarding their years of instrumental ensemble experience and years of private piano study, which were the primary responses considered for statistical evaluation of the pretest and posttest data. Demographic and descriptive data were used to determine whether these factors could have influenced the

student sight-singing pretest performance. This information will be reviewed in Chapter 4 (Results).

Following the collection of scores from all three judges, the pretest and posttest data for each subject was added to the preliminary table, merged to create one document containing all data collected through survey, pretest, and posttest for the researcher to analyze. In order to clearly express the experiences of subjects, subjects *with* instrumental ensemble experience were expressed as subgroups [control (C + I)] and [experimental (C + I)], and those *without* instrumental ensemble experience as subgroups [control (C – I)] and [experimental (C – I)] in the data. Subjects *with* at least one year of private piano study were expressed as subgroups [control (C + P)] and [experimental (C + P)], and those *without* at least one year of private piano study as subgroups [control (C – P)] and [experimental (C – P)]. Participants who had instrumental ensemble experience *and* at least one year of private piano study were considered as part of two subgroups (with piano, with instrumental ensemble experience) in the data. The same consideration was made for subjects *with* piano but *without* instrumental ensemble experience, *with* instrumental ensemble experience and *without* piano, and *without* instrumental ensemble experience and *without* piano. Throughout the data analysis process, subjects only appeared in one subgroup being compared at any given time. The classification of student experiences as relative to this study can be viewed in Table 1.

Table 1

Subgroup Classifications for Sample (*N* = 46)

Group	Experience
Control (*n* = 23)	
C + I (*n* = 16)	choral and instrumental ensemble experience
C – I (*n* = 7)	choral without instrumental ensemble experience
C + P (*n* = 11)	choral with private piano instruction
C – P (*n* = 12)	choral without private piano instruction
Experimental (*n* = 23)	
C + I (*n* = 17)	choral and instrumental ensemble experience
C – I (*n* = 6)	choral without instrumental ensemble experience
C + P (*n* = 14)	choral with private piano instruction
C – P (*n* = 9)	choral without private piano instruction

Note: Control group received vocal-only treatment; Experimental group received vocal-instrumental treatment.
Note: "Instrumental ensemble experience" is defined as at least one year of participation in band or orchestra; "private piano instruction" is defined as at least one year of private piano instruction.

In order to assess the effects that instrumental ensemble experience or at least one year of private piano study may have had on the pretest scores of the sample, a series of statistical tests were performed. Results were determined via independent sample *t*-tests, which were performed to address possible relationships of pretest scores to any of the survey items. All of the tests pertaining to instrumental ensemble experience and private piano study were performed between, within, and among all subgroups of the control and experimental groups. Pretest scores of control and experimental subgroups (C + I) were compared to those of control and experimental subgroups (C – I) to determine if instrumental ensemble experience could have been an influential factor in the pretest score. Pretest scores of control and experimental subgroups (C + P) were compared to those of control and experimental subgroups

(C – P) in order to determine whether having at least one year of private piano study could have been an influential factor in pretest scores. Results, frequencies, and comparative representations were provided in a variety of formats.

Pretest to posttest scores between, within, and among the two ensembles were also compared in an effort to demonstrate any effects on the posttest scores that could have resulted from the contrasting 300-minute treatments experienced by either group. In order to evaluate the relationship of pretest to posttest scores, paired samples *t*-tests were undertaken. The comparative results from pretest to posttest data determined any effects of treatment to the experimental group, which were statistically compared to the results of the control group.

CHAPTER 4

Results

This study was designed to investigate the effects of instrumental training on the music notation reading abilities of choral musicians within the realm of performance-based music education at the high school level. Subjects in the control group (vocal-only treatment) were members of a curricular mixed a cappella choral ensemble, and subjects in the experimental group (vocal-instrumental treatment) were members of a curricular treble a cappella choral ensemble. The collective memberships of the two choral ensembles were determined to have demonstrated similar levels of ability as choral musicians. Data that reflected the individual musical backgrounds and interests of each subject were collected through a written survey, and sight-singing achievement was measured before and after treatment via pretest and posttest measures. The control (n = 23) and experimental (n = 23) groups received identical surveys, pretests, and posttests. Two contrasting methods of treatment were incorporated into class activities over a 6-week period. As the test site operated on a modified rotating block schedule, this equated to 15 minutes of twenty 57-minute class periods for each group. The 300-minute treatment received by the control group was a vocal-only approach to sight-singing employing published method books, teacher-designed exercises, and choral repertoire study. The 300-minute treatment experienced by the experimental group also utilized published method books, teacher-designed exercises, and choral repertoire study, but was approached in a format using piano keyboards (vocal-instrumental approach). The survey, pretest, 300-minute treatment, and posttest were administered to both groups by the researcher, who was also the director of both ensembles.

Survey

The purpose of the survey was to describe the musical backgrounds and interests of each subject, and to provide a demographic background of the sample $N = 46$ ($n = 23$, $n = 23$). This information was analyzed to consider factors that *could* have contributed to corresponding pretest scores.

Demographic factors. Demographic results for the control group indicated a mean age of 16.7 ($SD = .33$) years and a mean grade level of 10.9 ($SD = 1.08$), which also implied a mean of 2.9 years of experience in the high school choral music program (all members of both ensembles had been members of the choral program throughout their time in high school thus far). The experimental group had a mean age of 16.9 ($SD = .92$) years and a mean grade level of 11.1 ($SD = .79$), which implied a mean of 3.1 years of experience in the high school choral music program. The pooled mean age for both groups was 16.8 years, with the mean grade level of 11 reflecting a mean of 3 years of experience in the high school choral music program. The gender distribution of the control group was 48% male, 52% female; experimental subjects were 100% female.

Descriptive factors. Descriptive results from the survey indicated mean years of instrumental ensemble experience to be 2.43 ($SD = 2.19$) for the control group, and 3.69 ($SD = 2.82$) for the experimental group. With regard to years of private piano study, control had a mean of 3.04 years ($SD = 3.99$), and 3.74 years ($SD = 3.86$) for the experimental group. Mean years of private voice study were 1.87 ($SD = 2.12$) for the control group and 1.39 ($SD = 2.27$) for the experimental group. Table 2 illustrates these selected descriptive and demographic characteristics of the sample by group.

Table 2

Selected Descriptive and Demographic Data Means and Standard Deviations by Group

Factor	*M*	*SD*	*Range* *min*	*max*	*M*	*SD*	*Range* *min*	*max*
	Control (*n* = 23)				Experimental (*n* = 23)			
Years of Instrumental Ensemble Experience	2.43	2.19	0	8	3.69	2.82	0	9
Years of Private Piano Study	3.04	3.99	0	12	3.74	3.86	0	12
Years of Private Voice Study	1.87	2.12	0	12	1.39	2.27	0	6
Grade Level	10.9	1.08	9	12	11.1	.79	10	12
Age	16.7	.33	14	18	16.9	.92	15	18

Frequencies of other selected descriptive factors for each group (*n* = 23, *n* = 23) and the cumulative sample (*N* = 46) may be observed in Table 3. Of the 29 juniors and seniors eligible for the curricular honors music program, 3 control and 4 experimental subjects (15%) had auditioned, been accepted, and participated. Nine (7 control and 2 experimental) subjects (20%) had completed supplemental curricular music elective courses (piano and theory). Twenty-three (18 control and 5 experimental) subjects (50%) had participated in school-sponsored honor choirs (County, Regional, and/or All-State choruses). Thirty-eight of the 46 (20 control and 18 experimental) subjects (83%) reported participation in some form of extra-curricular music, mostly school-sponsored activities or church choirs. Six (4 control and 2 experimental) subjects (13%) expressed a

desire to follow a career path in music, with 32 (13 control and 19 experimental) subjects (70%) reporting their intent to continue with music as a hobby. The remaining 8 (6 control, 2 experimental) subjects (17%) indicated their future involvement in music to be unknown at the time of the survey. Gender representation was 24% male (11 control, 0 experimental) and 76% female (12 control, 23 experimental). All subjects reported their families to be supportive of their involvement in music.

Table 3

Frequencies of Selected Factors Communicated in Survey

Factor	%		
Honors Music Program	Yes	No	N/A
All participants (*N* = 46)	15	48	37
Control (*n* = 23)	13	43.5	43.5
Experimental (*n* = 23)	18	52	30
Supplemental Curricular Music Courses	Yes	No	
All participants (*N* = 46)	20	80	
Control (*n* = 23)	30	70	
Experimental (*n* = 23)	9	91	
Honor Choir Membership	Yes	No	
All participants (*N* = 46)	50	50	
Control (*n* = 23)	78	22	
Experimental (*n* = 23)	22	78	
Extra-Curricular Music Involvement	Yes	No	
All participants (*N* = 46)	83	17	
Control (*n* = 23)	87	13	
Experimental (*n* = 23)	78	22	
Post-High School Music Plans	Career	Hobby	Unknown
All participants (*N* = 46)	13	70	17
Control (*n* = 23)	17	57	26
Experimental (*n* = 23)	9	83	9
Gender	Male	Female	
All participants (*N* = 46)	24	76	
Control (*n* = 23)	48	52	
Experimental (*n* = 23)	0	100	

Note: Only students in grades 11 and 12 were eligible for the Honors Music program.

