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Effects of Sight Singing Using Moveable-DO Solmization on the Transposition Performance of Undergraduate Group Piano Students

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EFFECTS OF SIGHT SINGING USING MOVEABLE-DO SOLMIZATION ON THE TRANSPOSITION PERFORMANCE OF UNDERGRADUATE GROUP PIANO STUDENTS

by

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ABSTRACT

The purpose of this study was to examine the effects of sight singing, using moveable-do solmization, on the keyboard transposition performance of undergraduate group piano students. Thirty-nine (N = 39) undergraduate non-keyboard music majors enrolled in three intact sections of first-semester group piano courses participated in this quantitative study. Students completed an individual pretest and posttest consisting of a videotaped sight-reading and transposition performance and a pretest and posttest questionnaire. Throughout the six-week treatment period, all students received sight-reading and transposition instruction using identical musical examples. A control group sight read and transposed examples without singing, while students in two experimental groups sang all musical examples using moveable-do solmization prior to sight reading and transposing.

Results of the Kruskal–Wallis One-Way Analysis of Variance by Ranks revealed no statistically significant differences between the control and experimental groups in total transposition scores or in individual scores of pitch accuracy, rhythmic accuracy, continuity, and musical expressivity. However, post-hoc Mann–Whitney U tests on students’ gain scores revealed that students in the second experimental group displayed significantly greater gains than students in the control group on continuity scores (p = .04). While not statistically significant, freshmen in both experimental groups who
engaged in singing instruction evidenced considerably larger pretest-to-posttest gains on both posttest examples than freshmen in the control group who did not sing prior to transposing. Additionally, all students in both experimental groups—regardless of academic level—attained greater pretest-to-posttest gains than students in the control group on the second, more difficult posttest transposition example. Results from this study therefore suggest that the use of singing may positively affect student achievement in keyboard transposition performances.
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CHAPTER 1
INTRODUCTION AND REVIEW OF LITERATURE

Musicians practice a fundamentally aural art. Educators therefore widely recognize the importance of aural skills training to students’ music education, and many pinpoint this training as the most important facet in developing complete musicianship (Clark, 1992; Fisher, 2010; Karpinski, 2000). The term *aural skills* encompasses the broad categories of both ear training and sight singing, but training in aural processes may also involve activities such as rhythm drills, playing by ear, transposition, improvisation, and listening (Karpinski, 2000; Rogers, 2004). Researchers have found that aural skills instruction encourages stronger audiation skills (Cresci, 2010; Gordon, 2004), error-detection abilities (Sheldon, 1998), sight-reading skills (Bozone, 1986; Mishra, 2013), and performance achievement (Krubsack, 2006). Ultimately, the goal of any comprehensive aural skills instruction is the development of increased aural comprehension and “internal musical perception—the ability to hear musical relationships accurately and with understanding” (Rogers, 2004, p. 100).

Collegiate music majors enrolled in professional baccalaureate degrees must

---

1 Musicians and educators throughout history have spoken about the importance of aural skills training: Robert Schumann (1848/2009) said, “The cultivation of the ear is of the greatest importance,” and Frances Clark (1992) suggested, “All music teaching…should be focused toward developing the ear” (p. 98). Gromko (1993) states, “Perception of musical sound should be a primary purpose of music teaching” (p. 46).

2 *Audiation* is Edwin Gordon’s term for the “ability to think music in the mind with understanding” (Dalby, 2008–2014a). Audiation takes place when we “hear and…understand music for which the sound is not physically present or may never have been physically present” (Gordon, 2001, p. 3). Gordon (2001) also states that “audiation is to music what thought is to language” (p. 3).
develop competency in aural musicianship (NASM, 2014), and they typically learn these skills of ear training and sight singing in the context of theory and aural skills courses. However, many educators also recognize the opportunity for aural skills instruction within collegiate group piano courses (Brown, 1990; Fisher, 2010; Rogers, 2004). Since students can combine tactile, visual, and aural experiences to reinforce theoretical and aural concepts at the keyboard (Rogers, 2004, p. 70), the group piano class is a prime location in which to incorporate aural skills training.

Therefore, music educators frequently identify keyboard instruction as a crucial component of comprehensive undergraduate music curricula (Beckman, 2011; Karpinski, 2000; Rogers, 2004). Nevertheless, the content and sequencing of keyboard courses may often be isolated from theory and aural skills curricula (Bogard, 1983; Larsen, 2007; Machado, 2009; McCoy, 2011). Instructors then face the difficult task of correlating learning objectives, terminology, and pacing of instruction among these courses to allow for reinforcement of concepts and complemental development of aural, theory, and keyboard skills (Karpinski, 2000; Larsen, 2007; Rogers, 2004).

Furthermore, while aural skills training is an essential aspect of keyboard study, the primary purpose of collegiate group piano courses is the development of functional piano skills (Crappell, 2009). McDonald (1989) defines functional piano skills as “specific skills, competencies, or concepts that pianists need to function adequately at the keyboard” (p. 8). In a broader sense, Young (2010) describes functional piano skills as those “that allow a musician to use the piano as a tool to enhance other types of music learning” (p. 3). Typically, these functional skills include sight reading, harmonization, transposition, improvisation, accompanying, technique, playing by ear, and score reading.
Music educators and professional musicians widely acknowledge the importance of these functional piano skills to undergraduate music majors’ education and, more significantly, to their future careers (Baker, 2008; Christensen, 2000; March, 1988). In a 2000 study, Christensen surveyed band, choral, orchestral, and general music teachers concerning their use of functional piano skills in the classroom. Participants cited frequent use of accompanying, score reading, harmonization, technique, transposition, and sight reading in their teaching (Christensen, 2000).

Young (2010) also surveyed music faculty members, performers, and private music teachers on their use of functional piano skills. Most study participants indicated they regularly sight read accompaniments, played scales, and transposed melodies at the piano. In addition to the use of these three skills, faculty members said they frequently accompanied soloists, played by ear, and played chord progressions, while performers said they often harmonized melodies from lead sheets, transposed accompaniments, and accompanied soloists. Furthermore, private music teachers cited frequent reading of open scores and transposition of accompaniments, and school music teachers indicated their need to regularly sight read, improvise, read open scores, accompany, and harmonize in the classroom (Young, 2010, p. 123).

Due to the importance of keyboard proficiency to professional musicians and music educators, most pedagogues strongly support extensive training in functional keyboard skills (Christensen, 2000; March, 1988; Slattery, 2000; Webber, 1958; Young, 2010). The National Association of Schools of Music (NASM) also recognizes the need for attainment of facility at the piano and requires students enrolled in professional
baccalaureate degrees to achieve keyboard proficiency (NASM, 2014). However, Buchanan (1964) points out that “mastery of any one of these [functional keyboard skills], even to a moderate degree of proficiency, is a study in itself” (p. 136), and it is often challenging for students to achieve competence in such a large variety of functional keyboard skills in the timeframe of two to four semesters of study (Baker, 2008; Christensen, 2000). Furthermore, instructors of group piano courses also face the challenge of efficiently and effectively presenting extensive amounts of material to students of varying skill levels and abilities (Baker, 2008; Pike & Carter, 2010). Consequently, group piano instructors benefit from knowing the results of empirical research on effective teaching practices for these functional skills.

Many researchers have examined effective instructional techniques for skills such as sight reading (Baker, 2008; Cox, 2000; Hardy, 1992; Pajtas, 2002; Pike & Carter, 2010), harmonization (Betts & Cassidy, 2000), and improvisation (Chess, 2005; Larsen, 2007) in group piano classes. However, few researchers have studied practical teaching procedures for the skill of keyboard transposition, even though instructors view transposition proficiency as a meaningful and necessary component of group piano classes and of students’ overall music training (Crappell, 2009; Fisher, 2010; Machado, 2009). In the context of piano study, educators suggest that transposition activities promote intervallic note reading and pattern recognition, which may aid the development of students’ keyboard sight-reading skills (Coats, 2006; Kwon, 2013; Webber, 1958).³

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³ Coats (2006) advocates the use of transposition to help students “clarify key and interval relationships. Often students play with better accuracy in transposing because they are forced to read by relationships—scale degrees and intervals within the scale. Too often they read note to note by letter name instead of seeing intervals and chord patterns within a key” (p. 126).

Kwon (2013) says that “transposing [sight-]reading exercises are [sic] one of the best ways…to develop solid sight-reading skills. This will also significantly improve directional reading, as it prepares students to think holistically about the musical context and reinforces intervallic reading.”
Additionally, Karpinski (2000) identifies transposition as an intrinsically aural activity and suggests students use transposition exercises to assist transfer of aural skills training to instrumental performance (p. 192).

Furthermore, Karpinski (2000) proposes that all musicians, regardless of instrument, need basic transposing skills to perform various musical activities, including the simple act of moving a piece from one key to another (to accommodate an individual’s range or to transpose an accompanying part to match an instrument with a different transposition), reading from instrumental scores and parts, playing a transposing part on a C instrument (or on an instrument with yet another transposition), and composing or arranging music for transposing instruments (p. 215).

Researchers have substantiated Karpinski’s insistence on the need for basic transposing skills: results from quantitative surveys by Buchanan (1964), Christensen (2000), March (1988), and Young (2010) all indicate that music educators, performers, and private music teachers frequently use the keyboard to transpose. Due to the importance of keyboard transposition proficiency to musicians, group piano instructors would benefit from knowing the results of in-depth research on teaching practices for this skill.

While little experimental research exists regarding the acquisition of keyboard transposition skills, empirical research on successful teaching techniques from other areas of music may be applied to the skill of keyboard transposition. In particular, several researchers have studied the efficacy of the instructional technique of singing in elementary education (Bloedel Beery, 1996; Davis, 1981; Dell, 2003; Dunlap, 1989; Elliott, 1974; Emanuele, 2000; Grutzmacher, 1987; Ojeda, 2010; Yang, 1994), high

Webber (1958) also suggests, “Transposition provides one of the best devices to develop a sense of key and tonal relationships” (p. 145).

Coats (2006) echoes Karpinski’s (2000) statements saying, “The ability to transpose serves a pianist well by accommodating voice ranges, by understanding transposing instruments, and by adding variety to accompaniments for hymn singing. In addition, transposing is a most valuable resource in learning to read music” (p. 126).
school settings (Jones, 2003; Krubsack, 2006; Schlacks, 1981), and collegiate situations (Bozone, 1986; Hargiss, 1962; Sheldon, 1998). These researchers found that the use of singing improved students’ sight-reading skills (Bozone, 1986; Grutzmacher, 1987; Mishra, 2014), error detection abilities (Sheldon, 1998), intonation accuracy (Dell, 2003), aural discrimination abilities (Yang, 1994), musical expressivity (Bloedel Beery, 1996), rhythmic accuracy (Emanuele, 2000), and overall performance achievement (Bernhard, 2003a; Davis, 1981). Although singing provides many benefits to students of all ages, only a few researchers (Bozone, 1986; Brown, 1990; Hargiss, 1962) have systematically explored the effects of singing within the collegiate group piano classroom, and none have investigated its effects on the skill of keyboard transposition.

Additionally, sight singing in particular is a fundamental component of aural skills training (Clark, 1992; Karpinski, 2000). Many theory and aural skills instructors teach melodic and rhythmic solmization systems to aid students’ acquisition of sight-singing skills. Hughes and Gerson-Kiwi (2007–2014) define solmization as

the use of syllables [such as do–re–mi–fa–sol–la] in association with pitches as a mnemonic device for indicating melodic intervals…. [These systems] serve as aids in the oral transmission of music, and may be used either for direct teaching or as a means of memorizing what has been heard. A solmization system is not a notation: it is a method of aural rather than visual recognition.

Students enrolled in collegiate group piano courses thus share a common knowledge of these solmization systems, which they can transfer to the context of group piano activities. By integrating the skill of sight singing into the group piano classroom, instructors can encourage keyboard proficiency and aural skills acquisition simultaneously, which may aid in enhanced understanding of musical concepts and
facilitate greater performance achievement (Bozone, 1986; Karpinski, 2000; Larsen, 2007; Rogers, 2004).

Finally, since the ability to successfully transpose music involves both mental and aural processes (Karpinski, 2000, p. 192), instructors would benefit from knowing results of quantitative research which explores the effects of using sight singing as an instructional technique to promote transposition achievement. In this current study, the researcher therefore incorporated the aural skill of sight singing, using moveable-do solmization, into first-semester undergraduate group piano classes to examine its effects on students’ transposition performance.

**Purpose of the Study**

The purpose of this study was to examine the effects of sight singing, using moveable-do solmization, on the keyboard transposition performance of undergraduate group piano students. A secondary purpose was to investigate if students’ academic level and prior piano and singing experiences influenced the effectiveness of sight singing on their transposition performance. The final purpose was to seek information on students’ perceived value of keyboard skills and singing as they relate to students’ overall music education and future careers.

**Need for the Study**

Music educators largely agree that all undergraduate music majors must attain proficiency in functional piano skills (Christensen, 2000; Graff, 1984; McWhirter, 2005; Young, 2010). Students usually acquire keyboard proficiency in collegiate group piano
classes, but Betts and Cassidy (2000) reported a lack of empirical research on teaching practices in these courses. Betts and Cassidy (2000) therefore suggested researchers “pinpoint critical areas for in-depth coverage and practice in class piano” (p. 153). Previously, several researchers examined effective instructional strategies for keyboard harmonization (Betts & Cassidy, 2000), improvisation (Kishimoto, 2002; Larsen, 2007), and sight-reading skills (Baker, 2008; Beeler, 1995; Fjerstad, 1968; Hagen, 2001; Hardy, 1992; Lowder, 1973; Micheletti, 1980; Montano, 1983; Pajtas, 2002; Pike & Carter, 2010). However, few researchers have investigated effective teaching procedures for keyboard transposition skills, even though educators view the skill of transposition as a critical curricular component of undergraduate group piano courses (Coats, 2006; Crappell, 2009; Fisher, 2010; Machado, 2009).

While students need this proficiency in keyboard transposition to fulfill requirements of group piano curricula, the skill is also useful in aural, theory, conducting, and other undergraduate courses. Additionally, students must achieve competency in keyboard transposition to meet demands of their future careers. Researchers have gathered valuable survey data on the use of functional piano skills by professional musicians and educators (Buchanan, 1964; Case, 1977; Christensen, 2000; Graff, 1984; McWhirter, 2005; Slattery, 2000; Young, 2010). Many of the music professionals surveyed specifically reported use of transposition skills in their careers (Christensen, 2000; Graff, 1984; March, 1988; Young, 2010).

However, while Young (2010) discovered that music educators, performers, and private music teachers frequently use the keyboard to transpose, many reported inadequate training in this keyboard skill. Respondents in surveys by Christensen (2000),
March (1988), and McWhirter (2005) similarly noted that they would use functional piano skills—including transposition skills—more often in their teaching if they felt more proficient in each area. To better understand why music educators and professional musicians have reported a lack of sufficient training in various functional keyboard skills, other researchers have examined instructional practices and teacher training for undergraduate group piano courses (Chin, 2002; Skroch, 1991). In regards to the skill of keyboard transposition, Skroch (1991) found that group piano instructors felt least prepared to teach this skill in the group piano classroom. Respondents in a survey conducted by Chin (2002) stated that their own perceived weaknesses in transposition skills led them to spend less time teaching the skill in group piano courses.

This problem is compounded by the fact that while many authors of current group piano texts include transposition activities (Hilley & Olson, 2010; Lancaster & Renfrow, 2004, 2008; Lyke, Caramia, Alexander, Haydon, & Chioldi, 2009, 2010; Mach, 2008), few authors provide directions for how instructors and students should approach the skill. When directions for transposition are present, such as in Hilley and Olson’s *Piano for the Developing Musician* (2010), the content is largely analytical in nature. Analysis is crucial for successful transposition, but instructors must ensure that students have the necessary background in aural and theoretical understanding so they may fluently analyze the score (Gordon, 2007; Karpinski, 2000; Rogers, 2004).

Other authors have also written instructional texts devoted solely to transposition (Colombatti, 1941; Hunt, 1969; Lovelock, 1978; Rees-Davies, 1954; Sumsion & Wilkinson, 1980; Tracy, 1915). Some of these authors suggest that students use singing (Rees-Davies, 1954; Tracy, 1915) or mental imagery techniques (Hunt, 1969; Rees-
Davies, 1954)—such as thinking in terms of the new key—while transposing. However, these historical texts are difficult to find and not currently in widespread use. (See Appendix A for a list of these texts.) Furthermore, students can only think in a new key while transposing if they have learned how to fluently read, theoretically understand, and aurally comprehend both the printed score and the key to which they must transpose (Coats, 2006; Gordon, 2004, 2007; Karpinski, 2000; Mursell, 1927; Rogers, 2004). Students who lack this holistic comprehension will have difficulty attaining true competence in many musical skills, including the skill of transposition (Karpinski, 2000).

Therefore, to better equip students with the holistic understanding necessary for fluent keyboard transposition performance, group piano instructors would benefit from knowing the results of experimental research on effective teaching practices for this skill. Educators throughout all areas of music education frequently identify singing as a foundational component of music literacy, conceptual and aural understanding, and instrumental performance achievement (Bernhard, 2003a; Clark, 1992; Coats, 2006; Fisher, 2010; Gordon, 1971; Karpinski, 2000; Mursell, 1927; Mursell & Glenn, 1938; Ottman, 1956; Rogers, 2004). Singing may thus be an appropriate instructional technique to help foster students’ keyboard transposition performance.

While many researchers (Bernhard, 2003a; Davis, 1981; Dunlap, 1989; Elliott, 1974; Emanuele, 2000; Grutzmacher, 1987; Yang, 1994) examined the effects of singing on the musical achievement of young students, only a small number of researchers

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5 Karpinski (2000) discusses this necessity of thinking in music, rather than about music, and the important relationship between theory and aural skill training to cultivate this skill: “An important goal in the development of music skills is the ability to think in music….Developing musicians who study rudiments, harmony, counterpoint, form, and other subdisciplines of music theory without previous or concurrent training in the appropriate kinds of aural skills are usually condemned to thinking about music without learning how to think in music….Music readers who understand and auralize what they read are thinking in music” (p. 4).
(Bozone, 1986; Brown, 1990; Hargiss, 1962) investigated the use of singing in the collegiate group piano classroom. Consequently, little empirical evidence exists for the effects of singing on undergraduate group piano students’ transposition performance. In this current study, the researcher therefore applied the aural instructional technique of sight singing in first-semester undergraduate group piano classes to examine its effects on students’ keyboard transposition performance.

**Research Questions**

The following research questions guided this study:

1. Does a significant difference exist between the experimental and control groups’ total scores in transposition performances?
2. Does a significant difference exist between the experimental and control groups’ individual scores in pitch accuracy, rhythmic accuracy, continuity, and musical expressivity in transposition performances?
3. Does a significant difference exist between the experimental and control groups’ perceived value of keyboard skills as they relate to their overall music education and future careers?
4. Does a significant difference exist between the experimental and control groups’ perceived value of singing as it relates to their overall music education and future careers?
Limitations of the Study

Students enrolled in collegiate group piano classes typically learn functional keyboard skills—including sight reading, harmonization, transposition, improvisation, accompanying, technique, playing by ear, and score reading—throughout a prescribed course sequence. In this study, however, the researcher only examined the effects of sight singing with moveable-do solmization on students’ keyboard transposition performance. In addition, the researcher limited all transposition examples to diatonic major tonalities. Furthermore, students transposed examples of simple keyboard textures in both closed and open positions within the span of an octave.

Review of Literature

The purpose of this study was to examine the effects of sight singing, using moveable-do solmization, on the keyboard transposition performance of undergraduate group piano students. Therefore, this current study involved aspects of both aural and keyboard skills. The following literature review thus begins with a discussion of research relevant to aural musicianship skills and includes scholarship on audiation and singing. The second section of this literature review explores research pertaining to undergraduate group piano instructional strategies. Since most authors of current group piano texts include transposition exercises as an extension of sight-reading activities (Lancaster & Renfrow, 2004, 2008; Lyke et al., 2009, 2010; Mach, 2008), the final portion of this literature review includes a discussion of research related to keyboard sight reading.
Audiation

Educators view the development of aural understanding as a fundamental component in the acquisition of music literacy (Gordon, 2007; Karpinski, 2000; Rogers, 2004). While instruction in written theory provides musicians with a conceptual framework for notation, aural understanding refers to one’s ability to perceive and comprehend tonal and rhythmic relationships in the mind while listening to, reading, performing, or creating music (Gordon, 2004; Karpinski, 2000). Edwin Gordon (2001) refers to this as the process of *audiation*, which he defines as

the ability to hear and to understand music for which the sound is not physically present or may never have been physically present. Persons may audiate when they are listening to music, performing music solo and in ensemble, reading and writing music notation, composing music, and improvising music (p. 3).

Audiation therefore allows one to draw greater meaning from music (Dalby, 2008–2014a; Gordon, 2007). When students possess audiation skills, they can move beyond mere imitation and memorization and instead can listen to, read, perform, and create music with depth of acuity and understanding (Gordon, 2007; Karpinski, 2000). Through exposure to appropriate knowledge and experiences, Gordon (2007) believed all students could be taught how to audiate (p. 3).

Humphreys (1984, 1986) explored the development of audiation skills in collegiate students and suggested that “music majors could be trained to audiate and perform harmony implied by simple melodies” (Humphreys, 1986, p. 198). In the study, Humphreys used a harmonic audiation and performance training program designed by James Froseth to examine instrumental music majors’ abilities to audiate and perform harmonic accompaniments implied by recorded melodies. Forty-five ($N = 45$) students enrolled in an intact instrumental methods courses first participated in musical
discrimination examinations and echo-playing tests. Humphreys then administered a pretest consisting of six harmonization tasks that required students to determine an implied harmonic accompaniment from either notation or a recording. Depending on the task, students notated chord symbols or performed the accompaniment. In the first two tasks, students provided written chord symbols for several notated melodic patterns in both major and minor tonalities (notational presentation, notational response). In the third and fourth tasks, students then provided written chord symbols for several recorded melodic patterns in both major and minor tonalities (auditory presentation, notational response). Finally, students performed a harmonization to several recorded melodic patterns in both major and minor tonalities with no notational stimulus (auditory presentation, performance response).

Humphreys (1984, 1986) then randomly divided students into a control and experimental group. Over an eight-week treatment period, students in the control group participated in regular class activities, while students in the experimental group received instruction in the harmonic audiation and performance training program in a separate room. Following analysis of the data, Humphreys found that students in the experimental group demonstrated significantly greater proficiency when performing a harmonization to a recorded melodic pattern (auditory presentation, performance response) and when notating chord symbols to harmonize a recorded melodic pattern (auditory presentation, notational response). Humphreys (1984) concluded that training in harmonic audiation “can be effective in teaching undergraduate students to accompany melodies by ear and to notate harmony implied by taped melodies” (p. 156).
While Humphreys (1984, 1986) studied the development of audiation skills among collegiate students, other researchers (Azzara, 1992; Douglas, 2005; Josuweit, 1991; Stoltzfus, 2005) examined the effects of audiation-based instruction on the music achievement of elementary students. Stoltzfus (2005) investigated the effects of audiation-based composition instruction on the music achievement of 64 fourth-grade wind and percussion students enrolled in two elementary schools. After administering Gordon’s *Musical Aptitude Profile* (MAP), Stoltzfus randomly assigned students to an experimental or control group. For 32 weeks, all students received the same audiation-based instruction, which included tonal and rhythm pattern instruction, vocalization, play-by-ear activities, and vocal and instrumental improvisation.

Additionally, the experimental group in Stoltzfus’s (2005) study participated in composition activities. In contrast, the control group engaged in traditional method book reading activities in place of composition activities. At the end of the treatment period, all students sang and played three etudes as part of the researcher-designed Elementary Music Achievement Measure (EMAM). Following analysis of results, Stoltzfus reported that students in the experimental group scored significantly higher than the control group in overall singing and performance achievement. Stoltzfus therefore suggested that engagement in audiation-based composition activities helped students recognize and comprehend both aural and visual elements of notated music, which resulted in greater overall performance achievement.

Gordon (2007) suggested that musicians audiate in a variety of musical activities, including while composing and improvising. In the above study, Stoltzfus (2005) found

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6 Gordon’s *Musical Aptitude Profile* is a stabilized music aptitude test “designed to assess music aptitudes of students…in fourth through twelfth grades” (Gordon, 2007, p. 54).
that students who engaged in audiation-based composition activities learned how to internalize and organize tonal and rhythmic patterns, which helped them create more meaningful connections between sound and symbol in both composition and performance activities. In a similar study, Azzara (1992) investigated the effect of audiation-based improvisation techniques on the music achievement of elementary instrumental students. Azzara first administered the *Musical Aptitude Profile* to 66 elementary students enrolled in two schools; all students had previously completed one year of audiation-based instrumental music instruction. The researcher then divided students in each school into one experimental and one control group. For 27 weeks, both experimental and control groups received the same instruction using *Jump Right In: The Instrumental Series* by Grunow and Gordon. However, the experimental group also engaged in improvisation activities for 10 to 15 minutes each week.

At the end of the treatment period, all students in Azzara’s (1992) study performed three etudes composed by the researcher. Four judges then independently scored tonal, rhythmic, and expressive elements of each performance. Following analysis of results, Azzara reported that students in the experimental group demonstrated significantly greater musical achievement than students in the control group. Azzara suggested that students who improvised learned how to audiate and mentally organize musical vocabulary comprised of tonal and rhythmic patterns, which allowed them to spontaneously express their internalized musical thoughts in improvised performance. As a result of developing these audiation and improvisation skills, students also demonstrated greater comprehension and achievement while performing music from notation.
Douglas (2005) also examined the effects of Music Learning Theory–based\(^7\) improvisation instruction on the achievement of 87 sixth-, seventh-, and eighth-grade wind and percussion students. Before instruction began, Douglas administered the *Musical Aptitude Profile* to a total of 101 students. Then, the researcher randomly divided students into either a control or experimental group. During the twelve-week instructional period, all students received rote-song instruction. However, the experimental group also participated in additional tonal and rhythmic pattern instruction; students then used their knowledge of these patterns to improvise. At the conclusion of the treatment period, 87 students agreed to participate in the researcher‐designed Antecedent/Consequent Improvisational Measure (ACIM), where students improvised four consequent phrases to a set of four antecedent phrases.

Following analysis of results, Douglas (2005) found that students in the experimental group demonstrated significantly greater achievement in tonal improvisation than students in the control group. While not statistically significant, students in the experimental group also demonstrated slightly higher rhythmic improvisation achievement than students in the control group. Douglas (2005) therefore suggested that “meaningful improvisation requires that musicians possess a repertoire of musical patterns from which to draw upon when improvising. They must also be able to sequence the patterns logically within the context. Audiation makes this possible” (p. 20).

While students ideally learn to audiate from the very beginning of their musical studies, the above researchers suggest students of all ages can learn how to audiate. As students participate in audiation-based instruction involving elements of singing, \(^7\) Dalby (2008–2014a) defines *Music Learning Theory* as “an explanation of how we learn when we learn music. Based on an extensive body of research and practical field testing by Edwin E. Gordon and others, Music Learning Theory is a comprehensive method for teaching audiation.”
rhythmic movement, and creative activities, they develop a wide vocabulary of tonal and rhythmic patterns, which prepares for and enhances their understanding of music notation (Gordon, 2004). As a result of this instruction, students can perceive the relationships between these notational symbols and the musical sounds they represent, and they can then perform these sounds with an understanding of the flow and context of the notated music (Gordon, 2007; Stoltzfus, 2005). Furthermore, audiation allows musicians to listen to, improvise, and compose music with a sophisticated depth of comprehension and perception.