Research Question One (Hypothesis One)

The first research question asked if subjects with instrumental ensemble experience displayed greater accuracy on the pretest than those without instrumental ensemble experience. The 33 subjects (C + I) with instrumental ensemble experience represented 72% of the sample. The remaining 13 subjects (C – I) without instrumental ensemble experience represented 28% of the sample. Pretest scores were analyzed between subgroups control (C + I) plus experimental (C + I), and control (C – I) plus experimental (C – I) in an effort to determine whether instrumental ensemble experience *could* have been a contributing factor to the difference in pretest scores between the two pairings of subgroups. The comparison of pretest scores for subgroups (C + I) and (C – I) is presented in Table 4.

Table 4

Summary of Independent Samples t-Tests, Pretest Means for Subjects With (C + I) and Without (C - I) Instrumental Ensemble Experience

Group	*n*	*M*	*SD*	*t*	*p*
	Subjects With Instrumental Ensemble Experience				
(C + I)	33	3.33	2.25	1.26	.22
	Subjects Without Instrumental Ensemble Experience				
(C – I)	13	2.38	2.47		

The mean pretest score of subjects in the collective (C + I) subgroups (N =33) was 3.33 (SD = 2.25). The mean pretest score of subjects in the collective (C – I) subgroups (N = 13) was 2.38 (SD = 2.47). An independent samples t-test revealed no significant difference in music notation reading ability evident in pretest scores between subjects

with instrumental ensemble experience and those without (t = 1.26, p = .22). The first null hypothesis, stating there would be no significant difference in the music notation reading abilities evident between pretest scores of subjects with and without instrumental ensemble experience, was not rejected.

Research Question Two (Hypothesis Two)

The second research question inquired whether subjects with at least one year of private piano study displayed greater accuracy on the pretest than those without at least one year of private piano study. The 25 subjects with at least one year of private piano study (C + P) represented 54% of the sample. The remaining 21 subjects (C – P) represented 46% of the sample. Pretest scores were analyzed between (C + P) and (C – P) subgroups to determine if having at least one year of private piano study *could* have been a contributing factor to the difference in pretest scores between these two pairings of subgroups. The comparison of pretest scores for subgroups (C + P) and (C – P) is presented in Table 5.

Table 5

Summary of Independent Samples t-Tests, Pretest Means for Subjects With (C + P) and Without (C – P) at Least One Year of Private Piano Study

Subgroups	*n*	*M*	*SD*	*t*	*p*
		Subjects With at Least One Year of Private Piano Study			
(C + P)	25	3.76	2.20	2.32	.03*
		Subjects Without at Least One Year of Private Piano Study			
(C – P)	21	2.24	2.23		

*p < .05

The mean pretest score of subjects in (C + P) subgroups (N = 25) was 3.76 (SD = 2.20). The mean pretest score of subjects in (C – P) subgroups (N = 21) was 2.24 (SD = 2.23). An independent samples t-test revealed a significant difference in pretest scores between subjects with at least one year of private piano study and those without (t = 2.32, p = .03). The second null hypothesis, stating there would be no significant difference in the music notation reading abilities evident in pretest scores between subjects with at least one year of private piano study and those without, was rejected.

Additional survey factors. To examine other survey factors that *could* have influenced pretest scores, Independent Sample t-tests were run. A comparison of pretest scores for each factor indicated no statistical significance with regard to gender (t = -.04, p = .97), private voice lessons (t = .33, p = .74), completion of supplemental curricular music courses (t = .07, p = .95), participation in the curricular honors music program (t = 1.16, p = .26), participation in County, Regional, or All-State honor choirs (t = 1.22, p = .23), or participation in extra-curricular music activities (t = 1.81, p = .08). The survey item that compared the pretest scores of 6 subjects who intended on pursuing a career in music (M = 5.5, SD = 2.43) to 32 subjects who expressed interest in continuing with music as a hobby (M = 2.59, SD = 1.9) did produce a significant finding (t = -3.3, p = .002). Subjects whose future plans were unknown at the time of the survey (n = 8) were not included in the statistical comparison. Results may be viewed in Table 6.

Table 6

Summary of Independent Samples t-Tests, Pretest Means by Survey Factors

Factor	*n*	*M*	*SD*	*t*	*df*	*p*
Gender						
Male	11	3.09	2.30	-.04	44	.97
Female	35	3.06	2.36			
Voice Lessons						
Yes	21	3.19	2.18	.33	44	.74
No	25	2.96	2.47			
Supplemental Curricular Music Courses						
Yes	9	3.11	2.85	.07	44	.95
No	37	3.05	2.22			
Honors Music Participation						
Yes	7	3.43	2.44	1.16	27	.26
No	22	2.36	2.01			
Honor Choir Participation (County, Region, All-State)						
Yes	22	3.50	2.58	1.22	44	.23
No	24	2.70	2.04			
Extra-Curricular Music Participation						
Yes	38	3.34	2.37	1.81	44	.08
No	8	1.75	1.58			
Plans for Music After High School						
Career	6	5.5	2.43	-3.3	36	.002*
Hobby	32	2.59	1.9			

*$p < .05$

**$p < .01$

Research Question Three (Hypothesis Three)

Research question three specifically concerns the comparative results of the pretest and posttest assessments, asking if subjects given 300 minutes of treatment in sight-singing with the aid of a piano (vocal-instrumental) displayed greater improvement in sight-singing from pretest to posttest than students who did not receive treatment using piano (vocal-only). Pretest to posttest means were analyzed in order to consider the effectiveness of the treatment methods for the control (vocal-only) and experimental (vocal-instrumental) groups and their respective subgroups. The summative relationship of pretest to posttest means (by group) is presented in Table 7.

Table 7

Summary of Paired Samples t-Tests, Comparison of Pretest to Posttest Mean Scores for Music Notation Reading Ability by Group

Source	*M*	*SD*	*t*	*df*	*p*	*M*	*SD*	*t*	*df*	*p*
	Control					Experimental				
Pretest	3.22	2.28	-3.06	22	.006**	2.91	2.41	-6.03	22	.000**
Posttest	4.22	2.19				5.48	2.19			

**$p < .01$

A paired samples *t*-test revealed a significant increase from pretest ($M = 3.22$, $SD = 2.28$) to posttest scores ($M = 4.22$, $SD = 2.19$) in the control group ($t = -3.06$, $p = .006$). There was also a significant increase from pretest scores ($M = 2.91$, $SD = 2.41$) to posttest scores ($M = 5.48$, $SD = 2.19$) for the experimental group ($t = -6.03$, $p = .000$). The third null hypothesis, stating there would be no significant difference in music notation reading ability evident between the pretest and posttest scores for either group, was rejected.

Research question three specifically asked if the subjects in the experimental group (vocal-instrumental treatment) demonstrated *greater* improvement from pretest to posttest scores compared to subjects in the control group (vocal-only treatment). Results of paired samples *t*-tests (Table 8) indicated there to be no significant difference between the control (M = 3.22, SD = 2.28) and experimental (M = 2.91, SD = 2.41) groups in the pretest scores (t = .44, p = .66). Further, there was no statistically significant difference found between the control (M = 4.22, SD = 2.19) and experimental (M = 5.48, SD = 2.19) groups in mean posttest scores (t = -1.95, p = .058), although it was approaching significance. A larger sample may have revealed the experimental group to had scored significantly higher on the posttest than did the control group. Further, the comparative pretest-to-posttest scores indicated a high level of significance (p = .006, p = .000) for both groups. As a result, neither treatment method was statistically significant over the other. However, raw score analysis indicated a 1-point mean score increase from pretest to posttest scores for the control group, while the experimental group had a 2.57 point mean score increase from pretest to posttest.

Table 8

Summary of Paired Samples t-Tests, Comparison of Pretest and Posttest Mean Scores for Music Notation Reading Ability by Group

	Pretest					Posttest				
Group	*M*	*SD*	*t*	*df*	*p*	*M*	*SD*	*t*	*df*	*p*
Control (n = 23)										
	3.22	2.28	.44	44	.66	4.22	2.19	-1.95	44	.058
Experimental (n = 23)										
	2.91	2.41				5.48	2.19			

Hypothesis four. Relative to research question three, hypotheses four and five concerned the differences from pretest to posttest scores within two sets of four shared-factor subgroups. Hypothesis four stated there would be no difference from pretest to posttest scores for each of four subgroups [(C + I); subjects with instrumental ensemble experience, and (C – I); subjects without instrumental ensemble experience]. Paired samples *t*-tests revealed statistically significant increases from pretest to posttest scores for subgroups [control (C – I); $t = -2.52$, $p = .05$] and [experimental (C + I); $t = -6.59$, $p = .000$]. Pretest to posttest findings for (C + I) and (C – I) subgroups are presented in Table 9. The fourth null hypothesis, stating there would be no significant difference between the pretest and posttest scores within subgroups with or without instrumental ensemble experience, was rejected.

Table 9

Summary of Paired Samples t-Tests, Pretest to Posttest Means by Subgroups With (C + I) or Without (C – I) Instrumental Ensemble Experience

	Pretest		Posttest				
Subgroup	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*
Control (C + I) (*n* = 16)							
	3.25	2.18	3.94	2.14	-1.96	30	.07
Control (C – I) (*n* = 7)							
	3.14	2.67	4.86	2.34	-2.52	12	.05*
Experimental (C + I) (*n* = 17)							
	3.41	2.37	5.88	1.90	-6.59	32	.000**
Experimental (C – I) (*n* = 6)							
	1.5	2.07	4.3	2.73	-2.14	10	.09

*$p < .05$
**$p < .01$

Hypothesis five. The significance of the differences between pretest and posttest means within each of the four remaining shared-factor subgroups was considered in addressing hypothesis five. Hypothesis five stated there would be no difference from pretest to posttest scores for each of four subgroups [(C + P): subjects with at least one year of private piano study, and (C – P): subjects without at least one year of private piano study]. Paired sample *t*-tests revealed statistically significant increases from pretest to posttest scores for the control [(C + P); $t = -3.63$, $p = .005$], experimental [(C + P); $t = -4.38$, $p = .001$] and experimental [(C – P) ; $t = -4.50$, $p = .002$] subgroups. Pretest to posttest findings for the control (C + P), (C – P) and experimental (C + P), (C – P) subgroups are presented in Table 10. The fifth null hypothesis, stating there would be no

significant difference between the pretest and posttest scores within any of the subgroups with or without at least one year of private piano study, was rejected.

Table 10

Summary of Paired Samples t-Tests, Pretest to Posttest Means by Subgroups With (C + P) or Without (C – P) at Least One Year of Private Piano Study

	Pretest		Posttest				
Subgroup	*M*	*SD*	*M*	*SD*	*t*	*df*	*p*
Control (C + P) (*n* = 11)							
	4.27	2.20	5.45	2.30	-3.63	20	.005*
Control (C – P) (*n* = 12)							
	2.25	1.96	3.08	1.38	-1.48	22	.17
Experimental (C + P) (*n* = 14)							
	3.36	2.21	5.36	2.44	-4.38	26	.001**
Experimental (C – P) (*n* = 9)							
	2.22	2.68	5.67	1.87	-4.50	16	.002*

**$p < .01$

A comparison of posttest scores was also made between subgroups (C + I) and (C – I) to test for differences in posttest means for subjects with and without instrumental ensemble experience. The same comparison was made between subgroups with (C + P) and without (C – P) at least one year of private piano study. Results (Table 11) of a paired samples *t*-test revealed significant differences to exist only in the comparative posttest scores between the [(C + I) (t = -2.76, p =.009)] and [(C – P) (t = -3.65, p =.002)] subgroups. Subgroups [(C – I) (t = .37, p = .72)] and [(C + P) (t = .10, p = .92)] did not yield significant results.

Table 11

Summary of Paired Samples t-Tests, Posttest Means Between Shared-Factor Subgroups

Subgroup	*n*	*M*	*SD*	*t*	*df*	*p*
	With Instrumental Ensemble Experience					
Control (C + I)	16	3.94	2.14	-2.76	31	.009*
Experimental (C + I)	17	5.88	1.90			
	Without Instrumental Ensemble Experience					
Control (C – I)	7	4.86	2.34	.37	11	.72
Experimental (C – I)	6	4.33	2.73			
	With at Least One Year of Private Piano Study					
Control (C + P)	11	5.45	2.29	.10	23	.92
Experimental (C + P)	14	5.36	2.44			
	Without at Least One Year of Private Piano Study					
Control (C – P)	12	3.08	1.38	-3.65	19	.002*
Experimental (C – P)	9	5.67	1.87			

**$p < .01$

CHAPTER 5

Discussion

This study was designed to investigate the effects of instrumental training on the music notation reading abilities of high school choral musicians. Hypotheses and research questions specifically considered the relationship of participants' musical backgrounds and experiences to their relative pretest and posttest scores of sight-singing exercises. Factors relating to the musical backgrounds of the sample were also examined to consider the effects of musical involvement through a variety of experiences. With experience as a instrumental and choral music educator, the researcher sought to quantify sight-singing performance, taking into account instrumental ensemble experience and/or private piano study. Results of the study were consistent with previous research in revealing a positive relationship between piano training and sight-singing ability. Although instrumental ensemble experience was not shown to be statistically significant, a comparison of raw scores to survey results indicated a positive relationship. Finally, the entire sample showed improvement from pretest to posttest scores, although the intervention experienced by the experimental group appeared to be more effective.

Members of two curricular high school choral ensembles participated in activities relevant to data collection, which included a survey, pretest, 300-minute treatment, and posttest. Subjects were identified as either control (n = 23) or experimental group (n = 23) members depending upon their class schedule. Each group was further divided into 4 subgroups whose memberships were subjects with instrumental ensemble experience (C + I), without instrumental ensemble experience (C – I), with at least one year of private piano study (C + P), and without at least one year of private piano study

(C – P). Both choral groups perform regularly in a variety of venues (in and outside of the community) during the school year, and experience a great deal of sight-singing activity throughout their regular class activities.

Subjects were interested in participating and anxious to begin. The survey, pretest, treatment, and posttest were all administered to the sample by the researcher (the groups' teacher). Both groups received identical surveys, pretests, and posttests, but experienced different treatment methods, vocal-only (control group) and vocal-instrumental (experimental group). The vocal-instrumental approach experienced by the experimental group contained elements of the test site's Kodály-based elementary curriculum including basic piano study, solfège, and Curwen hand signs, whereas the control group continued with vocal activity only and did not experience any physical/spatial relationship to pitch. Results showed both groups to have a statistically significant improvement in sight-singing scores between the pretest and posttest, although there were differing results in examining the subgroups' performances.

Components of the Study

Survey. Each participant completed a written survey that identified factors relating to individual backgrounds and experiences in performing music. Survey responses were analyzed in multiple formats throughout the study, the first of which was to identify students who did/did not have instrumental ensemble experience, and to identify subjects who did/did not have at least one year of private piano study. These two factors guided all five hypotheses. Since Demorest (1998b, p. 9) found "breadth of training" to be advantageous in the development of music literacy skills, survey responses were analyzed to consider additional musical factors that could have influenced

pretest scores, a topic intended to be the focus of a future study. These additional factors included participation in the curricular honors music program, participation in honor choirs (County, Region, All-State), completion of supplemental curricular music courses, engaging in private voice study, participation in extra-curricular music activities, and post-high school plans for music. The survey also sought to identify demographic factors including age, grade level, and gender. Results revealed a close relationship between the control and experimental groups with regard to age and grade level.

In order to address the disproportionate nature of gender distribution between the groups, an independent samples *t*-test was undertaken. Results indicated the distribution of male versus female participants (11 male, 35 female) to not be significant in the comparison of pretest scores. This finding could impact future research, as ensembles with mixed-voice memberships could be statistically compared to those of treble-voice memberships. However, this finding could also be limited to this particular group of musicians. If mixed and treble ensembles are to be compared in future research, a comparison by gender should be undertaken in order to assure validity of results.

The formation of subgroups during the preliminary stages of designing the study was thwarted when the survey revealed the numbers of subjects having certain experiences [choral background only (n =5), piano only (n = 8)] were not large enough to statistically validate results. For this reason, the classification of experiences was altered for statistical purposes. In comparing survey results of the groups, it was evident that the experimental group had more years of instrumental ensemble experience and private piano study than did the control group. The control group, however, had more years of private voice study than the experimental group. It is of interest that the number

of subjects who indicated no instrumental ensemble experience *and* no private piano study was three in the control group and two in the experimental. This equates to 41 of the 46-member sample having some variety of instrumental and/or piano study, and only 5 subjects not having either experience. For these 5 subjects, their musical background was rooted in the Kodály approach experienced while in elementary school. An examination of the raw scores of these 5 subjects indicated 1 subject to have regressed from pretest to posttest, and 4 to have demonstrated improvement ranging from 3 to 8 points.

An overview of raw scores indicates several interesting findings not evident in the statistical results. The raw pretest scores for the pooled groups indicated subjects with instrumental ensemble experience *and* at least one year of private piano study (17 subjects) to have earned the higher scores, followed by those with at least one year of private piano study only (8 subjects) and instrumental ensemble experience only (16 subjects). Those without any instrumental ensemble or piano experience (5 subjects) earned the lowest scores. In examining the raw posttest scores of the pooled groups, those subjects who had instrumental ensemble experience *and* at least one year of private piano study again earned the superior scores, followed by those with instrumental ensemble experience only, and then subjects with neither experience. It is of interest that the raw scores indicate subjects with private piano study to have had the lower posttest scores. This observation could be attributed to the comparatively small number of subjects (5 without either instrumental ensemble experience or piano study, 8 with piano only) represented in each category.