Ultimately, the underlying purpose of audiation-based instruction is to teach students how to “think music in the mind with understanding” (Dalby, 2008–2014a). While instructors may use different terminology to describe this type of instruction at the collegiate level, Karpinski (2000) and Rogers (2004) identify this same fundamental goal—the development of students’ comprehensive aural understanding—as the cornerstone of curricular objectives in collegiate theory, aural skills, and keyboard courses. Additionally, Gordon (2004), Karpinski (2000), and Rogers (2004) all identify aural comprehension as the basis of music literacy. Collectively, these educators thus recognize the necessity of fostering students’ aural understanding, or audiation skills, at all stages of musical instruction (Gordon, 2004; Karpinski, 2000; Rogers, 2004).

**Singing**

Music educators and researchers unanimously agree on the foundational importance of singing in the development of aural understanding (Clark, 1992; Coats, 2006; Gordon, 2004; McPherson & Gabrielsson, 2002; Mursell & Glenn, 1938). Gordon
(2004) believed that “the experience of singing is fundamental for the brain to audiate” (p. 10), and performers and educators have long viewed singing as a valuable aid to proficient instrumental performance (Karpinski, 2000; White & Lake, 2002). In recent years, researchers have also sought empirical evidence for the efficacy of singing activities on a variety of musical tasks. Through their investigations, researchers have found that singing—through use of activities such as solmization, sight singing, and tonal pattern training—aids in the development of various aspects of students’ instrumental performance achievement, including musical expression (Bloedel Beery, 1996), rhythmic accuracy (Emanuele, 2000), pitch discrimination (Elliott, 1974; Jones, 2003), error-detection abilities (Sheldon, 1998), melodic play-by-ear activities (Bernhard, 2003a), intonation accuracy (Dell, 2003), and sight-reading achievement (Bozone, 1986; Davis, 1981; Grutzmacher, 1987; MacKnight, 1975).

While many of these researchers have conducted their studies in band and orchestral settings, some researchers (Bozone, 1986; Emanuele, 2000; Yang, 1994) have explored the use of singing specifically in the context of piano instruction. Emanuele (2000) found that singing positively affected the rhythmic accuracy of the performances of young piano students. Sixteen students between the ages of seven and twelve learned four keyboard pieces during the course of eight weeks. Emanuele taught each of the four pieces twice to every student—one with and once without singing. When teaching without singing, Emanuele gave only spoken instructions to students. In contrast, when teaching with singing, students still received spoken instructions, but Emanuele also sang the piece once while students listened, and then students sang the piece with the researcher prior to performing it on the piano. Although Emanuele found no statistically
significant difference in pitch accuracy between the results of the singing and non-singing experimental conditions, the researcher did observe that students demonstrated significantly greater rhythmic accuracy when they sang the piece prior to performing.

In another study involving young pianists, Yang (1994) investigated both the effects of singing using moveable-do solmization and movement-based instruction on the achievement of elementary group piano students. The researcher evenly divided 48 beginning piano students between the ages of six and nine into four group piano classes. Each of the four classes received a different treatment during the nine-month study: (a) both movement and solmization training, (b) only movement training, (c) only solmization training, and (d) no movement or solmization training. Yang reported that students who participated in either solmization-only training or in a combination of solmization and movement-based instruction evidenced significantly greater achievement in tonal discrimination, melodic play-back, and piano performance activities than students who only received rhythmic movement training. Although not statistically significant, Yang also observed that students who received only solmization training or a combination of solmization and movement-based instruction displayed consistently greater sight-reading proficiency than students who did not receive this instruction.

Other researchers have found similar results regarding the positive effects of singing on sight-reading achievement. Bozone (1986) found that the use of sight singing melodic lines, on the neutral syllable of la, served as a useful pre-study aid for sight reading at the keyboard. In the study, two randomized groups of second-semester collegiate group piano students (N = 17) received 15 weeks of training. The control group used only analytical pre-study prior to sight reading, while the experimental group
utilized both analytical pre-study and sight singing. Following the treatment period, Bozone collected posttest data and found significant differences between the two groups, with students in the experimental group surpassing the control group most in expressive performance, followed by composite accuracy, rhythm accuracy, and pitch accuracy. The researcher therefore recommended that instructors incorporate sight singing when teaching the skill of sight reading to collegiate group piano students. Bozone also encouraged further studies on the effects of singing on sight-reading achievement in other instructional environments and at instruments other than the piano.

Several other researchers identified this same need and, as a result, looked at the implications of singing on students’ sight-reading performance in areas outside of keyboard instruction. Davis (1981) reported that structured singing activities positively affected the development of fifth- and sixth-grade band students’ instrumental performance skills in both sight-read and prepared music. Ninety-three (N = 93) band students (59 fifth graders and 34 sixth graders) from three elementary schools participated in Davis’s nineteen-week study, which examined the effects of structured singing activities and self-evaluation practice on students’ instrumental performance, melodic tonal imagery, self-evaluation of instrumental performance, and attitude toward music and instrumental study. Within each school, the researcher randomly divided students in each grade level into an experimental or control group. Once every week, the experimental and control groups within each grade met separately for 30 minutes each. Additionally, both control and experimental groups met simultaneously each week for one further forty-minute instruction session.
Davis (1981) taught the three experimental groups, which each received one of the following treatment conditions: (a) singing only, (b) self-evaluation only, and (c) a combination of singing and self-evaluation. Two of these experimental groups also engaged in group evaluation activities during the weekly forty-minute instruction sessions. In contrast, the control groups did not engage in singing or self-evaluation; Davis also taught one of these classes, while a colleague taught the final two control groups. Following the treatment period, all students participated in a posttest on individual performance measures, which included prepared and sight-read music and singing selections, as well as a self-evaluation of students’ performances on the posttest.

Davis (1981) analyzed pretests and posttests and found that fifth-grade students who engaged in the structured singing activities scored significantly higher on instrumental music performance of prepared and sight-read music than students who did not engage in these activities. Additionally, six-grade students who participated in a combination of singing and self-evaluation exercises also scored significantly higher on prepared and sight-read music selections. Therefore, Davis (1981) suggested that students who regularly engage in both singing and self-evaluation “may become more discriminating in their evaluation of their instrumental performance” (p. 92).

In separate studies, Grutzmacher (1987) and MacKnight (1975) similarly found that tonal pattern instruction and engagement with singing activities aided elementary band students’ acquisition of sight-reading and aural discrimination skills. In MacKnight’s (1975) study, 90 fourth-grade students from three elementary schools volunteered to study a wind instrument of their choice for one year (p. 26). Through

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8 Bernhard (2003a) defines *tonal patterns* as “groups of two to five pitches related to harmonic function” (p. 3).
random selection, MacKnight designated students in one of the three elementary schools as the experimental group, while students in the other two schools served as the control groups. Students in both control and experimental groups received the same basic instruction on music fundamentals, but the instructor of the experimental group presented unfamiliar pitches through a series of tonal patterns using solmization. Students in the experimental group also had the opportunity to respond vocally and instrumentally to the aural and visual presentation of these new pitches. Following analysis of the results, MacKnight found that students in the experimental group scored significantly higher on sight-reading and auditory-visual discrimination tests than students in the control group.

Grutzmacher (1987) found similar results in a study exploring the effect of tonal pattern training on the aural perception, reading recognition, and sight-reading achievement of beginning instrumental students. The researcher randomly assigned 48 fifth- and sixth-grade instrumental students from three elementary schools to a control or experimental group. During the fourteen-week treatment period, the experimental group learned tonal patterns through harmonization and singing exercises using solmization. In contrast, the control group learned the same material directly from notation and did not engage in singing or harmonization activities. Grutzmacher found that students in the experimental group who harmonized and sang tonal patterns made significantly greater pretest-to-posttest gains on melodic sight-reading skills than students in the control group. Additionally, Grutzmacher (1987) suggested that students who regularly engage in singing, playing, listening, and aural discrimination tasks may develop heightened conceptual understanding of musical elements (p. 178).
Bernhard (2003b) echoed Grutzmacher’s statements and explained that participation in these types of singing activities may provide students with a “unique means of representing aural and notational stimuli, [which may aid] in the comprehension and performance of instrumental music” (p. 28). Bernhard (2003a) also examined the effects of tonal training on the melodic ear playing and sight-reading achievement of beginning wind instrumentalists. Forty-two students from two intact sixth-grade band classes participated in the ten-week study. Bernhard divided the students into two experimental and two control groups; the groups met twice weekly. Throughout the study, experimental and control groups learned 22 melodies taken from two standard method books. While the control group learned the melodies purely through visual identification, Bernhard taught the experimental group through tonal training procedures involving vocalization and solmization.

To learn each melody, students in the experimental group first listened to the researcher sing the melody on the neutral syllable of loo, and then students also sang the melody using the same neutral syllable. Bernhard (2003a) then repeated the same process using solmization. Finally, students in the experimental group performed the melody instrumentally, first by ear and then by sight. Following analysis of the data, Bernhard found that students taught with the tonal training procedure demonstrated significantly greater melodic ear playing achievement than students not taught with this process. However, Bernhard found no significant difference between the control and experimental groups regarding sight-reading achievement.

Other researchers have reported similar mixed results regarding the effects of singing on students’ sight-reading performance. In studies examining the use of singing
on sight-reading and instrumental performance achievement, Dunlap (1989), Karas (2005), and Grande (1989) found no statistically significant differences in student achievement as a result of singing instruction. Moreover, many researchers have examined various other treatments in addition to singing to aid students’ sight-reading achievement, but many have reported contradictory findings (Mishra, 2014). To address this disparity in the literature, Mishra (2014) conducted a meta-analysis of 92 quasi-experimental studies on sight reading to determine which types of treatments, if any, significantly influenced sight-reading ability. Among the included studies, Mishra noted the large amount of conflicting reports of significant and non-significant effects for differing treatments on sight-reading achievement.

To perform the meta-analysis, Mishra (2014) used moderator variables to group comparable studies; these variables included the type of publication, participants’ age and experience level, the type of sight-reading test, and the mode of sight reading. Additionally, Mishra grouped treatments used in the 92 studies into ten categories: Aural Training, Collaboration, Controlled Reading, Creative Activities, Instrumental Training, Interval Drill, Movement, Notation, Rhythmic Drill, and Singing/Solfège. Following analysis of the data, Mishra found that only treatments using aural skills (aural models, play-by-ear activities, and melodic dictation), controlled reading (eye movements), creative activities (composition and improvisation), and singing/solfège significantly and

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9 Borenstein, Hedges, Higgins, and Rothstein (2009) define meta-analysis as “the statistical synthesis of results from a series of studies” (p. xxi). Mishra (2014) further says that meta-analysis “is a procedure capable of synthesizing a large body of research, and allows the research synthesist to look for patterns in research results across studies that might be otherwise hidden by the breadth of research. A meta-analysis includes all relevant studies and also allows for the investigation of study-level variables (e.g., population characteristics) that have not been directly tested within a primary research study” (p. 132–133).
positively affected sight-reading achievement. No other treatment or moderator variable had a significant influence on sight reading.

Additionally, although Mishra (2014) grouped studies using singing and solfège treatments into their own category (Singing/Solfège) rather than including them under Aural Skills, the researcher noted that instructors generally view the use of singing and solmization as a subset of aural skills training. Therefore, when Mishra grouped the categories of Aural Skills and Singing/Solfège together, the researcher reported that these treatments jointly produced an even larger positive effect on sight-reading achievement. Furthermore, musicians involved in creative activities such as composition and improvisation also draw on aural imagery and audiation skills, which are frequently developed through comprehensive aural skills training (Gordon, 2004; McPherson & Gabrielsson, 2002). Consequently, three of the four significant treatment categories identified by Mishra (Aural Skills, Singing/Solfège, and Creative Activities) are related to either the development of aural understanding through aural skills training, or the application of aural understanding through creative activities.

Based on these findings, Mishra (2014) suggested that proficiency in sight reading involves a combination of cognitive, auditory, and kinesthetic processes (Hayward & Gromko, 2009; Kopiez & Lee, 2008; Ronkainen & Kuusi, 2009; Waters, Townsend, and Underwood, 1998). As part of this equation, aural training therefore encourages an understanding of the music as a whole, leading to the development of expectations that allow for more sophisticated guessing during sightreading….Sightreading appears to go beyond the simple visual decoding of notational symbols. It is a musical activity that relies on expectations developed during previous musical experiences. The treatments that encourage a deeper musical understanding and the development of expectations appear to be the most effective in improving sightreading skills (Mishra, 2014, p. 146–147).
Thus, students’ sight-reading skills may improve through aural skills training and engagement with creative activities. Furthermore, the researchers listed above suggest singing as one significant avenue to help students acquire greater sight-reading proficiency, instrumental performance achievement, and aural understanding.

Additionally, researchers (Killian, 1991; Sheldon, 1998) have also found that singing activities may aid students’ error detection abilities. Sheldon (1998) examined the effects of contextual sight singing and ear training on collegiate students’ abilities to detect pitch and rhythm errors. The study’s sample consisted of 30 undergraduate music education majors enrolled in daily instrumental methods classes. Sheldon evenly divided these students into a control and experimental group. For 16 weeks, both groups received the same instrumental methods instruction, which focused on conducting and rehearsal techniques. However, the experimental group also received an additional 50 minutes of sight singing and ear training instruction per week for 11 weeks. At the conclusion of the treatment period, students participated in a posttest consisting of one-, two-, and three-part homorhythmic and polyrhythmic examples. Students listened to a recording of each example twice and then marked pitch and rhythm errors on a notated score. The researcher found that students in the experimental group more accurately identified pitch and rhythm errors and also made fewer incorrect assumptions about errors when compared to students in the control group. Sheldon concluded that instruction involving singing and ear training may contribute to development of error detection abilities.