In examining individual survey responses and relative raw pretest/posttest scores, it was apparent that those subjects who had multiple musical experiences performed with greater accuracy on both the pretest and posttest. It is also notable that the subjects who identified themselves as career-bound in music were observed as performing most confidently and taking less time to examine the exercise prior to their performance. With few exceptions, subjects who had indicated a limitation of musical experiences in their survey responses were observed to demonstrate signs of nervousness, took more time to examine the exercises prior to performing, and generally had the lower pretest scores.

Pretest and posttest performances. The pretest was a teacher-designed, 8-measure sight-singing exercise. As a multitude of sight-singing materials are presented throughout the academic year, the creation of an original exercise assured the pretest not to be a repetition of a former exercise. Composed in the key of C major, in common time, and not rhythmically complex, the exercise contained subtleties that a reader of music notation would acknowledge, but a non-reader might not.

In order to assure a comparable level of performance difficulty, the pretest was rearranged into the posttest. The posttest contained the identical melodic material as the pretest, only in a different order. Cadential and harmonic elements were also preserved from pretest to posttest. For both the pretest and posttest, range limitation was a consideration in composition in order to assure all voice parts were equally able to perform the exercises. Although the posttest was a rearrangement of the pretest, none of the subjects commented that they had recognized its melodic, rhythmic, or harmonic structure.

It is of great interest that most members of the experimental group (vocal-instrumental treatment) were observed using their hands in order to create a physical/spatial relationship with pitch as they sang their posttest, mimicking a "virtual" piano under their hands or even using the Curwen hand signs. Several sang either in solfège or with numbers. The emphasis of their treatment was using piano, Curwen hand signs, and solfège/number systems in order to identify intervallic relationships while singing; although these methods were used extensively during treatment, they were not suggested for posttest performance. It was evident that the experimental group applied the strategies taught in the treatment process in their posttest performances. Demorest's (2001) comments regarding the development of confident sight-singing to be helpful in fostering musical independence were witnessed in this regard, as subjects in both groups who had displayed nervous tendencies in the pretest seemed much more at ease for the posttest. This could be attributed to a higher level of confidence in notation reading skills following treatment, having a level of comfort in their strategy for sight-singing, or simply having the unknown pretest experience behind them (the posttest format mirrored that of the pretest).

Implications of Statistical Results

Pretest scores were interpreted as indicative of each subject's musical background and experiences. In comparing pretest scores, it was not necessary to view the control and experimental groups separately (research questions one and two), since the only "treatment" involved was in consideration of each subject's prior musical experience. Subgroups referenced as (C + I) were viewed as those *with* instrumental ensemble experience, and (C – I) as those *without* instrumental ensemble experience. Results of

pretest scores revealed no statistically significant difference between pretest scores of subjects with *or* without instrumental ensemble experience. The differences in pretest means for subjects with (C + P) or without (C – P) at least one year of private piano study, however, were shown to be significant. This could be indicative of the physical/spatial connection that could have been attributed to a higher degree to private piano study than (band or orchestra) instrumental ensemble experience (Parks, 2005; Demorest & May, 1995; Tucker, 1969; Colwell, 1963). Subjects in control subgroup (C + P), those who had at least one year of private piano study, scored significantly higher on the pretest than those who did not. In the experimental group, there was no statistically significant difference of pretest scores between subjects with (C + P) or without (C – P) at least one year of private piano study, although subjects who did scored higher. These findings are consistent with previous research (Voth, 2006; Fine, Berry, & Rosner, 2006) that details the complementary nature of a piano-choral experience.

Results of the pretest-to-posttest comparison (research question three) revealed both groups to have shown statistically significant improvements in sight-singing scores between the pretests and posttests, quite possibly reflecting the results of treatment for both groups. Although the mean pretest-to-posttest score increases were substantial, neither treatment method showed statistical significance over the other ($p = .006$, $p = .000$). In comparing the pretest-to-posttest raw score increases for each group, however, it is apparent that the vocal-instrumental treatment undertaken with the experimental group (2.57 point increase) may have been more effective than the vocal-only treatment (1 point increase) achieved by the control group. There was also no statistical significance shown between the control and experimental groups in the

comparison of pretest (p = .66) or posttest (p = .06) scores. In the case of the posttest, however, a larger sample might have revealed the experimental group to have scored significantly higher than the control group, as statistical significance was approaching (p = .058). In the future, it is suggested the study be replicated with a larger sample and that the subjects be purposefully selected to reflect all levels of musical backgrounds and experiences.

Review of raw scores for the control group (vocal-only treatment) showed 2 subjects (9%) with a decrease and 8 subjects with no change (35%) from pretest to posttest scores. Remaining members of the control group (13 subjects, or 56%) showed an increase ranging from 1 to 4 points. The experimental group (vocal-instrumental treatment) results revealed one subject (4%) to have had a decrease in their pretest-to-posttest score, while three (13%) showed no improvement. Remaining experimental group members (19 subjects, or 83%) showed improvement in their pretest to posttest scores ranging from 1 to 8 points.

Future Research

Sloboda (2005) described the ability to read music as "an irreplaceable asset to anyone who indulges in musical activity" (p. 5). He continued to question the amount of research available:

> …the amount of attention devoted to music reading by teachers, educationalists, and psychologists has, on the whole, been very small. Influential commentators on psychological aspects of music have had little to say about music reading. This neglect is unjustified in the consideration of the importance of music literacy for overall musical competence. (p. 5)

There is need for future research with regard to the effects of instrumental training on the music notation reading abilities of high school choral musicians. As the literature

is limited, more study is required in order to explore the implications of a cooperative choral-instrumental curriculum. It would be of interest to this researcher to replicate the study with a larger sample, one that would also allow for a comparison of subjects void of any instrumental or piano experience, to be included in an analysis of variance of pretest to posttest scores. Since results of the current study showed significance, it would also be of interest to increase the treatment to reflect a longer time period, perhaps 12-16 weeks. Assessments administered every four weeks would serve to evaluate progress at different times throughout the treatment. In order to assure valid memberships of all subgroups, the survey would encompass a much larger sample, from which the researcher would make a purposeful selection of subjects representing descriptive factors of interest. Purposeful selection would allow for statistical validity, as the numbers of subjects in each subgroup would be determined prior to data collection.

It would also be of interest to examine the sight-singing/sight-reading relationship of string instrumentalists to singers, as Smith (1995) noted string players may experience a mental process similar to that of singers with regard to pitch and tuning. This relationship is intriguing in that Smith examined the aural-oral relationship with regard to individual pitch and tuning, but not with regard to performance within an ensemble. In that Smith found this relationship to be comparable between string players and vocalists only, band members would not be part of the sample. The limitation of literature regarding string players and choral musicians is good reason to pursue a study focusing on this relationship.

As a follow-up to the present study, an investigation of those factors antecedent to pretest scores would be of interest in determining effects of musical background and

experience on performance. For a study of this nature, subjects would need to complete a more detailed survey, followed by a single performance assessment. Using multiple regression analysis in order to assess the influence of each factor on performance, results of a study such as this would be valuable not only for music educators, curriculum specialists, and administrators, but for parents in considering the selection of musical experiences and relative outcomes for their children.

In considering curricular implications of future research, results of any of the proposed research models could affect requirements for music education undergraduate programs, as a complementary choral-instrumental experience may be a positive force in the development of musicianship skills applicable to both disciplines. The development and encouragement of comprehensive music educators, capable and confident in multiple musical disciplines and teaching strategies, could encourage a population of capable, confident, and versatile student musicians.

Summary

The purpose of this study was to examine the effects of instrumental training on the music notation reading abilities of high school choral musicians. Subjects were members of two a cappella choirs, one of which was identified as the control group (vocal-only treatment), and the other as the experimental group (vocal-instrumental treatment). Prior to pretest and treatment procedures, subjects responded to demographic and descriptive survey items that identified their musical backgrounds, experiences, age, grade, and gender. Each group was further broken down into four subgroups: subjects with instrumental ensemble experience (C + I), subjects without instrumental ensemble experience (C – I), subjects with at least one year of private piano study (C + P), and

subjects without at least one year of private piano study (C – P).

Following the pretest, each group engaged in contrasting treatments. The control group (vocal-only treatment) experienced nothing new, as solfège (movable *do*), numeric counting systems, and reading new literature was the extent of treatment. The experimental group (vocal-instrumental treatment) augmented these methods with the use of digital keyboards, educational music software programs, and Curwen hand sign emphasis. After 6 weeks (300 minutes of treatment per group), subjects completed posttest procedures. Effects of musical backgrounds and experiences were reviewed through statistical testing, in addition to raw score data interpretation.

In examining comparative subgroup performances, there was no statistically significant difference in pretest scores of subjects with (C + I) and without (C – I) instrumental ensemble experience. However, there was a significant difference in the pretest scores of subjects with at least one year of private piano study (C + P) as compared to those without (C – P). Further, subgroups were examined in their comparative pretest to posttest scores, revealing significant increases in scores for both (C + P) subgroups, as well as control (C – I) and experimental (C + I) and (C – P). Subgroups control (C + I), (C – P), and experimental (C – I) did not show statistically significant differences. In viewing results for the two comparative groups (control and experimental) both displayed statistically significant increases from pretest to posttest scores.