In a similar study, Killian (1991) examined the relationship between junior high students’ sight-singing accuracy and their ability to identify errors in recorded examples. In the first part of the study, Killian asked seventy-five (N = 75) seventh- and eighth-
grade students enrolled in choir to record themselves singing eight two-measure examples. Killian presented every example in two ways to each student: (a) as notation on the staff, and (b) as solfège syllables off the staff. After students recorded all eight examples twice—sight singing once from notation and once from solfège syllables—Killian again presented students with the same eight examples in notation only. Students then listened to a recording of these same eight examples and circled any pitch errors they heard.

Following analysis of results, Killian (1991) reported no statistically significant difference between sight singing from notation and sight singing from solfège syllables, although low-scoring sight singers did score higher when reading from solfège syllables. Additionally, students who scored lowest on the sight-singing task were significantly more accurate on the error detection task than high- or medium-scoring sight singers. Killian (1991) explained that these low-scoring sight singers perhaps “found it easier to listen for errors than to perform the examples themselves” (p. 220). Although not statistically significant, Killian also found that students who scored highest on the sight-singing task also score highest on the error detection task, which suggests a possible link between students’ sight-singing proficiency and their ability to detect errors.

Many educators further suggest that effective error detection begins with an accurate aural understanding of the score (Byo, 1997; Karpinski, 2000; Price & Byo, 2002; Sheldon, 1998). Therefore, researchers stress the importance of singing activities, which foster the aural discrimination skills necessary for error detection (Karpinski, 2000; Ottman, 1956). In addition, singing experiences, such as those examined above, help students acquire greater sight-reading proficiency and instrumental performance.
achievement (Bernhard, 2003a; Bloedel Beery, 1996; Bozone, 1986; Davis, 1981; Elliott, 1974; Emanuele, 2000; Grutzmacher, 1987; Jones, 2003; MacKnight, 1975; Sheldon, 1998). Finally, singing experiences are fundamental to the development of audiation skills and aural understanding (Gordon, 2004; Karpinski, 2000).

**Keyboard Skills**

As part of a comprehensive music curriculum, students enrolled in professional baccalaureate degrees must develop competency in functional keyboard skills (NASM, 2014). Students typically learn these skills of sight reading, harmonization, transposition, improvisation, accompanying, technique, playing by ear, and score reading within the context of collegiate group piano courses. Because many educators view sight reading as one of the most important of these functional skills (Baker, 2008; March, 1988; Wells, 1986), many researchers have sought empirical evidence for effective teaching procedures for this activity (Baker, 2008; Beeler, 1995; Cox, 2000; Fincher, 1983; Fjerstad, 1968; Hagen, 2001; Hagen, Benson, & Cremaschi, 2007; Hanberry, 2004; Hardy, 1992; Kostka, 2000; Lowder, 1973; Micheletti, 1980; Montano, 1983; Pajtas, 2002; Pike & Carter, 2010; Watkins, 1984).

Baker (2008) examined the effects of peer teaching on undergraduate group piano students’ sight-reading achievement. Following completion of a videotaped pretest and attitudinal questionnaire, the researcher divided group piano students \( (N = 85) \), who were enrolled in the second (Group Piano II) or fourth (Group Piano IV) semester of a four-semester group piano sequence, into experimental and control groups. Within the experimental groups, Baker created 23 peer teaching dyads consisting of a Group Piano
IV student (the *tutor*) and a Group Piano II student (the *tutee*). Throughout the semester, these pairs participated in eight sight-reading sessions outside of class time. During the sessions, the tutor in each pair guided the tutee through researcher-selected sight-reading exercises. In contrast, students in the control group engaged in individual sight-reading sessions once per week for eight weeks.

At the end of the treatment period, students again participated in a videotaped posttest and attitudinal questionnaire. Following analysis of results, Baker (2008) found that tutors in the Group Piano IV experimental group scored significantly higher on the sight-reading posttest than students in the Group Piano IV control group. Due to this finding, Baker (2008) suggested that “teaching the skill of sight-reading may increase personal achievement in the skill” (p. 83). While Baker found no significant difference between the sight-reading scores of tutees in the Group Piano II experimental group and students in the Group Piano II control group, the researcher reported that tutees in the Group Piano II experimental group did express more confidence regarding their ability to maintain continuity while sight reading as a result of the peer teaching experience.

In other studies, investigators (Beeler, 1995; Kosta, 2000; Pike & Carter, 2010) examined the effects of preparatory exercises on students’ subsequent achievement in sight-reading activities. Kostka (2000) examined the effects of participation in error detection practice and shadowing\(^\text{10}\) on undergraduate group piano students’ sight-reading proficiency at the keyboard. The researcher assigned 69 students from six intact collegiate group piano classes to one of three experimental conditions: (a) error-detection practice and shadowing (EDS); (b) shadowing only (S); and (c) self-guided practice

\(^\text{10}\) Kostka (2000) defines *shadowing* as “silently playing the notes on top of the keys” (p. 114).
During the ten-week treatment period, all groups received five sight-reading instructional sessions spaced two weeks apart.

During these sessions, Kostka (2000) instructed students in the CC group to prepare the sight-reading examples on their own using any practice techniques they found appropriate. In contrast, Kostka asked students in both the S and EDS groups to shadow each piece individually prior to sight reading. Additionally, students in the EDS group also received five minutes of group instruction in error detection practice prior to sight reading. While Kostka found no statistically significant differences among the groups’ scores due to treatment, students in the EDS group did demonstrate the greatest overall improvement between the pretest and posttest. Additionally, all students demonstrated improvement in rhythmic accuracy between the pretest and posttest as a result of sight-reading instruction.

Because educators suggest that successful sight reading involves the ability to recognize patterns in the score (Hodges & Nolker, 2011; Lehmann & McArthur, 2002; Pike & Carter, 2010), Pike and Carter (2010) examined the effects of cognitive chunking drills—which involved practice in and recognition of tonal and rhythmic patterns—on the sight-reading performance of undergraduate group piano students. After nine weeks of initial piano instruction, the researchers randomly assigned 43 students from six intact collegiate group piano classes to either a control group or one of two experimental groups. For three weeks, each group received 10 minutes of sight-reading instruction at the end of every class period. All groups sight read the same 12 musical examples. Prior to sight reading each piece, students in the two experimental groups participated in either rhythm or pitch drills, which consisted of prominent pitch and rhythm patterns from each
example. In contrast, the control group sight read each example without any prior rhythm or pitch instruction. Following analysis of the data, Pike and Carter reported no significant differences between the experimental and control groups in overall sight-reading scores. However, the experimental groups made significant improvements in their rhythmic accuracy and ability to maintain continuity while sight reading.

In a prior study, Beeler (1995) examined how the use of recorded accompaniments and preparatory score study affected students’ sight-reading achievement. Before treatment began, 50 students, who were enrolled in four sections of second-semester group piano classes, received four weeks of preliminary rhythm instruction. After administration of a pretest, Beeler then assigned intact classes to one of four treatment groups: (a) sight reading with digital sequencer accompaniment; (b) sight reading with interval pre-study; (c) sight reading with the combination of interval pre-study and digital sequencer accompaniment; and (d) sight reading without guided instruction (contact control). For four weeks, all students sight read the same 32 researcher-composed examples. Students in the control group sight read these exercises independently without any guided pre-study instruction.

In contrast, students in Beeler’s (1995) first experimental group (digital sequencer accompaniment) engaged in 30 seconds of silent pre-study and then sight read examples with a pre-recorded accompaniment consisting of percussion and basic instrumental harmonization. Students in the second experimental group (interval pre-study) received 30 seconds of directed interval pre-study: Beeler chanted the direction and size of the example’s melodic intervals in rhythm while students simultaneously followed the notation and tapped the appropriate fingering on the top of the keyboard. Students then
sight read the example without accompaniment. Finally, students in the third experimental group (interval pre-study and digital sequencer accompaniment) received the same directed interval pre-study instructions as the second group. Students in the third experimental group then sight read the examples with accompaniment. At the end of the treatment period, all students participated in a sight-reading posttest. Regardless of treatment, Beeler reported that pitch accuracy scores of all students improved due to participation in the structured sight-reading exercises. Additionally, students who engaged in silent pre-study (control group and digital sequencer accompaniment group) and who sight read examples with a pre-recorded accompaniment (digital sequencer accompaniment group) also demonstrated the greatest improvement in rhythmic accuracy and continuity scores between the pretest and posttest.

Montano (1983) similarly found that engagement with improvisation activities also aided students’ rhythmic accuracy and continuity while sight reading. In Montano’s study, 32 undergraduate group piano students received six weeks of instruction in sight reading. Students in the control group met weekly for 15 minutes outside of regular class time and engaged in pre-study procedures involving tapping and chanting prior to sight reading. In contrast, the experimental group met weekly for 30 minutes outside of normal class time. Students in the experimental group received the same 15 minutes of sight-reading instruction as the control group, but they also participated in an additional 15 minutes of improvisation activities. After analysis of the data, Montano reported that students who engaged in improvisation activities exhibited significantly greater rhythmic accuracy while sight reading than students in the control group.
The above researchers therefore suggest that experiences involving peer teaching, as well as engagement in improvisation activities and preparatory exercises, may improve undergraduate group piano students’ sight-reading abilities. In addition to examining effective teaching procedures for keyboard sight reading, other researchers conducted empirical research concerning the development of harmonization skills (Betts & Cassidy, 2000) and the inclusion of improvisation in group piano curricula (Kishimoto, 2002; Laughlin, 2004). However, few researchers have examined effective teaching procedures for other functional piano skills typically taught in collegiate group piano courses.

Finally, while educators identify the development of functional keyboard skills as the main purpose of collegiate group piano courses, other researchers recognize the opportunity for concurrent theory and aural skills instruction within these classes. Some educators have designed unique collegiate group piano curricula that incorporate music theory and aural skills materials (McCoy, 2011; Moss, 2000; Servias, 2010). Other researchers examined the development of aural skills within the group piano classroom (Brown, 1990; Hargiss, 1962; Lueft, 1974). Brown (1990) incorporated singing and play-by-ear activities into a group piano class composed of music and non-music majors. After one semester of instruction, Brown reported that students’ abilities significantly improved in dictation proficiency and play-by-ear skills at the piano. Similarly, Hargiss (1962) studied the development of sight-singing abilities in the group piano classroom and found that students’ achievement in sight singing increased when students sang while performing musical examples at the piano. Ultimately, Hargiss (1962) and Brown (1990) both affirmed the value of incorporating aural skills instruction into collegiate group piano classes.
While educators view collegiate group piano courses as an important curricular component of comprehensive music instruction (Karpinski, 2000; Rogers, 2004), few other researchers have examined the effects of theory and aural skills instruction within the group piano classroom. Additionally, although many researchers have studied effective teaching procedures for keyboard sight reading, harmonization, and improvisation, few researchers have conducted empirical research concerning the acquisition of other functional keyboard skills. Educators would therefore benefit from knowing the results of empirical research that examines effective teaching procedures for these functional keyboard skills, as well as research that investigates the effects of theory and aural skills instruction within collegiate group piano courses.

**Summary**

Educators identify the development of comprehensive aural understanding as an indispensable component in the acquisition of music literacy (Gordon, 2007; Karpinski, 2000; Rogers, 2004). Edwin Gordon coined the term *audiation* to refer to this ability to “think music in the mind with understanding” (Dalby, 2008–2014a). Engagement in audiation allows musicians to listen to, read, write, perform, and create music with depth of perception and understanding (Dalby, 2008–2014b; Gordon, 2007). Researchers found that students of all ages could be taught how to audiate (Azzara, 1992; Douglas, 2005; Humphreys, 1984, 1986; Stoltzfus, 2005), and educators therefore recognize the necessity of fostering students’ audiation skills at all stages of musical instruction (Gordon, 2004; Karpinski, 2000; Rogers, 2004).
Gordon (2004) suggests singing as a fundamental element in the development of audiation skills. Additionally, researchers found that singing encourages greater sight-reading proficiency, error detection ability, and instrumental performance achievement (Bernhard, 2003a; Bloedel Beery, 1996; Bozone, 1986; Davis, 1981; Elliott, 1974; Emanuele, 2000; Grutzmacher, 1987; Jones, 2003; Killian, 1991; MacKnight, 1975; Mishra, 2014; Sheldon, 1998). While many researchers have examined the use of singing in elementary and high school settings, only a few researchers (Bozone, 1986; Brown, 1990; Hargiss, 1962) have investigated the use of singing and aural skills instruction within the collegiate group piano classroom.

Furthermore, many researchers have conducted empirical research regarding effective instructional procedures for the functional keyboard skill of sight reading within the group piano classroom (Baker, 2008; Beeler, 1995; Cox, 2000; Fincher, 1983; Fjerstad, 1968; Hagen, 2001; Hagen, Benson, & Cremaschi, 2007; Hanberry, 2004; Hardy, 1992; Kostka, 2000; Lowder, 1973; Micheletti, 1980; Montano, 1983; Pajtas, 2002; Pike & Carter, 2010; Watkins, 1984). These researchers found that preparatory exercises, engagement in improvisation activities, and peer teaching involvement may foster students’ keyboard sight-reading achievement. Although researchers have also examined effective instructional procedures regarding the development of keyboard harmonization (Betts & Cassidy, 2000) and improvisation skills (Kishimoto, 2002), few researchers have conducted empirical research regarding the development of other functional keyboard skills in the group piano classroom. Therefore, in this current study, the researcher incorporated the aural skill of sight singing, using moveable-do.
solmization, into the group piano classroom to determine its effects on students’ abilities to transpose at the keyboard.
CHAPTER 2
METHODOLOGY

The purpose of this quantitative study was to examine the effects of sight singing, using moveable-do solmization, on the keyboard transposition performance of undergraduate group piano students. A secondary purpose was to investigate if students’ academic level and prior piano and singing experiences influenced the effectiveness of sight singing on their transposition performance. The final purpose was to seek information on students’ perceived value of keyboard skills and singing as they relate to students’ overall music education and future careers. This chapter includes information regarding the research setting and participants, as well as the procedures and methods of data collection and analysis used to achieve the purposes of the study.