The survey results of this study indicated the sample was not large enough to pursue students void of *both* instrumental ensemble experience and private piano study. Should this study be replicated, future research related to the effects of instrumental

training on choral musicians will incorporate a larger sample (resulting in larger comparative subgroups) and extended lengths of time. Additionally, a purposefully-selected pool of subjects (determined after survey responses are analyzed) will permit the researcher to balance subgroups not only by instrumental ensemble experience and private piano study, but by isolating students without experience in either entity as a stand-alone subgroup. Finally, a subgroup having both instrumental ensemble experience and private piano study would be included in the new sample.

The acquired skill of interpreting music notation is a necessary component of student musicianship. Findings from this and future research could inform music educators as to the benefits of a comprehensive choral-instrumental curriculum, since the integration of differentiated activities can strengthen programs (Music Educators National Conference, 1967). Further, statistical results and raw data observations of this and future research regarding the benefits of a comprehensive music curriculum could enlighten parents, educators, boards of education, school curriculum specialists, and administrators. Ultimately, this research is intended to strengthen the profession of music education through the preparation of capable, confident, and versatile music educators. Veteran music educators could also be inspired to incorporate new methods into their teaching that may have previously fallen outside of their comfort zones. It is often necessary to change approach in order to experience growth; the existing research warrants this change through the implementation of a comprehensive choral-instrumental curriculum.

References

Bean, K. L. (1938). An experimental approach to the reading of music. *Psychological Monographs 50*(6), 226, 1-80.

Beck, A., Surmani, K., and Lewis, B. (2004). *Sing at first sight*. Van Nuys, CA: Alfred Publishing Co., Inc.

Bennett, P. (1984). Tricks, masks, and camouflage: is imitation passing for music reading? *Music Educators Journal, 71*(3), 62-63, 65-69.

Bertalot, J. (2004). *Teaching adults to sight sing*. Pacific, MO; Mel Bay Publications.

Bloedel Beery, C. (1996). The effects of structured singing instruction on beginning instrumental students' performance achievement. *Masters Abstracts International*, 35(01), 40.

Boyle, J. D. and Lucas, K. V. (Fall 1990). The effect of context on sightsinging. *Bulletin of the Council for Research in Music Education, 106*, 1-9.

Bozone, J. (1986). The use of sight singing as a prestudy aid for the improvement of the sight- reading skill of second-semester class piano students. *Dissertation Abstracts International*, 47(07), 2358.

Brinson, B. A. (1996). *Choral music methods and materials: developing successful choral music programs, grades 5 to 12.* New York: Schirmer Books.

Brooks, P. (2001). Creating better listeners. *Teaching Music, 9*(2), 52-56.

Brown, K. (2003). An alternative approach to developing music literacy skills in a transient society. *Music Educators Journal, 90*(2), 46-54.

Buchanan, W. (1946). Comparison of fixed and moveable solfège in teaching sight singing from the staff. *Dissertation Abstracts International*, 10(04), 0080.

Burnsed, V. and Fiocca, P. (1990). Bringing general music techniques to the instrumental class. *Music Educators Journal, 76*(6), 45-49.

Burton, J. (1986). A study to determine the extent to which vocalization is used as an instructional technique in selected public high school, public junior college, and state university band rehearsals: Alabama, Georgia, Louisiana, and Mississippi. *Dissertation Abstracts International,* 47(08), 2937A.

Cambiata Vocal Music Institute of America, Inc. (2008). Rote teaching melody-part style. Retrieved March 24, 2008 from http://www.cambiatapress.com/CVMIA/roteteaching.html

Cappers, P. K. (1985). Sightsinging makes middle school singers into high school musicians. *Music Educators Journal, 72*(2), 45-48.

Carey, D. A. (1959). A survey of the sight reading ability of senior students in nine Kansas high schools. Unpublished masters thesis, University of Kansas, Lawrence.

Cartwright, K. (1995). If you can't sing it…oral-aural tradition and the integrated curriculum. *Jazz Educators Journal, 28*(3), 27-30.

Choksy, L. (1981). *The Kodály context.* Engelwood Cliffs, NJ: Prentice Hall.

Choksy, L. (1974). *The Kodály method; comprehensive music education from infant to adult*. Englewood Cliffs, NJ: Prentice-Hall.

Cole, S., and Lewis, L. (1909). *Melodia*. Bryn Mawr, PA: Oliver Ditson Company.

Colwell, R. (1963). An investigation of musical achievement among vocal students, vocal-instrumental students, and instrumental students. *Journal of Research in Music Education, 11*, 123-130.

Colwell, R. (1967). *Music Achievement Test (MAT).* Chicago: Follett Educational Corp.

Colwell, R. (2002). *MENC handbook of music cognition and development*. New York: Oxford University Press, Inc.

Comelek, B. (1985). Allusions to the vocal art in selected wind instrument pedagogical sources (brass, woodwind). *Dissertation Abstracts International*, 47(01), 12A.

Conway, C. (2008). The implementation of the national standards in music education: capturing the spirit of the standards. *Music Educators Journal, 94*(4), 34-39.

Costanza, A. P. & Russell, T. (1992). Methodologies in music education. In R. Colwell (Ed.) *Handbook of research on music teaching and learning.* (pp. 498-508). New York: Schirmer Books.

Coveyduck, S. (1998). Vocalization and its effect on the intonation of a beginning instrumentalist. *Masters Abstracts International*, 37(03), 718.

Dalby, B. (1999). Teaching audiation in instrumental classes. *Music Educators Journal, 85*(6), 22-25.

Daniels, R. D. (1986). Relationships among selected factors and the sight-reading ability of high school mixed choirs. *Journal of Research in Music Education, 34*, 279-289.

Daniels, R. D. (1988). Sight-reading instruction in the choral rehearsal. *Update: The Application of Research in Music Education, 6*(2), 22-24.

Davis, L. (1981). The effects of structured singing activities and self-evaluation practice on elementary band students' instrumental music performance, melodic tonal imagery, self-evaluation, and attitude (Doctoral Dissertation, The Ohio State University, 1981). *Dissertation Abstracts International*, 42(07), 3051A.

Demorest, S. M. (2001). *Building choral excellence: teaching sight-singing in the choral rehearsal*. New York: Oxford University Press.

Demorest, S. M. (1998a). Integrating sight-singing into the high school choral rehearsal. *Choral Journal, 39,* 55-8.

Demorest, S. M. (Summer 1998b). Sightsinging in the secondary choral ensemble; a review of the research. *Bulletin of the Council for Research in Music Education, 137,* 1-15.

Demorest, S. M. & May, W. V. (1995). Sight-singing instruction in the choral ensemble; factors related to individual performance. *Journal of Research in Music Education, 43,* 156-67.

Deutsch, D. (1999). *The psychology of music* (2nd ed.). San Diego: Academic Press.

Dodson, T. (1989). Are students learning music in band? *Music Educators Journal, 76*(3), 25-29.

Dowling, W. J., and Harwood, D. (1986). *Music cognition.* Orlando, FL: Academic Press, Inc.

Dunlap, M. (1989). The effects of singing and solmization training on the musical achievement of beginning fifth-grade instrumental students. *Dissertation Abstracts International,* 51(02), 444A.

Dwiggins, R. R. (1984). Teaching sight-reading in the high school chorus. *Update: The Applications of Research in Music Education 2*(2), 8-11.

Eilers, J., and Crocker, E. (1994). *Sight-singing for SSA*. Milwaukee, WI: Hal Leonard Publishing Corporation.

Elliott, C. (1974). Effect of vocalization on the sense of pitch of beginning band students. *Journal of Research in Music Education, 22,* 120-128.

Elliott, C. A. (1982). The relationship among instrumental sight-reading ability and seven selected predictor values. *Journal of Research in Music Education, 30,* 5-14.

Elliott, D. (1995). *Music Matters: a new philosophy of music education*. New York: Oxford University Press.

Engel, S. C. (1920). The mission of the singer. *The Musical Quarterly*, *6*(3), 451-454.

Fine, P., Berry, A., and Rosner, B. (2006). The effect of pattern recognition and tonal predictability on sight-singing ability. *Psychology of Music, 34*(4), 431-447.

Fitchhorn, E. (1983). A foundation for musical literacy. *The School Musician, 54*(8), 14-15.

Furby, V. (2008). Process and product: The sight-singing backgrounds and behaviors of first-year undergraduate students. *Dissertation Abstracts International,* 69(05), 1712.

Gardner, H. (1994). *The arts and human development.* New York: Basic Books.

Garner, A. M. (2009). Singing and moving: Teaching strategies for audiation in children. *Music Educators Journal, 95*(4), 46-50.

Goins, W. (1999). Sight-reading. *Michigan Music Educator*, Fall 1999.

Gordon, E. E. (2005). *GIML Newsletter 4*(1).

Gordon, E. E. (2008). The Gordon Institute for Music Learning, retrieved March 24, 2008 from http://www.giml.org.

Gorow, R. (2002). *Hearing and writing music: professional training for today's musician* (2nd edition). Studio City, CA: September Publishing.

Grande, L E. (1989). A comparison of the rote-to-note approach and the traditional music reading approach in teaching beginning instrumental music. *Masters Abstracts International* 28(01), 22.

Gregory, T. (1972). The effect of rhythmic notation variable on sight-reading errors. *Journal of Research in Music Education, 20,* 462-468.

Gries, J. (1999). *371 Bach chorales in order of sight-reading complexity.* Olympia, WA: Masterworks Press.

Grunow, R. (2009). Jump right in: The instrumental series – from the inside out. *The GIML Audea (14)*1.

Grunow, R. (2005). "Music learning theory: A catalyst for change in beginning instrumental music instruction," in M. Runfola & C. Taggart (Eds.), *The Development and Practical Applications of Music Learning Theory.* Chicago: GIA Publications.

Grunow, R. (1999). When to begin instrumental lessons? *Journal of Music and Movement-based Learning 5*(4).

Grutzmacher, P. (1987). The effect of tonal pattern training on the aural perception, reading recognition, and melodic sight-reading achievement of first-year instrumental music students. *Journal of Research in Music Education, 25*, 171-181.

Guelker-Cone, L. (1998). The unaccompanied choral rehearsal. *Music Educators Journal, 85*(2), 17-22.

Hansen, L.A. (1961) A study of score reading ability of musicians. *Journal of Research in Music Education, 9,* 147-156.

Hargreaves, D. (1986). *The developmental psychology of music*. New York: Cambridge University Press.

Haroutounian, J. (2002). *Kindling the spark; recognizing and developing musical talent*. New York: Oxford Press.

Harris, B. (1991). Comparisons of attained ratings to instructional behaviors and techniques exhibited by band directors in sight-reading performance situations. *Dissertation Abstracts International*, 52(08), 2852A.

Haston, W. (2007) Teacher modeling as an effective teaching strategy. *Music Educators Journal*, *93*(4), 26-30.

Heffernan, C. (1968). *Teaching children to read music*. New York: Appleton-Century Crofts.

Henry, M. & Demorest, S. M. (1994). Individual sight-singing achievement in successful choral ensembles: a preliminary study. *Update: The Applications of Research in Music Education, 13*(1), 4-8.

Hershenson, R. (1988). Singers strive for literacy in musical notes. *The New York Times, April 10, 1988.* Retrieved March 26, 2008 from http://query.nytimes.com/gst/fullpage.html?res=940DE3D81039F933A25757COA96E948

Hicks, C. (1980). Sound before sight strategies for teaching music reading. *Music Educators Journal*, *66*(8), 53-55, 65-67.

Hodges, D. (1980). *Handbook of music psychology.* Lawrence, Ks: National Association for Music Therapy, Inc.

Hodges, D. (1992). The acquisition of music-reading skills. *Handbook of Research in Music Teaching and Learning*, pp. 466-471. New York: Schirmer Books.

Howard, P. (1996). Kodály strategies for instrumental teachers. *Music Educators Journal, 82*(5), 27-33.

International Suzuki Organization. (2009). Retrieved August 19, 2009 from http://www.internationalsuzuki.org/method.htm

Johnson, G. (1987). A descriptive study of the pitch-reading methods and the amount of time utilized to teach sight-singing by high school choral directors in the North Central region of the American Choral Directors Association. *Masters Abstracts International,* 26(01), 22.

Jones, S. (2003). The effect of vocalization on pitch discrimination among high school instrumentalists. *Dissertation Abstracts International,* 64(06), 2017A.

Jordan-DeCarbo, J. (1997). A sound–to-symbol approach to learning music. *Music Educators Journal, 84*(2), 34-38.

Kendall, M. (1988). Two instructional approaches to the development of aural and instrumental performance skills. *Journal of Research in Music Education, 36,* 205-219.

Killian, J. N., and Henry, M. (2005). A comparison of successful and unsuccessful strategies in individual sight-singing preparation and performance. *Journal of Research in Music Education, 53,* 51-65.

The King's Singers. (2002). *Book of Rounds, canons, and partsongs*. Milwaukee: Hal Leonard Corporation.

Klemp, B. (2006). Student perceptions of multiple ensemble memberships: a qualitative study. Unpublished manuscript.

Knuth, W.E. (1933). The construction and validation of music tests designed to measure certain aspects of sight-reading. *Unpublished doctoral dissertation*, University of California, Berkeley.

Kodály, Z. (1963). *333 Elementary exercises in sight singing* (Young, P., editor). New York: Boosey & Co. Ltd.

Kodály, Z. (1971). Guest editorial. *Music Journal, 29*(7), p. 4.

Krubsack, D. (2006). The performance achievement of wind instrumentalists who have had singing experience. *Dissertation Abstracts International* 67(05), 1678A.

Krumhansl, C. (1979). The psychological representation of musical pitch in tonal context. *Cognitive Psychology, 11,* 346-374.

Lamb, G. H. (1988). *Choral techniques*. Dubuque, IA; William C. Brown Publishers.

Lannert, V., & Ullman, M. (1945). Factors in the reading of piano music. *American Journal of Psychology, 58,* 91-99.

Leavitt, J. (2002). *31 Bach chorales for sight-singing and performance.* Milwaukee, WI: Hal Leonard Corporation.

Leeson, D. (2009). The Orff Method. Retrieved July 17, 2009 from http://www.musicstaff.com/lounge/article5.asp

Lenzini, C. (1998). Beyond the wind ensemble. *The Instrumentalist, 52,* 12-16.

Leonhard, C. (1953). *A song approach to music reading.* New York: Silver Burdett Company.

Leonhard, C., & House, R. (1959). *Foundation and principles of music education.* New York: McGraw-Hill.

Levitin, D. (2007). *This is your brain on music*. New York, NY: Penguin Books, Ltd.

Luce, J. R. (1965). Sight-reading and ear-playing abilities as related to instrumental music students. *Journal of Research in Music Education, 13,* 101-109.

Lundin, R. W. (1985). *An objective psychology of music* (3rd ed.). Malabar, FL: Robert E. Krieger.

MacKnight, C. (1975). Music reading ability of beginning wind instruments after melodic instruction. *Journal of Research in Music Education, 23,* 23-34.

Madden, J. (1984). Zoltan Kodaly and Carl Orff: implications for program development in elementary instrumental music education. *Dissertation Abstracts International,* 45(01), 72A.

Mang, E. (2007). Effects of musical experience on singing achievement. *Bulletin of the Council for Research in Music Education, 174,* Fall 1990, 75-92.

Mann, R.G. (1991). The use of Kodály instruction to develop the sight-reading skills of undergraduate flute students. *Dissertation Abstracts International,* 52(06), 2063A.

Mason, L. (1837). *Manual of the Boston Academy of Music, for instruction in the elements of vocal music on the system of Pestalozzi* (2nd edition). Boston: J.H. Wilkins & R. B. Carter.

May, J. A. (1993). A description of current practices in the teaching of choral melody reading in the high schools of Texas. *Dissertation Abstracts International,* 54(03), p. 856.

May, W. V. & Elliott, C. A. (1980). Relationships among ensemble participation, private instruction, and aural skill development. *Journal of Research in Music Education, 28*, 155-161.

McClung, A. C. (2008). Sight-singing scores of high school choristers with extensive training in movable solfège syllables and Curwen hand signs. *Journal of Research in Music Education, 56*, 255-266.

McClung, A. C. (2001) Sight-singing systems: current practice and survey of all-state choristers. *Update: The Applications of Research in Music Education, 20*(1), 3-8.

McCoy, C. (1989). Basic training: working with inexperienced choirs. *Music Educators Journal, 75*(8), 42-45.

McIntosh-Johnson, J. (1984). Sight-singing: an aid to musicianship. *Clavier, 23*, 30-31.

McLean, C. (1999). Elementary directed listening to music: A singing versus a non-singing approach. *Journal of Research in Music Education, 47*, 239-250.

McPherson, G. (1993). Factors and abilities influencing the development of visual, aural, and creative performance skills in music and other educational implications. *Dissertation Abstracts International*, 54(04), 1277A.

MENC Task Force for National Standards in the Arts. (1994). The school music program: a new vision: the K-12 national standards, pre-K standards, and what they mean to music educators. Reston, VA: Music Educators National Conference.

Merriam-Webster Dictionary (2006). Retrieved July 22, 2009 from http://www.merriam-webster.com/dictionary

Merrill, J. (2002). Musical growth through a singing apprenticeship. *Music Educators Journal, 88*(4), 36-41.

Meyer, E. (1981). The relative effectiveness of vocal instruction and instrumental-vocal instruction on sight singing achievement of elementary education majors. *Dissertation Abstracts International,* 42(07), 3052.

Miller, S. D. (1980). Literacy for the beginning and intermediate high school choir. *Choral Journal, 20*(7), 11-14.

Minsel, T. R. (1995). Memory for tones in musicians and non-musicians: an expert/novice study. *Dissertation Abstracts International*, 57(02), 1479B.

Moss, R. B. (1987). The effects of electronic piano instruction on sixth-grade middle school students' music reading skills. *Dissertation Abstracts International* 49(07), 1728A.

Mowrer, T. (1996). Tonal memory as an audition factor for choral ensembles. *Dissertation Abstracts International* 57(05), 1988A.