Setting

All non-keyboard music majors pursuing professional baccalaureate degrees at the University of South Carolina must complete at least two semesters of group piano coursework. Students enrolled in the Bachelor of Arts, Bachelor of Music, and Bachelor of Music–Music Education degrees must complete Group Piano Basic, Levels I and II, and students enrolled in the Bachelor of Music–Music Education (Choral) degree program must complete two semesters each of Group Piano Basic and Advanced Group Piano (University of South Carolina School of Music, 2014). While students may begin
the course sequence at any point in their undergraduate program, most enroll in Group Piano I and II as first-year students.

Students enrolled in group piano classes at the University of South Carolina meet for 50 minutes twice a week in the keyboard lab. Graduate assistants teach all levels of the group piano sequence. Additionally, a Group Piano Coordinator oversees all aspects of the group piano curriculum and holds weekly meetings with teaching assistants to assess group piano procedures and lesson plans. While graduate assistants must follow a prescribed course sequence, each graduate assistant individually develops daily lesson plans. During this current study, three different graduate assistants—a fourth-year DMA student in piano pedagogy; a first-year DMA student in piano pedagogy; and a first-year master’s student in piano pedagogy—each taught one of three offered sections of Group Piano I.

Instructors and students use *Alfred’s Group Piano for Adults, Book 1* (Lancaster & Renfrow, 2004), in the first two semesters of group piano study. Students then progress to *Alfred’s Group Piano for Adults, Book 2* (Lancaster & Renfrow, 2008), in the third and fourth semesters of study. Instructors may also choose to incorporate supplementary materials in class activities. Throughout the entire group piano course sequence, students study keyboard sight reading, harmonization, transposition, improvisation, technique, accompanying, and score reading. Graduate teaching assistants must include keyboard theory and technique, solo and/or ensemble repertoire, sight reading, and creative activities in each class meeting. Students in Group Piano I typically experience these activities through basic piano textures containing left hand primary chord accompaniments and right hand melodies in both closed and open positions.
At the time of this study, the University of South Carolina keyboard lab contained 18 CLP 155 Yamaha student Clavinova keyboards connected to one GEC3 Korg controller. Individual headsets with microphones were connected to each keyboard via an adapter. Instructors used one CVP-85A Yamaha Clavinova teacher’s keyboard equipped with a Musical Instrument Digital Interface (MIDI) disc player. The keyboard lab also contained an iMac computer, an SCI Key/Note Visualizer, and a dry-erase board.

Participants

The University of South Carolina School of Music offered three sections of Group Piano I for music majors in the Fall of 2013. A total of 47 undergraduate students registered for these courses based on their scheduling needs, and students did not know about this research study at the time of registration. Of these 47 students, 40 students from the three intact sections of Group Piano I volunteered to serve as participants in this quantitative study. Students were excluded from the final sample if they withdrew from the class or did not complete the videotaped posttest and posttest questionnaire. Thirty-nine students (N = 39) completed all requirements of the study and comprised the final sample for this research. The control group consisted of 14 students (n = 14), while the experimental group consisted of 25 total students (n = 25) divided between two intact Group Piano I classes (n = 13 and n = 12, respectively).

The sample consisted of 77% freshmen, 15% sophomores, 8% juniors, and 0% seniors. Students declared a variety of different majors within the School of Music, with the majority of students (62%) pursuing a Bachelor of Music–Music Education Emphasis. Figure 2.1 shows the breakdown of degree programs declared by participants.
in this study. Additionally, 36% of all students in this study had taken formal piano lessons at some point prior to their enrollment in this group piano course. In contrast, 56% of all students indicated prior involvement in singing activities, such as participation in choirs and private vocal lessons. Furthermore, at the time of this study, 92% of these students were concurrently enrolled in the theory and aural skills sequence at the University of South Carolina; the remaining 8% of students in this study’s sample were juniors who had completed the sequence. Finally, in compliance with the Institutional Review Board (IRB) at the University of South Carolina, this study was submitted for review and approved as exempt (See Appendix B). During the first two weeks of classes, the researcher also gave students the opportunity to sign a letter of consent, which served as their agreement to participate in the study (See Appendix C).
Materials

During the treatment phase of this study, students sight read and transposed 22 musical examples. The researcher selected these examples from the following texts: *Alfred’s Group Piano for Adults*, Book 1 (Lancaster & Renfrow, 2004); *Alfred’s Technical Skills*, Level 1–2 (Magrath, 1992); *Progressive Class Piano* (Heerema, 1984); *Keyboard Strategies*, Master Text I (Stecher, Horowitz, Gordon, Kern, & Lancaster, 1980); *Keyboard Musicianship*, Book 1 (Lyke et al., 2009); *Contemporary Class Piano* (Mach, 2008); and the Preliminary text of the Associated Board of the Royal Schools of Music’s *First Series of Graded Pianoforte Studies* (Associated Board of the Royal Schools of Music, ca. 1985). Appendix D lists the specific examples used in this study, as well as the semester calendar and general lesson sequence.

When choosing these materials, the researcher selected only major-key examples. While students in Group Piano I courses covered minor keys during the course of this study, minor solmization was not introduced in the aural skills curriculum until after the conclusion of this research. Since 77% of participants in this study were freshmen—many of whom were simultaneously enrolled in their first semester of the aural skills sequence—most did not yet know the minor solmization needed to sing these types of examples. Therefore, minor-key examples were not included in the study materials. Additionally, musical examples remained within five-finger positions, with the exception of Louis Köhler’s “Etude,” Op. 190, No. 13 (Magrath, 1992) from Study Week 4 and Cornelius Gurlitt’s “Allegro,” Op. 82, No. 29 (Associated Board of the Royal Schools of Music, ca. 1985, #53) from Study Week 5, which expanded the position to include the leading tone (ti).
Finally, the researcher made an effort to include musical examples where both the right hand and left hand parts could be sung using moveable-do solmization; chordal accompaniments therefore were not included. Musical examples remained in their original form. However, the researcher removed indicated fingerings when it seemed they were redundant.\textsuperscript{11} The Group Piano Coordinator and two faculty members in the School of Music at the University of South Carolina reviewed and approved all materials used in the treatment phase of this study as appropriate to the purposes of this research and the level of students enrolled in Group Piano I courses. Furthermore, the researcher worked closely with the Group Piano Coordinator and the three graduate teaching assistants throughout the course of this study to ensure that sight-reading and transposition materials continually aligned with the sequencing of the core group piano curriculum.

Additionally, students sight read and transposed two other examples as part of the study’s pretest and posttest. The pretest consisted of one example, “Bagpipe” (Appendix F; Snell, 1997), which the researcher chose based on its consistency with examples used in the core group piano curriculum during the second and third week of Group Piano I classes. To fit the confines of this study, the researcher also made slight modifications to “Bagpipe”: (a) repeat signs were removed due to time constraints and to eliminate any possible effects that could occur as a result of playing the example twice; and (b) the piano dynamic was removed from the first line, and the forte dynamic was removed from the second line.

The posttest consisted of the same pretest example, “Bagpipe,” as well as a new example of greater difficulty, Louis Köhler’s “Etude,” Op. 190, No. 15 (Appendix F;

\textsuperscript{11} Fingerings were removed in Louis Köhler’s Etude, Op. 190, No. 13 (Magrath, 1992, p. 14) from Study Week 4.
Magrath, 1992). The researcher also slightly modified “Etude” for the purposes of this study: (a) the subtitle, “The French Balloon,” was removed; and (b) the left hand fingering was removed in measure five. The Group Piano Coordinator and two faculty members in the School of Music at the University of South Carolina also approved these pretest and posttest examples as appropriate to the purposes of this research and the level of students enrolled in Group Piano I courses. Additionally, the researcher obtained permission to include these two examples in Appendix F; Appendix G contains these copyright licenses.

**Procedures**

The researcher used the *Nonequivalent Control Group Design* for this study. Campbell and Stanley (1963) describe this design as follows:

One of the most widespread experimental designs in educational research involves an experimental group and a control group both given a pretest and a posttest, but in which the control group and the experimental group do not have pre-experimental sampling equivalence. Rather, the groups constitute naturally assembled collectives such as classrooms, as similar as availability permits but yet not so similar that one can dispense with the pretest. The assignment of X [treatment] to one group or the other is assumed to be random and under the experimenter’s control (p. 47).

Table 2.1 details the design of this current study. The treatment period lasted for six weeks and occurred during normal class time. Students in the two experimental groups received the same treatment—sight singing with movable-do solmization—while the control group sight read and transposed the same musical examples without engaging in sight-singing activities.
Table 2.1

Nonequivalent Control Group Design

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Treatment</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>O</td>
<td></td>
<td>O</td>
</tr>
<tr>
<td>Experimental 1</td>
<td>O</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>Experimental 2</td>
<td>O</td>
<td>X</td>
<td>O</td>
</tr>
</tbody>
</table>

On the first day of classes, the researcher visited each of the three sections of Group Piano I to inform students about the study and to recruit participants. The researcher returned to each of the three sections of Group Piano I on the second and third days of class to answer any further questions and continue recruiting. Of the 47 students enrolled in these three sections, 40 students volunteered to sign the consent form (Appendix C), which served as their agreement to participate in the study. Students completed researcher-constructed pretest questionnaires (Appendix I) at the same time they signed the consent form. In the second and third weeks of classes, students then participated in an individual videotaped pretest. Due to the number of students who volunteered to participate, the researcher administered the pretest over two days: one day outside of class time and one day during scheduled class time. Students signed up for a pretest time based on their availability and scheduling preferences.

Students took the pretest in a separate classroom equipped with a CLP 155 Yamaha student Clavinova keyboard, and the researcher provided pencils to students if they wished to write on the score. The researcher also used a Canon T3i camera to record performances. Once students entered the room, the researcher gave them instructions regarding how to complete the pretest (Appendix J). The researcher informed students
that they would have two minutes to prepare to sight read and transpose the example. During this time, the researcher told students they could use any preparation techniques they found beneficial; however, they were asked not to play the piano during these two minutes. The researcher also informed students that they would sight read the piece once at the conclusion of the two-minute preparation phase, and they would then immediately transpose the piece to E major, again performing the transposed version only once. Students were urged to sight read and transpose “Bagpipe” without stopping or restarting.

The researcher also wrote a list of these pretest steps on the whiteboard in the room so students could reference them during the pretest. Figure 2.2 shows the sequential steps used in the pretest.

![Figure 2.2. Pretest Steps.](image)

Once participants indicated they understood the instructions and were ready to begin, the researcher handed the student a clean copy of “Bagpipe,” started a stopwatch, and began recording the student’s preparation time on the camera. The researcher then left the room while the student prepared to sight read and transpose the example. After two minutes had passed, the researcher re-entered the room and told the student that he or she could now sight read the piece once and transpose the piece once. The researcher
again exited the room while the student performed. Students had a maximum of three minutes to sight read and transpose the example.

Following the completion of the pretest by all participants, the researcher randomly selected one intact section of Group Piano I as the control group \((n = 15)\), while the other two intact sections served as the two experimental groups \((n = 13 \text{ and } n = 12, \text{ respectively})\). For the next phase of the study—the treatment phase—the researcher developed individual lesson plans for each day’s sight-reading and transposition segment. (See Appendix E for detailed lesson plans for each day of treatment.) Students sight read and transposed two musical examples on each day of the treatment; in total, students sight read and transposed 22 examples over the course of the study. In the third week of classes, the researcher began teaching these ten- to fifteen-minute sight-reading and transposition treatment lessons in all three Group Piano I classes. Graduate teaching assistants taught all other elements of the course.

Sight singing with moveable-\textit{do} solmization was the independent variable in this study. To isolate the effects of sight singing with moveable-\textit{do} solmization on students’ transposition performance, the control and experimental groups followed the same general lesson plan outline and received the same amount of time to sight read and transpose each example. The experimental groups, however, sang each example using moveable-\textit{do} solmization prior to sight reading and transposing, while the control groups did not sing before sight reading and transposing. Figure 2.3 summarizes the four main steps of each lesson, including variations between control and experimental groups.
Students in both the experimental and control groups started with guided score study, where they were asked to identify the key and meter of the example, as well as the five-finger pattern or scale used in the music. Then, students in both the control and experimental groups engaged in the same sight-reading preparation exercises, which included shadowing, tapping on the closed keyboard lid, and chanting finger numbers. The researcher designed these exercises to help students determine the fingerings, rhythms, dynamics, and keyboard position required to accurately perform each example. Where appropriate, preparation techniques used in the sight-reading preparation phase were modeled for students. Furthermore, when developing this sight-reading preparation segment, the researcher carefully planned each lesson so that students in the control and experimental groups would spend the same amount of preparation time on each example.
Additionally, the experimental groups’ preparation stage involved sight singing of right hand or left hand melodies, as well as single-note harmonies, using moveable-do solmization. The experimental groups first heard the researcher play a cadence in the key of the example, and then students in the experimental groups tonicized this key by outlining the tonic triad using solmization syllables. The researcher then asked students directed questions about the starting pitch of the example, which they then identified and sang. Next, the researcher instructed students in the experimental groups to use a sight-reading preparation technique—either shadowing or tapping on the closed keyboard lid—while simultaneously sight singing the melody or single-note harmony using solmization.

Students in both the control and experimental groups then sight read the example once. Next, the researcher told students the key to which the example would be transposed. The researcher gave students in the control group approximately one minute of individual preparation time, where they were allowed to use any techniques they found appropriate in preparation to transpose. However, the researcher instructed students in the control group to refrain from playing the example on the piano during this preparation time. In contrast, the researcher played a cadence in the new key for the experimental groups, and these students then tonicized the new key and identified and sang the new starting pitch. Students in the experimental groups then sang the melody or single-note harmony using solmization syllables while shadowing. During some classes, the researcher asked students in the experimental group to sing the melody or single-note harmony using solmization syllables while playing, rather than shadowing, the example. Finally, students in both experimental and control groups played the example hands together in the transposed key.
After approximately six weeks of treatment, students participated in an individual videotaped posttest. The researcher administered the posttest over three days; posttests occurred in a separate room during scheduled class time. Students took posttests in the same room as the pretest, and the setup and posttest instructions were identical to that of the pretest. Once students entered the room, the researcher gave them instructions on how to complete the posttest (Appendix J). The researcher then gave students two minutes of preparation time for the first example, “Bagpipe.” During these two minutes of preparation, the researcher told students they could use any preparation techniques they found beneficial. As in the pretest, the researcher also asked students to refrain from playing the piano during these two minutes. The researcher used a stopwatch to time the preparation phase and left the room during this time. Once two minutes had passed, the researcher re-entered the room and instructed students to first sight read “Bagpipe” and then transpose it to E major. Students were given a maximum of three minutes to sight read and transpose the piece.

After students indicated they were finished, the researcher again entered the room and reiterated the instructions for the second example, which followed the same steps as “Bagpipe.” Once a student stated that he or she was ready to complete the second example, the researcher handed a clean copy of “Etude” to the student and left the room. Following two minutes of preparation time, the researcher re-entered the room and instructed students to first sight read “Etude” once and then transpose the example once to the key of F major. Students again had three minutes to sight read and transpose this second example. Once students finished sight reading and transposing “Etude,” they were asked to complete the posttest questionnaire (Appendix I). A total of 39 students
completed all requirements of the study, yielding a final sample of \( N = 39 \), with 14 students in the control group \( (n = 14) \)\(^{12}\) and 25 total students \( (n = 25) \) divided between the two experimental groups \( (n = 13 \text{ and } n = 12, \text{ respectively}) \).

**Dependent Measures and Instrumentation**

The researcher used two forms of data collection in this study: (a) video recordings of all pretests and posttests, and (b) researcher-constructed pretest and posttest questionnaires. The video recordings of students’ pretests and posttests contained the two minutes of preparation time for each example, as well as students’ sight-read and transposed performances of “Bagpipe” and “Etude.” The researcher analyzed performances from these videotaped pretests and posttests using an observation form and scoring process adapted by Baker (2008) from the *Watkins–Farnum Performance Scale for Instrumentalists* (1954), a standardized achievement test for all band instruments.\(^{13}\) In Baker’s (2008) scoring procedure, participants’ performances were scored for pitch accuracy, rhythmic accuracy, and continuity.

In this current study, the researcher assessed each beat of “Bagpipe” and “Etude” for (a) the pitch accuracy of right hand \( (PR) \); (b) the pitch accuracy of left hand \( (PL) \); (c) the rhythmic accuracy of right hand \( (RR) \); (d) the rhythmic accuracy of left hand \( (RL) \); and (e) continuity \( (C) \). Students could therefore receive a total of five points per beat.

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\(^{12}\) One student, who was originally part of the control group, withdrew from the course.

\(^{13}\) Baker (2008) states that “because sight-reading pretests and posttests were written on a grand staff, and because pianists simultaneously read many more notes than a musician performing on a monophonic band instrument, alterations were made to the Watkins–Farnum scoring process to collect as much information as possible from a pianist’s performance” (p. 36). In addition, Baker notes that “the measure serves as the scoring unit” (p. 36) in the *Watkins–Farnum Performance Scale*, but “for the purposes of analyzing the pretests and posttests in this study, however, the beat served as the scoring unit” (p. 36). See Baker (2008), pages 35–37, for full scoring definitions and adaptations.
Additionally, the researcher added a sixth category of *dynamics* (*D*) to the observation form used in this study. Participants could thus receive pretest and posttest scores ranging from 0–162 (32 beats per example x 5 possible errors per beat + 2 dynamic units) for Example 1, “Bagpipe” (Appendix F; Snell, 1997), and 0–164 (32 beats per example x 5 possible errors per beat + 4 dynamic units) for Example 2, “Etude,” Op. 190, No. 15 by Louis Köhler (Appendix F; Magrath, 1992).

The researcher used scoring procedures and definitions outlined in both the *Watkins–Farnum Performance Scale*, Form A (1954), and Baker’s (2008, p. 35–37) adapted version of the *Watkins–Farnum Performance Scale*. The following definitions of pitch, rhythm, continuity, and dynamic errors guided the scoring procedures:

1. *Pitch errors* included any note added or omitted, as well as any note played on the wrong pitch. However, if a student played one or both hands in the wrong register, the researcher did not deduct points for pitch errors. Instead, examples were scored as if the student played in the correct register, and the researcher made an indication of which hand(s) was played in the wrong register beside the student’s total score.

2. *Rhythm errors* included (a) any note not held for its full value, (b) any note held longer than its full value (up to three-quarters of a beat longer), (c) any note held when it should be repeated, and (d) any omitted note.

3. *Continuity errors* occurred in three ways: (a) if a pause or hesitation occurred at the bar line, a continuity error was marked on the first beat of the measure *after* the pause; (b) if a hesitation of *more* than three-quarters of a beat occurred at any point, a continuity error was marked for the beat that was delayed due to the
hesitation; and (c) if a student moved backwards to replay any portion of the music, a continuity error was marked for the beat that did not occur at the correct time.

4. *Dynamic errors* were marked if a student failed to observe the indicated dynamic mark.

Additionally, if a student moved backwards to replay any portion of the exercise, only the first performance of any repeated material was scored. Appendix H lists detailed scoring procedures used by the researcher. An independent observer used these same scoring instructions to evaluate a random selection (20%) of the videos in order to calculate interjudge reliability.

In addition to scoring pretest and posttest performances, the researcher watched, transcribed, and coded every student’s two-minute preparation segment for each of the sight-read and transposed versions of “Bagpipe” and “Etude.” The researcher observed 23 different types of preparation behaviors used by students during these two minutes of preparation. As shown in Table 2.2, these behaviors were then organized into three main categories: (a) aural, (b) visual, and (c) kinesthetic. Additionally, many students engaged in combinations of *Aural* and *Kinesthetic* behaviors, such as humming while tapping, counting while shadowing, and singing solfège syllables while shadowing, among others. Furthermore, the researcher coded any behaviors unrelated to sight-reading or transposition preparation into the category of “Other.”

Finally, students in both the control and experimental groups also completed the same pretest and posttest questionnaires (Appendix I), which the researcher developed specifically for this study. The pretest questionnaire consisted of 20 items and was
Table 2.2  
*Observed Pretest and Posttest Preparation Behaviors*

<table>
<thead>
<tr>
<th>Category</th>
<th>Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aural</strong></td>
<td>Chanting neutral syllables</td>
</tr>
<tr>
<td></td>
<td>Chanting finger numbers</td>
</tr>
<tr>
<td></td>
<td>Counting</td>
</tr>
<tr>
<td></td>
<td>Humming</td>
</tr>
<tr>
<td></td>
<td>Saying finger numbers</td>
</tr>
<tr>
<td></td>
<td>Saying neutral syllables</td>
</tr>
<tr>
<td></td>
<td>Saying solfège syllables</td>
</tr>
<tr>
<td></td>
<td>Singing finger numbers</td>
</tr>
<tr>
<td></td>
<td>Singing neutral syllables</td>
</tr>
<tr>
<td></td>
<td>Singing solfège syllables</td>
</tr>
<tr>
<td></td>
<td>Talking</td>
</tr>
<tr>
<td></td>
<td>Whistling</td>
</tr>
<tr>
<td><strong>Visual</strong></td>
<td>Reading instructions</td>
</tr>
<tr>
<td></td>
<td>Studying the score</td>
</tr>
<tr>
<td></td>
<td>Writing on the score</td>
</tr>
<tr>
<td><strong>Kinesthetic</strong></td>
<td>Clapping</td>
</tr>
<tr>
<td></td>
<td>Finding keyboard position</td>
</tr>
<tr>
<td></td>
<td>Shadowing</td>
</tr>
<tr>
<td></td>
<td>Silent playing</td>
</tr>
<tr>
<td></td>
<td>Snapping</td>
</tr>
<tr>
<td></td>
<td>Tapping</td>
</tr>
<tr>
<td></td>
<td>Using body movements</td>
</tr>
<tr>
<td></td>
<td>Using Curwen hand signs</td>
</tr>
</tbody>
</table>

designed to gather information on students’ academic level and degree program; prior theory, aural skills, and keyboard experiences; and perceived abilities in sight reading, transposition, and solmization. In the first two sections (*General Information* and *Skills*, Questions 1–13), the researcher collected information on students’ (a) year in college, (b) degree program, (c) primary instrument, (d) secondary instrument(s), (e) prior or current enrollment in theory classes, (f) prior or current enrollment in aural skills classes, (g) prior piano study, (h) prior singing experiences, and (i) prior experience with various solmization systems. These nine items were identified as variables that could influence
results of the study. Additionally, students provided their name and email in the General Information section for purposes of communication in this study.

The third section of the pretest questionnaire (Reading Ability, Questions 14–20), gathered students’ views on their perceived abilities in sight reading, transposition, and solmization using a six-point Likert Scale. Students first responded to questions regarding their perceived reading ability on treble and bass clef, as well as on the grand staff. Questions 16–19 asked students to rate their sight-reading and transposition abilities both on the keyboard and on their own instrument; the researcher included these questions to examine if any correlation existed between students’ perceived abilities on their own instrument and on the keyboard. Additionally, the researcher compared response data from Questions 16 and 18 to response data from identical questions on the posttest questionnaire (Questions 1–2) to identify if students’ perceptions changed between the beginning and end of the study. Furthermore, the twentieth pretest question asked students to rate their current solmization skills. The researcher also compared response data from Question 20 to response data from the identical question on the posttest questionnaire (Question 3) to determine if any changes occurred in students’ perceptions of their solmization abilities.

Students completed the three-part posttest questionnaire immediately following their individual videotaped posttest. The posttest questionnaire was designed to gather students’ (a) perceptions of their abilities following treatment; (b) opinions on the efficacy of various sight-reading and transposition preparation techniques; and (c) opinions on the importance of keyboard skills, transposition skills, and singing to their music education and future careers. Part A asked students to rate their current keyboard
sight-reading and transposition skills, as well as their solmization skills; the researcher compared response data from these questions to response data from identical questions on the pretest questionnaire (Questions 16, 18, and 20) to identify if any changes occurred between the pretest and posttest. In Part B, students used a six-point Likert Scale to rate the effectiveness of the following sight-reading preparation techniques: (a) silent score study, (b) tapping on the closed keyboard cover, (c) shadowing on the keys, and (d) singing with solfège. Students then rated the effectiveness of the following transposition preparation techniques: (a) silent score study, (b) thinking about the intervals, (c) thinking about the scale degrees, (d) singing with solfège, and (e) thinking the solfège. Students also had the opportunity to list any other preparation techniques they found helpful before sight reading or transposing.

Because educators recognize the importance of keyboard proficiency to students’ music education and future careers (Baker, 2008; Christensen, 2000; March, 1988), the researcher designed Questions 1–4 in Part C of the posttest questionnaire to gather students’ perceptions of the importance of general keyboard skills and keyboard transposition skills to both their music education and their future careers. Similarly, educators also identify singing experiences as a fundamental component of aural understanding and performance achievement (Gordon, 2004; Karpinski, 2000; Bernhard, 2003b; Rogers, 2004). The researcher therefore designed Questions 5 and 6 in Part C to collect students’ views on the importance of singing to their music education, as well as to their future careers. Furthermore, Questions 7 and 8 in Part C of the posttest questionnaire asked students how likely they were to use singing to transpose at the
keyboard (Question 7) or on their own instrument (Question 8) in the future. The final item on the posttest questionnaire asked students to provide any additional comments.

**Analysis of Data**

To statistically address the research questions presented in Chapter 1, the researcher tested the following null hypotheses:

\( H_{01} \): There will be no significant difference in total scores between experimental and control groups.

\( H_{02} \): There will be no significant difference in pitch accuracy scores between experimental and control groups.

\( H_{03} \): There will be no significant difference in rhythmic accuracy scores between experimental and control groups.

\( H_{04} \): There will be no significant difference in continuity scores between experimental and control groups.

\( H_{05} \): There will be no significant difference in musical expressivity scores between experimental and control groups.

\( H_{06} \): There will be no significant difference between experimental and control groups in posttest Likert Scale responses regarding perceived value of keyboard skills as they relate to students’ overall music education and future careers.

\( H_{07} \): There will be no significant difference between experimental and control groups in posttest Likert Scale responses regarding perceived value of singing as it relates to students’ overall music education and future careers.
For all statistical tests, the level of significance was set to $\alpha = .05$; all tests were two-tailed.

To examine the above null hypotheses, the researcher first entered students’ pretest and posttest scores, as well as results from pretest and posttest questionnaires, into Microsoft Excel 2013. The researcher also used this same program to transcribe and code each student’s videotaped sight-reading and transposition preparation segments. Analysis of the data began with calculations of descriptive and exploratory statistics. Quantile-Quantile (Q-Q) plots and results from formal normality testing with the chi-square goodness-of-fit test and the Shapiro–Wilk test for normality indicated non-normal distributions for much of the data. Therefore, the researcher used non-parametric tests to evaluate if any significant differences existed between experimental and control groups as a result of the treatment.