Music Educators National Conference. (1967). *The study of music in the elementary school – a conceptual approach.* Washington, D.C.: NEA Publications.

Music Educators National Conference (with CNAEA). (1994). National standards for arts education: what every young American should know and be able to do in the arts. Reston, VA: Music Educators National Conference.

Muzzi, G. (1999). What the literature says about sightsinging. *Georgia Music News, 60*(1).

Norris, C. E. (2000). Factors related to the validity of reproduction tonal memory tests (evaluation of students' aural skills, ability to learn new choral material and potential sight-singing achievement). *Journal of Research in Music Education, 48*, 52-64.

Orzolek, D. (2004). Absolute musicianship for performers: a model of general music study for high school performing groups. *General Music Today, 17*(3), 21.

Oxford English Dictionary (2006). Retrieved 7/22/2009 from http://dictionary.oed.com

Palmer, N. (2000). *Steps to harmony*. Olympia, WA: Masterworks Press.

Parks, J. (2005). The effect of a program of portable electronic piano keyboard experience on the acquisition of sight-singing skill in the novice high school chorus. *Dissertation Abstracts International,* 66(12), 4334A.

Petzold, R. (1960). The perception of music symbols in music reading by normal children and by children gifted musically. *Journal of Experimental Education, 28*.

Phillips, K. H. (1996). Teaching singers to sight-read. *Teaching Music, 3*(6), 32-33.

Rawlins R. (2005). Sight singing for instrumentalists. *American Music Teacher, 55,* 26-29.

Rawlins, R. (2004). I have to do what? Young instrumentalists should learn to sing so they can learn to hear. *Conn-Selmer Keynotes Online Magazine*, retrieved May 8, 2008 from http://www.keynotesmagazine.com

Robinson, M. (1996). To sing or not to sing in instrumental class. *Music Educators Journal, 83*(1), 17-21.

Rocco, R. (1995). Singing brass tones, ignoring the mechanics. *The Instrumentalist, 49,* 16-20.

Roe, P. F. (1983). *Choral music education*. Englewood Cliffs, NJ; Prentice Hall.

Salzberg, R., & Wang, C. (1989). A comparison of prompts to aid rhythmic sight singing of string students. *Psychology of Music, 17*(2), 123-131.

Schlacks, W. (1981). The effect of vocalization through an interval training program upon the pitch accuracy of high school band students. *Dissertation Abstracts International*, 42(08), 3492A.

Schleuter, S. (1984). *A sound approach to teaching instrumentalists.* Kent, Ohio: Kent State University Press.

Scott, T. B. (1996). The construction of a holistic, criterion-referenced sightsinging test for high school sopranos based on the voluntary national standards for music education. *Dissertation Abstracts International***,** 57(11), 4684A.

Shehan, P. (1987). Effects of rote versus note presentations on rhythm learning and retention. *Journal of Research in Music Education, 35*, 117-126.

Sinor, J. (1986). The ideas of Kodaly in America. *Music Educators Journal 72*(6), 32-7.

Sloboda, J. (2005). *Exploring the musical mind*. New York: Oxford University Press.

Sloboda, J. (1984). Experimental studies of music reading: A review. *Music Perception, 2*(2), 222-236.

Smith, C. (Spring 1995). Development of performance pitch accuracy of string students. *Bulletin of the Council for Research in Music Education, 124*, 13-23.

Snider, M. T. (2007). Choral sightsinging strategies in 1A, 3A, 4A, and 6A Kansas high schools: instructional time allotted, teacher strategies, and materials used. *Masters Abstracts International* 46(02), April 2008.

Stauffer, D. (2005). Learning to read music fluently. *Music Educators Journal, 92*(1), 21-22.

Stecklin, J. & Aliferis, J. (1957). The relationship of instruments to music achievement test scores. *Journal of Research in Music Education, 5*, 3-15.

Sunderland, M. R. (1994). A description of selected Ohio secondary choral ensembles with particular attention to sightreading skills (Volumes I and II). *Dissertation Abstracts International*, 55(09), 2759A.

Swanson, C. D. (2008). This is your brain on song. *Journal of Singing, 64*(4), 491-495.

Tucker, D. W. (1969). Factors related to musical reading ability of senior high school students participating in choral groups. *Dissertation Abstracts International*, 31(05), 2427A.

Voth, E. G. (2006). An investigation of the use of the keyboard and moveable do solfège in American high school choral instruction. *Dissertation Abstracts International* 68(04), 1379A.

Weaver, M. (1996). An investigation of the relationships between performance-based aural musicianship, music achievement, and socialization of first-year music majors. *Dissertation Abstracts International*, 57(11), 4685A.

Weir, M. (1998). Singers are from Krypton and instrumentalists are from Ork. *Jazz Educators Journal, 30,* 69 -73.

Wheeler, D. (2007). Neglected skills: aural perception and music reading. *American Music Teacher, 57*(2), 35.

Wolbers, M. (2002). Singing in the band rehearsal. *Music Educators Journal, 89*(2), 37-41.

Wolf, T. (1976). A cognitive model of musical sight-reading. *Journal of Psycholinguistic Research, 5*, 143-171

Zimmerman, C. R. (1962). Relationship of musical environment to choral sight-reading ability. *Dissertation Abstracts International* 24(03), 1198.

Appendix A

Letter to Parents

Dear Parent/Guardian,

As many of your children already know, I have two identities; Miss Klemp, the Choral Director at Chatham High School and Barbara Klemp, the Doctoral student at Rutgers University. During the course of my studies, I selected music education as my focus so I can continue to bring the results of research and proven methodologies to my students at Chatham High School. As a choral director with broad experiences as an instrumentalist, my research topic concerns the connection between reading music and the degree to which prior instrumental study assists a student in performing that task in the choral classroom.

I am currently in the process of preparing the study that will be the focal point of my dissertation, and am asking your permission for your child to be part of the study. Please note that your child will not be identified by name in the results of the study; only as a member of the control or experimental group. Their involvement will be limited to the completion of a survey, and performance of sight reading activities as a group and individually during our scheduled class meetings. Each choral ensemble will experience a different approach to sight reading activities over a six-week period, and all activities will be designed in order to supplement our existing curriculum, not to replace it. Your child's class time will not be compromised in any way through their participation in this study.

Participation in this study is voluntary. You may choose for your child not to participate, and you may withdraw your child from participating at any time during the study activities without any penalty to your child. In addition, your child may choose not to answer any questions with which your child is not comfortable. Your child will also be asked if they wish to participate in this study.

Thank you so much for your consideration of this project. I believe that teacher-generated research projects are important to the professional development of educators, and that your child's participation in this carefully designed series of activities will enhance their membership in the Chatham High School Choral Music Program. If you have any questions, please do not hesitate to contact me at your choice of contacts listed below. If you choose to allow your child to participate, please sign the attached consent form and return it to me by May 1, 2009.

With Best Regards,

Barbara Klemp
CHS Director of Choral Activities
bklemp@chatham-nj.org

Appendix B

Parent/Guardian Consent Form

Your child is invited to participate in a research study concerning the effects of instrumental study on the music notation reading abilities of choral musicians. There will be 48 participants in study, all of which are students enrolled in two curricular choral ensembles. Your child's participation in this study will occur during the first fifteen minutes of their regularly scheduled choral ensemble class period over a 6-week period. The study will require one choral ensemble (control group) to practice reading music notation using a "vocal-only" approach, and the second choral ensemble (experimental group) will practice reading music notation using a "vocal-instrumental" approach. There will be a pretest to determine your child's level of ability prior to the study, and a posttest to determine if there were any changes. Your child will be audio-recorded for each of these assessments and scored by three music educators not affiliated with our music program.

This research is anonymous, which means no information will be recorded about you/your child that could identify you/your child. Your/your child's name, address, phone number, and date of birth will not be recorded. If you/your child agree to take part in the study, your child will be assigned a random code number that will be used on each test and the questionnaire. Your child's name will appear only on a list of subjects and will not be linked to the code number that is assigned to your child. There will be no way to link your child's responses back to your child. Therefore, data collection is anonymous.

There are no foreseeable risks associated with your child's participation in this research project. Your child's participation in this study will assist in determining the effectiveness of instrumental training on the music notation reading skills of choral musicians.

Your child's participation is voluntary. You and your child have the right to withdraw your consent or discontinue participation at any time without penalty. You will receive a copy of this consent form for your records.

I understand the information presented above. My signature below shall serve as my consent to participate in this project.

Name of Student (printed)	Date
Signature of Parent/Guardian	Date
Signature of Principal Investigator	Date

Appendix C

Audiotape Addendum to Consent Form

You have already agreed to allow your child to participate in a research study entitled: The Effects of Instrumental Training on the Music Notation Reading Abilities of High School Choral Musicians conducted by Barbara Klemp. I am asking for your permission to allow me to audiotape your child as part of that research study.

The recordings will be used in order to score the pre and posttests of the sight-singing assessments that will be conducted at the beginning and end of the study.

The recordings will include your child's code for identification only, not their name. Your child will recite their code prior to their pre and posttest recordings. Only the principal investigator (Barbara Klemp) will know the code.

The recordings will be stored in a locked file cabinet with no link to subjects' identity and will be destroyed upon completion of the study procedures.

Your signature on this form grants the investigator named above permission to audio-record your child as described above during participation in the above-referenced study. The investigator will not use the recordings for any other reason than that/those stated in the consent form without your written permission.

Name of Student (printed)	Date
Signature of Parent/Guardian	Date
Signature of Principal Investigator	Date

Appendix D

Assent for Participation in Research Activities

Investigator: Ms. Barbara Klemp, Rutgers University

This assent form may contain words that you do not understand. Please ask Ms. Klemp (the researcher) or your parent to explain any words or information that you do not clearly understand before signing this document.

1. **Ms. Klemp is inviting you to take part in his/her research study.**
   Why is this study being done?
   I want to find out if training on a musical instrument affects abilities to read music notation.

2. **What will happen**:
   First, you will take a 16-question survey which will ask you about your musical background and training. Then, you will take a pretest which will determine your level of music notation reading skill. This test will last about 3 minutes and will be taken privately, not in front of your class. For the next 6 weeks (for the first 15 minutes of our scheduled class), you will be trained in music notation reading using either a vocal-only or vocal-instrumental method. At the end of the 6 weeks, you will take a posttest to determine changes (if any).
   You will be audio-recorded on the pretest and posttest, and three music teachers from outside of our school district will score them.

3. **What does it cost and how much does it pay?**
   You do not pay to take part in this study, and your participation is voluntary.

4. **There are very few risks in taking part in this research, but the following things could happen**:
   Probably: Nothing bad would happen.
   Maybe: For example: Your surveys and pretests/posttests would be seen by somebody not involved in this study. I will do my absolute best to keep all your answers private. Your answers will be locked away. Your name will not appear on the answer sheets; we will use a code number instead.
   Very unusual: You could be upset by your performance in the pre or posttest. If this should occur, remember that your identity is kept anonymous in the reporting of results.

5. **Are there any benefits that you or others will get out of being in this study?**
   All research must have some potential benefit either directly to those that take part in it or potentially to others through the knowledge gained. The only direct benefit to you may be the enjoyment of training to become better readers of music notation. The knowledge gained through this study may allow me (and other music educators) to develop more effective training programs to assist singers who need help with their ability to read music. **It's completely up to you!**

Both you and your parents have to agree to allow you to take part in this study. If you choose to not take part in this study, I will honor that choice. No one will get angry or upset with you if you do not want to do this. If you agree to take part in it and then you change your mind later, that is okay too. It's always your choice!

6. CONFIDENTIALITY: I will do everything I can to protect the confidentiality of your records.

If I write professional articles about this research, they will never say your name or anything that could give away who you are. I will do a good job at keeping my entire records secret by following the rules made for researchers.

Your parent or guardian will also be asked if they wish for you to participate in this study. You will be given a copy of this form for your records.

Please sign below if you assent (that means you agree) to participate in this study.

Name of Student (please print)	Date
Signature of Student	Date
Signature of Principal Investigator	Date

Appendix E

Student survey

Students: Thank you for completing this survey and returning it to me. Your input is extremely valuable. You will not be identified (except by grade level and as being a member of either the control or experimental group) in the reporting of results of this study.

Please respond to the following items. If you have additional comments regarding your experiences in choral and/or instrumental music, please note them on the back of this page. You are welcome to add additional pages if needed.

1. In which curricular music performing groups have you participated as a high school student? *(Please check all that apply)*

___Concert Choir ___Choraliers ___Select Choir ___Chatham Voices
___Concert Band ___Symphonic Band ___Wind Ensemble ___Orchestra
___Chamber Orchestra
Other (please specify) _____

2. Which of the following music courses have you taken (if any)?

___Piano lab ___Music Theory ___AP Music Theory ___Other

3. Have you participated in our curricular Honors Music Program? ___Yes ___No

4. In which of the following extracurricular music performing groups have you participated as a high school student? *(Please check all that apply)*

___SNAPS (student-run a cappella ensemble) ___Cast of the Spring Musical ___Jazz Band
___Marching Band ___Pit Orchestra for the Spring Musical
___Pops Orchestra ___Percussion Ensemble

5. Have you ever studied voice privately? ___Yes ___No

6. If you have studied voice, for how long have you taken lessons?

__less than 1 year __1-2 years __3-5 years

__more than 5 years __I have never studied voice privately

7. Besides being a vocalist, what instruments do you play (if any)? Please indicate if you have participated in an instrumental ensemble (band or orchestra).

_____
_____
_____
_____

8. Which of the above instruments have you studied privately, and for how long?

_____
_____

9. Do you participate in performing music outside of school? ___Yes ___No

10. If yes, identify your participation as being vocally or instrumentally focused.

___Vocal ___Instrumental ___Equally Vocal and Instrumental

11. Indicate the nature of your involvement. *(please check all that apply)*

___Church Choir ___Church Instrumentalist ___open-mic performer

___Student-run Garage Band ___accompanist ___solo instrumentalist

___Other (please specify)_____

12. After high school, do you plan to *(please check all that apply):*

___Major/minor in music as a performer
___Major/minor in music as a future educator
___Major/minor in music as a composer
___Include music in your life through ensemble involvement
(band, choir, orchestra at the college or community level)
___Discontinue your involvement in music

13. Would you describe yourself as coming from a musical family (one with performers or one which appreciates music)? ___Yes ___No

14. What grade are you currently in? *(please circle)* 9 10 11 12

15. What is your age? *(please circle)* 14 15 16 17 18

16. Are you Male or Female? *(please circle)* M F

Dear Student,

Thank you for taking the time to respond to this survey. I am currently pursuing my Doctor of Musical Arts degree at Rutgers University, and value your input. The topic of my dissertation involves the connection between a student's instrumental background and their success in reading music notation in the choral classroom.

In the results of this study, you will be completely anonymous, and the results will not bear any weight on your grades.

Again, thank you for your input. At the end of the survey, there is a blank page, where I welcome you to write any personal thoughts you may have on your choral music reading abilities and whether or not you believe they have been influenced through the study of an instrument.

Should you prefer to e-mail as opposed to write your comments, please feel welcome to do so. My e-mail address is bklemp@chatham-nj.org. On the subject line, please write DMA SURVEY. Your responses will be confidential.

Thank you!
Barbara Klemp

Appendix F

Directions to Judges

June 14, 2009

Dear_____,

Thank you so much for agreeing to assist in my dissertation process. Enclosed you will find a three-ring binder containing all of the materials required for you to participate. As I am planning to complete the data analysis in July, I am hopeful that you will be able to complete your scoring and return the binder, scored pretests/posttests, and CD to me by June 30th. I'm sure you will find your scoring to go very quickly, so this should not be a very time-consuming process. If you think this time frame will not be possible for you, please let me know immediately.

Contents of the binder include the following:

46 copies of the sight-singing pretest
46 copies of the sight-singing posttest
One CD recording with 92 consecutive tracks

Directions:

The format for the scoring of the pretest and posttest is identical. To complete your scoring, you will need a quiet space, a CD player, and something to write with.

The CD you have is a compilation of 92 tracks (46 pretest, 46 posttest) of student performances. Each track is approximately 25 seconds in length. Prior to each performance, the student will recite their identity code. The student identity codes written on your score sheets as they appear in the binder will align with the order they are heard on the CD. Your judge number (1, 2, or 3) is already highlighted. Your charge is to score pitch and rhythm only – please do not credit or discredit any student's score with regard to vocal quality or expressivity. Students were not given a tempo, so any tempo they are taking the exercise at is acceptable.

At the beginning of each track, students will recite their code and then perform the 8-measure exercise. As you listen, please clearly draw an "X" over any measure that contains any errors in pitch and/or rhythm. Even one error will count the entire measure as incorrect. After you have heard the entire exercise, please count the number of CORRECT measures and put this number (your score) in the blank beneath the student's code. That's all there is to it!

If you have any questions or concerns, please let me know. Thank you so much for taking the time to assist me. After my work is complete, I look forward to sharing the results with you.

With best regards,

Barbara Klemp

Dedication

As evidenced in my research, one's interest and capacity for music is often dependent upon the experiences they had throughout their childhood and adolescence. For this reason, I am very proud to dedicate my work to my family.

To my Father, Carl (1916 – 1997), who taught me that music was fun and meant to be enjoyed. A casual clarinetist and lover of John Philip Sousa, Dad encouraged me to enjoy performing. Fond memories of Dad pounding out Christmas carols on the family piano, leading sing-alongs in the car, and ballroom dancing in the living room to the music of the Lawrence Welk Show are all experiences that helped to shape me as a music lover, musician, and music educator.

To my Mother, Edith (1919 – 2008), who taught me that not only was music fun, but it was a content area worthy of study. A serious singer, dancer, and artist, Mom valued the arts and held herself to high standards. Because of her, I have always held myself to high standards as well.

Finally, to my brother Steve, a fellow musician and creative thinker who encourages my work as a music educator, performer, and researcher. As children, we enjoyed music as family; as adults we pursue our musical interests as professionals.