The researcher first used the Kruskal–Wallis One-Way Analysis of Variance by Ranks to investigate differences between total and individual scores of the control and experimental groups. Additionally, post-hoc gain score analyses were performed using the Kruskal–Wallis One-Way Analysis of Variance by Ranks and the Mann–Whitney $U$ test. The Wilcoxon Matched-Pairs Signed-Ranks test was also used to compare pretest-to-posttest gains within groups. Results from pretest and posttest questionnaires were analyzed using two-way chi-square tests and the Mann–Whitney $U$ test. The Real Statistics Resource Pack© (Zaiontz, 2014) for Microsoft Excel was used to perform all inferential statistical analyses. Finally, the researcher evaluated students’ coded preparation behaviors by summing every student’s preparation time in each behavior.
category. These totals were then converted to percentages to compare the time students spent in aural, visual, and kinesthetic preparatory behaviors.
CHAPTER 3

RESULTS

This chapter includes information on interjudge reliability, descriptive and exploratory data regarding the sample, and the results of all inferential statistical tests related to each of the study’s null hypotheses. Normality tests indicated that a majority of the data were non-normally distributed. Therefore, non-parametric tests were chosen for all inferential statistical tests. The researcher used the Kruskal–Wallis One-Way Analysis of Variance by Ranks and the Mann–Whitney U test to analyze if any significant differences existed between the scores of the experimental and control groups. Additionally, the Wilcoxon Matched-Pairs Signed-Ranks test was used to examine intragroup pretest-to-posttest gains. Students’ preparation behaviors were also analyzed and compared across groups. Finally, response data from pretest and posttest questionnaires were analyzed using two-way chi-square tests and the Mann–Whitney U test.

Interjudge Reliability

To test the reliability of the observation form and scoring procedures used in this study, an independent observer scored approximately 20% of all videotaped pretest and posttest performances using the same observation form and scoring procedures as the
researcher (see Appendices F and H). Using the scores given by the independent observer for each of the sight-reading and transposition performances in these 16 videos, the researcher then calculated the Pearson product-moment correlation coefficient to assess the degree of agreement between the researcher and the independent observer on these scores. The resulting correlation coefficient, \( r = .98 \), indicated a strong positive correlation between the scores of the researcher and the independent observer. Due to this high correlation coefficient, the observation form and scoring procedures used in this study can be considered reliable.

**Descriptive Statistics**

The researcher began examination of the data by calculating descriptive statistics for the control and experimental groups’ pretest and posttest scores. Table 3.1 lists the means, standard deviations, and mean pretest-to-posttest gains for students’ total scores on the pretest and posttest. As seen in Table 3.1, experimental group 2 consistently had the lowest average scores on all facets of the pretest and posttest, with the exception of Sight Reading 1 and Transposition 1 (“Bagpipe”) on the posttest, where the group’s mean scores were slightly higher than those of experimental group 1. Additionally, since the first part of the posttest included the identical pretest example, “Bagpipe,” the researcher could directly compare pretest and posttest scores for Sight Reading 1 and Transposition 1. As expected, all groups showed improvement from the pretest to the posttest. However, experimental group 2 displayed the greatest mean pretest-to-posttest gains on both Sight Reading 1 (+15.5) and Transposition 1 (+47.7). Students in both experimental groups also evidenced larger mean gains (+35.5 and +46.5, respectively) than the control
### Table 3.1

**Descriptive Statistics for Pretest and Posttest Scores of Total Sample (N = 39)**

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th></th>
<th>Experimental 1</th>
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<th>Experimental 2</th>
<th></th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>n = 13</td>
<td>n = 12</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sight Reading 1</td>
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<td>149.9</td>
<td>137.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
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<td>23.1</td>
<td>30.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>SD</td>
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<td>42.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Posttest</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sight Reading 1</td>
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<td>152.2</td>
<td>152.8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gains</td>
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<td>+2.2</td>
<td>+15.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>4.1</td>
<td>12.3</td>
<td>32.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transposition 1</td>
<td>143.7</td>
<td>133.2</td>
<td>137.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gains</td>
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<td>+25.7</td>
<td>+47.7</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>SD</td>
<td>25.5</td>
<td>55.9</td>
<td>37.3</td>
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<td></td>
</tr>
<tr>
<td>Sight Reading 2</td>
<td>151.5</td>
<td>153.8</td>
<td>148.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gains</td>
<td>+4.6</td>
<td>+3.8</td>
<td>+11.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>10.8</td>
<td>11.9</td>
<td>31.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transposition 2</td>
<td>142.8</td>
<td>143.0</td>
<td>136.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gains</td>
<td>+26.7</td>
<td>+35.5</td>
<td>+46.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>11.1</td>
<td>47.6</td>
<td>42.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* Maximum points possible for Sight Reading 1 and Transposition 1 on both pretest and posttest = 162. Maximum points possible for Sight Reading 2 and Transposition 2 on posttest = 164.

While the academic level of students in this study’s sample ranged from freshmen to juniors, freshmen represented the majority (77%) of participants in this study. Therefore, the researcher also calculated descriptive statistics solely for freshmen students involved in this study. Table 3.2 lists means, standard deviations, and mean pretest-to-posttest gains for total scores of freshmen participants. Again, freshmen in experimental group 2 had the lowest mean scores on all areas of the pretest and posttest,
Table 3.2
Descriptive Statistics for Pretest and Posttest Scores of Freshmen (N = 30)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Experimental 1</th>
<th>Experimental 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 11</td>
<td>n = 10</td>
<td>n = 9</td>
</tr>
<tr>
<td><strong>Pretest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sight Reading 1</td>
<td>147.5</td>
<td>146.5</td>
<td>139.1</td>
</tr>
<tr>
<td>SD</td>
<td>21.2</td>
<td>25.6</td>
<td>27.3</td>
</tr>
<tr>
<td>Transposition 1</td>
<td>113.8</td>
<td>92.2</td>
<td>76.0</td>
</tr>
<tr>
<td>SD</td>
<td>29.8</td>
<td>50.6</td>
<td>40.3</td>
</tr>
<tr>
<td><strong>Posttest</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sight Reading 1</td>
<td>158.3</td>
<td>149.9</td>
<td>151.0</td>
</tr>
<tr>
<td>Gains</td>
<td>+10.7</td>
<td>+3.4</td>
<td>+11.9</td>
</tr>
<tr>
<td>SD</td>
<td>2.9</td>
<td>20.2</td>
<td>18.2</td>
</tr>
<tr>
<td>Transposition 1</td>
<td>141.6</td>
<td>125.1</td>
<td>131.9</td>
</tr>
<tr>
<td>Gains</td>
<td>+27.8</td>
<td>+32.9</td>
<td>+55.9</td>
</tr>
<tr>
<td>SD</td>
<td>27.9</td>
<td>38.5</td>
<td>29.6</td>
</tr>
<tr>
<td>Sight Reading 2</td>
<td>152.4</td>
<td>152.4</td>
<td>147.0</td>
</tr>
<tr>
<td>Gains</td>
<td>+4.8</td>
<td>+5.9</td>
<td>+7.9</td>
</tr>
<tr>
<td>SD</td>
<td>11.2</td>
<td>12.8</td>
<td>29.7</td>
</tr>
<tr>
<td>Transposition 2</td>
<td>142.6</td>
<td>138.8</td>
<td>135.6</td>
</tr>
<tr>
<td>Gains</td>
<td>+28.8</td>
<td>+46.6</td>
<td>+59.6</td>
</tr>
<tr>
<td>SD</td>
<td>10.7</td>
<td>25.3</td>
<td>13.3</td>
</tr>
</tbody>
</table>

Note. Maximum points possible for Sight Reading 1 and Transposition 1 on both pretest and posttest = 162. Maximum points possible for Sight Reading 2 and Transposition 2 on posttest = 164.

although students in this group did have slightly higher mean scores than freshmen in experimental group 1 on Sight Reading 1 and Transposition 1 on the posttest. In contrast, freshmen in the control group consistently had the highest mean scores on all aspects of the pretest and posttest.

Similarly, all students still evidenced improvement on all aspects of the posttest. However, when considering mean pretest-to-posttest gains of freshmen on the transposition segments of the posttest, both experimental groups made even larger gains on Transposition 1 (+32.9 and +55.9, respectively) and Transposition 2 (+46.6 and +59.6, respectively) than when considering the entire sample. The gains of freshmen in the control group, however, only vary from that of the total control group by two-tenths of a
point on Transposition 1 (+27.8) and approximately two points on Transposition 2 (+28.8).

To score students’ pretest and posttest performances, the researcher assessed each beat of “Bagpipe” and “Etude” for pitch accuracy, rhythmic accuracy, continuity, and dynamics. Therefore, in addition to calculating descriptive statistics for students’ total scores, the researcher also calculated descriptive statistics for each of these individual components. Table 3.3 lists means and standard deviations for each separate category on the pretest. Again, experimental group 2 consistently had the lowest mean scores on all individual components on the pretest. Additionally, students in all groups scored highest

Table 3.3

Descriptive Statistics for Individual Components of Pretest (N = 39)

<table>
<thead>
<tr>
<th></th>
<th>Control n = 14</th>
<th>Experimental 1 n = 13</th>
<th>Experimental 2 n = 12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Sight Reading 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pitch RH</td>
<td>27.4</td>
<td>8.4</td>
<td>27.5</td>
</tr>
<tr>
<td>Rhythm RH</td>
<td>30.7</td>
<td>1.3</td>
<td>31.1</td>
</tr>
<tr>
<td>Pitch LH</td>
<td>29.7</td>
<td>8.6</td>
<td>29.5</td>
</tr>
<tr>
<td>Rhythm LH</td>
<td>28.1</td>
<td>3.8</td>
<td>29.3</td>
</tr>
<tr>
<td>Continuity</td>
<td>29.6</td>
<td>3.0</td>
<td>31.0</td>
</tr>
<tr>
<td>Dynamics</td>
<td>1.4</td>
<td>0.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Transposition 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pitch RH</td>
<td>15.1</td>
<td>14.0</td>
<td>13.5</td>
</tr>
<tr>
<td>Rhythm RH</td>
<td>29.2</td>
<td>2.1</td>
<td>27.5</td>
</tr>
<tr>
<td>Pitch LH</td>
<td>16.0</td>
<td>16.6</td>
<td>14.8</td>
</tr>
<tr>
<td>Rhythm LH</td>
<td>27.1</td>
<td>4.8</td>
<td>25.5</td>
</tr>
<tr>
<td>Continuity</td>
<td>27.7</td>
<td>3.4</td>
<td>25.0</td>
</tr>
<tr>
<td>Dynamics</td>
<td>1.0</td>
<td>0.4</td>
<td>1.3</td>
</tr>
</tbody>
</table>

on right hand rhythm and lowest on right hand pitch on the pretest.

Table 3.4 lists means and standard deviations for each separate category on the posttest; all groups demonstrated pretest-to-posttest improvement on every component. However, students’ highest and lowest mean scores on each distinct aspect of the posttest varied depending on the example. On the posttest’s Transposition 1 (“Bagpipe”), mean scores were highest on right hand rhythm and lowest on left hand pitch. In contrast, mean scores were highest on left hand rhythm and lowest on right hand pitch on the posttest’s Transposition 2 (“Etude”). Highest and lowest scores on Sight Reading 1 and 2 differed among groups, with the exception of Sight Reading 2 (“Etude”), where mean scores were lowest on right hand pitch.

In addition to calculating students’ total gain scores (see Tables 3.1 and 3.2), the researcher also examined students’ pretest-to-posttest improvement on individual scores of pitch accuracy, rhythmic accuracy, continuity, and dynamics. All gain scores were computed by subtracting each student’s pretest score from his or her posttest score. As seen in Table 3.5, students in all groups showed improvement in almost every individual posttest category. In general, students in experimental group 2 evidenced the largest improvement in individual scores on nearly all aspects of the posttest.
Table 3.4

*Descriptive Statistics for Individual Components of Posttest (N = 39)*

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
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<th>Experimental 1</th>
<th></th>
<th>Experimental 2</th>
<th></th>
</tr>
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<tbody>
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<tr>
<td></td>
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<td>SD</td>
<td>M̅</td>
<td>SD</td>
<td>M̅</td>
</tr>
<tr>
<td><strong>Sight Reading 1</strong></td>
<td></td>
<td>31.2</td>
<td>1.0</td>
<td>31.0</td>
<td>1.5</td>
<td>31.2</td>
</tr>
<tr>
<td>Pitch RH</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhythm RH</td>
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<td>0.7</td>
<td>31.2</td>
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<td>30.7</td>
</tr>
<tr>
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<td>1.7</td>
<td>27.1</td>
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<td>29.3</td>
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<tr>
<td>Rhythm LH</td>
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<td>1.1</td>
<td>29.4</td>
<td>6.0</td>
<td>29.3</td>
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<tr>
<td>Continuity</td>
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<td>1.9</td>
<td>31.7</td>
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<td>30.8</td>
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<tr>
<td>Dynamics</td>
<td></td>
<td>1.5</td>
<td>0.5</td>
<td>1.8</td>
<td>0.4</td>
<td>1.6</td>
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<tr>
<td><strong>Transposition 1</strong></td>
<td></td>
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<td>11.4</td>
<td>21.0</td>
<td>14.7</td>
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<td>28.5</td>
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<tr>
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</tr>
<tr>
<td>Pitch RH</td>
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<tr>
<td>Rhythm RH</td>
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<td>2.0</td>
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<td>29.1</td>
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<td>2.1</td>
<td>30.9</td>
<td>1.5</td>
<td>29.5</td>
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<tr>
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<td>2.2</td>
<td>30.3</td>
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<td>Dynamics</td>
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<td>0.8</td>
<td>2.6</td>
<td>1.2</td>
<td>2.3</td>
</tr>
<tr>
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<tr>
<td>Pitch RH</td>
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<tr>
<td>Rhythm RH</td>
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<td>29.8</td>
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<tr>
<td>Pitch LH</td>
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<tr>
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</tr>
<tr>
<td>Continuity</td>
<td></td>
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<tr>
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<td>0.9</td>
<td>2.2</td>
<td>0.8</td>
<td>1.8</td>
</tr>
</tbody>
</table>

*Note.* Maximum points possible for Continuity and Pitch/Rhythm of RH and LH on Sight Reading 1 and 2 and Transposition 1 and 2 = 32. Maximum points possible for Dynamics on Sight Reading 1 and Transposition 1 = 2. Maximum points possible for Dynamics on Sight Reading 2 and Transposition 2 = 4. RH = Right Hand; LH = Left Hand.
Table 3.5

*Descriptive Statistics for Gain Scores of Individual Components on the Posttest (N = 39)*

<table>
<thead>
<tr>
<th>Component</th>
<th>Control</th>
<th>Experimental 1</th>
<th>Experimental 2</th>
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</thead>
<tbody>
<tr>
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<td>$n = 12$</td>
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<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Pitch RH</td>
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<td>8.6</td>
<td>3.5</td>
</tr>
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<td>Rhythm RH</td>
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</tr>
<tr>
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<td>-2.4</td>
</tr>
<tr>
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<td>2.7</td>
<td>3.9</td>
<td>0.1</td>
</tr>
<tr>
<td>Continuity</td>
<td>0.2</td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>Dynamics</td>
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<td>0.6</td>
<td>0.2</td>
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<td>7.5</td>
</tr>
<tr>
<td>Rhythm RH</td>
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<td>2.3</td>
<td>2.9</td>
</tr>
<tr>
<td>Pitch LH</td>
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<td>4.9</td>
</tr>
<tr>
<td>Rhythm LH</td>
<td>2.7</td>
<td>3.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Continuity</td>
<td>0.5</td>
<td>0.7</td>
<td>5.2</td>
</tr>
<tr>
<td>Dynamics</td>
<td>0.4</td>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>Pitch RH</td>
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<td>-0.6</td>
</tr>
<tr>
<td>Pitch LH</td>
<td>0.6</td>
<td>9.0</td>
<td>0.3</td>
</tr>
<tr>
<td>Rhythm LH</td>
<td>2.1</td>
<td>4.5</td>
<td>1.6</td>
</tr>
<tr>
<td>Continuity</td>
<td>0.1</td>
<td>2.4</td>
<td>-0.7</td>
</tr>
<tr>
<td>Dynamics</td>
<td>1.2</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Pitch RH</td>
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<td>14.7</td>
<td>11.5</td>
</tr>
<tr>
<td>Rhythm RH</td>
<td>-0.7</td>
<td>3.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Pitch LH</td>
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<td>16.1</td>
<td>12.8</td>
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<tr>
<td>Rhythm LH</td>
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</tr>
<tr>
<td>Continuity</td>
<td>-0.9</td>
<td>3.7</td>
<td>2.9</td>
</tr>
<tr>
<td>Dynamics</td>
<td>1.1</td>
<td>0.9</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Normality Testing

Notably, the means and standard deviations of the three groups’ total scores (seen in Tables 3.1 and 3.2) varied widely on all areas of the pretest and posttest. These large variations were likely due to the presence of outliers in the data and the small sample sizes of the control and experimental groups. Outliers in particular can dramatically influence values of the mean and standard deviation. Therefore, the researcher also calculated the median and interquartile range—two descriptive measures that are less sensitive to outliers and other data contamination (Sheskin, 2007)—for each group’s total pretest and posttest scores. Figures 3.1–3.3 display boxplots comparing the distribution of the pretest and posttest transposition scores for each group in the total sample. Additional boxplots for pretest and posttest sight-reading scores are included in Appendix K.

![Boxplot of Pretest Transposition 1 Scores](image-url)

*Figure 3.1. Boxplot of Pretest Transposition 1 Scores of Total Sample (N = 39). Note. C = Control Group; E-1 = Experimental Group 1; E-2 = Experimental Group 2; ▲ = Mean.*
Figure 3.2. Boxplot of Posttest Transposition 1 Scores of Total Sample (N = 39). Note. C = Control Group; E-1 = Experimental Group 1; E-2 = Experimental Group 2; ▲ = Mean.

Figure 3.3. Boxplot of Posttest Transposition 2 Scores of Total Sample (N = 39). Note. C = Control Group; E-1 = Experimental Group 1; E-2 = Experimental Group 2; ▲ = Mean.
Analysis of these boxplots (Figures 3.1–3.3) suggests that the distributions of each group’s scores are not symmetric, as the median does not lie in the center of the box element. Additionally, the lack of symmetry between the boxplots’ upper and lower whiskers also indicates inherent skewness in each of the distributions. Furthermore, if these distributions were perfectly symmetrical, the value of the mean would equal the value of the median. However, the boxplots show that the value of the mean for each group’s scores differs from the value of the median, again indicating the skewness in each of the distributions. Finally, the hinge spread—the area contained within the box element—displays the measure of variability in the distribution. Comparisons of each group’s hinge spread in Figures 3.1 and 3.2 indicate that the variability within and among them is considerable. Figure 3.3, however, suggests that scores on the posttest’s Transposition 2 (“Etude”) contained less variability both within and among groups.

Due to these observations, the researcher checked for the normality of the data by graphing Quantile-Quantile (Q-Q) plots and performing formal normality tests using the chi-square goodness-of-fit test and the Shapiro–Wilk test for normality. Q-Q plots indicated that data were predominantly non-normal; Figures 3.4 and 3.5 display two representative Q-Q plots. Figure 3.4 shows the normality of the control group’s posttest Transposition 2 scores, while Figure 3.5 shows the non-normality of the first experimental group’s posttest Transposition 2 scores. Additionally, results from the chi-square goodness-of-fit test and the Shapiro–Wilk test for normality corroborated the findings from the Q-Q plots. Table 3.6 lists results of both the chi-square goodness-of-fit test and the Shapiro–Wilk test for normality of pretest scores. Results from each test were similar and indicated that a majority of the groups’ scores did not follow a normal
distribution. Table 3.7 lists results of both the chi-square goodness-of-fit test and the Shapiro–Wilk test for normality of posttest scores. Again, results from each test were similar and revealed that data were predominantly non-normal. Because the data in this

![Posttest Transposition 2 Scores: Control Group](image1)

*Figure 3.4. Q-Q Plot for Posttest Transposition 2 Scores of the Control Group (N = 39).*

![Posttest Transposition 2 Scores: Experimental Group 1](image2)

*Figure 3.5. Q-Q Plot for Posttest Transposition 2 Scores of Experimental Group 1 (N = 39).*
Table 3.6

Results of Chi-Square Goodness-of-Fit and Shapiro–Wilk Test for Normality: Pretest Scores

<table>
<thead>
<tr>
<th></th>
<th>Chi-Square</th>
<th>Shapiro–Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n )</td>
<td>( df )</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sight Reading 1</td>
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<td>3</td>
</tr>
<tr>
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<tr>
<td>Transposition 1</td>
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<td>3</td>
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<td><strong>Experimental 2</strong></td>
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<tr>
<td>Transposition 1</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note. A \( p \)-value less than .05 indicates data is not normal. *denotes non-normality (\( p < .05 \)).

Table 3.7

Results of Chi-Square Goodness-of-Fit and Shapiro–Wilk Test for Normality: Posttest Scores

<table>
<thead>
<tr>
<th></th>
<th>Chi-Square</th>
<th>Shapiro–Wilk</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>( n )</td>
<td>( df )</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sight Reading 1</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Transposition 1</td>
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<td>3</td>
</tr>
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<td>Sight Reading 2</td>
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<td>3</td>
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<tr>
<td>Transposition 2</td>
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<td>3</td>
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<tr>
<td><strong>Experimental 1</strong></td>
<td></td>
<td></td>
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<td>Sight Reading 1</td>
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<tr>
<td>Sight Reading 2</td>
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<td>3</td>
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<tr>
<td>Transposition 2</td>
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<td>3</td>
</tr>
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<td><strong>Experimental 2</strong></td>
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<td>Sight Reading 1</td>
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<td>Transposition 1</td>
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<td>3</td>
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<td>Sight Reading 2</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Transposition 2</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note. A \( p \)-value less than .05 indicates data is not normal. *denotes non-normality (\( p < .05 \)).
study did not meet the assumption of normality necessary for parametric statistical testing, the researcher used non-parametric tests to analyze the effects of sight singing on students’ transposition performance.

**Analysis of Transposition Performance Achievement**

The researcher used the Kruskal–Wallis One-Way Analysis of Variance by Ranks to investigate the first null hypothesis, which stated that there would be no significant difference in total scores between experimental and control groups. Table 3.8 lists results from this test, which revealed no statistically significant difference between the total posttest scores of the control and experimental groups. Therefore, the first null hypothesis was not rejected.

Table 3.8

<table>
<thead>
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<td>Transposition 1</td>
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<td>.82</td>
</tr>
<tr>
<td>Transposition 2</td>
<td>3.86</td>
<td>.15</td>
</tr>
</tbody>
</table>

*Note. A p-value less than .05 indicates significance.*

The researcher then used the Kruskal–Wallis One-Way Analysis of Variance by Ranks to examine whether any statistically significant differences existed between scores of the control and experimental groups in pitch accuracy, rhythmic accuracy, continuity, and musical expressivity. Table 3.9 lists results of the Kruskal–Wallis One-Way Analysis of Variance by Ranks regarding each of these individual components. No significant differences between the control and experimental groups were found. Therefore, null
hypotheses two through five—which stated that there would be no significant difference in pitch accuracy, rhythmic accuracy, continuity, or musical expressivity scores between experimental and control groups, respectively—were not rejected.

**Post-Hoc Gain Score Analysis**

Using the Kruskal–Wallis One-Way Analysis of Variance by Ranks, the researcher then examined whether any statistically significant differences existed between the control and experimental groups in total and individual mean gain scores.

Table 3.10 displays results of the Kruskal–Wallis One-Way Analysis of Variance by Ranks regarding students’ pretest-to-posttest gain scores. While results of the test
revealed no statistically significant differences between the gain scores of the control and experimental groups, two individual categories—left hand rhythm in Transposition 1 and continuity in Transposition 2—approached significance.

Therefore, the researcher performed two individual Mann–Whitney U tests to examine whether rhythm and continuity scores were significantly different between the control group and either of the experimental groups. Results of the first Mann–Whitney U test revealed that experimental group 2 achieved significantly greater gains than the control group on left hand rhythm scores on Transposition 1 ($U = 39.5$, $p = .02$). Results of the second Mann–Whitney U test indicated that experimental group 2 also achieved

<table>
<thead>
<tr>
<th>Table 3.10</th>
<th>Results of the Kruskal–Wallis One-Way Analysis of Variance by Ranks on Gain Scores</th>
</tr>
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<td>Pitch RH</td>
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<td>Rhythm RH</td>
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<tr>
<td>Pitch LH</td>
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</tr>
<tr>
<td>Rhythm LH</td>
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<tr>
<td>Continuity</td>
<td>0.83</td>
</tr>
<tr>
<td>Dynamics</td>
<td>1.55</td>
</tr>
<tr>
<td><strong>Total Scores</strong></td>
<td><strong>4.72</strong></td>
</tr>
</tbody>
</table>

| Transposition 2 | $H$ | $p$-value |
| Pitch RH | 0.75 | .69 |
| Rhythm RH | 0.38 | .83 |
| Pitch LH | 0.09 | .96 |
| Rhythm LH | 2.72 | .26 |
| Continuity | 4.93 | .08† |
| Dynamics | 0.79 | .67 |
| **Total Scores** | **0.81** | **.67** |

*Note. A $p$-value less than .05 indicates significance. †approaches significance.*
significantly greater gains than the control group on continuity scores on Transposition 2 ($U = 45, p = .04$). The researcher found no other statistically significant differences between groups.

**Post-Hoc Intragroup Pretest-to-Posttest Improvement Analysis**

Because descriptive statistics of mean gain scores (Table 3.5) indicated that all groups improved from the pretest to the posttest, the researcher used the Wilcoxon Matched-Pairs Signed-Ranks test to analyze the significance of this improvement. Table 3.11 lists results of the Wilcoxon Matched-Pairs Signed-Ranks test for intragroup pretest-to-

<table>
<thead>
<tr>
<th>Table 3.11</th>
<th>Results of the Wilcoxon Matched-Pairs Signed-Ranks Test for Intragroup Improvement</th>
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<td>$t$</td>
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<tr>
<td><strong>Transposition 1</strong></td>
<td></td>
</tr>
<tr>
<td>Pitch RH</td>
<td>1</td>
</tr>
<tr>
<td>Rhythm RH</td>
<td>2.5</td>
</tr>
<tr>
<td>Pitch LH</td>
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<td>Rhythm LH</td>
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<tr>
<td>Continuity</td>
<td>8</td>
</tr>
<tr>
<td>Dynamics</td>
<td>4.5</td>
</tr>
<tr>
<td><strong>Total Scores</strong></td>
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<tr>
<td><strong>Transposition 2</strong></td>
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<td>Continuity</td>
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<td>Dynamics</td>
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</tr>
<tr>
<td><strong>Total Scores</strong></td>
<td>13</td>
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</tbody>
</table>

* $p < .05$
† approaches significance.
to-posttest improvement. All groups significantly improved in total gain scores for Transposition 1 (Control Group: $p = .001$; Experimental Group 1: $p = .05$; Experimental Group 2: $p = .01$). The control group and experimental group 2 also significantly improved in total gain scores for Transposition 2 ($p = .01$ and $p = .004$, respectively), while experimental group 1 approached significance in their total gain scores for Transposition 2 ($p = .07$). Additionally, both the control group and experimental group 2 evidenced significant improvement in a majority of the individual posttest categories, while experimental group 1 showed significant improvement on continuity in Transposition 1 ($p = .02$), as well as on right hand pitch accuracy ($p = .03$) and dynamics ($p = .01$) on Transposition 2.

**Pretest and Posttest Preparation Behaviors**

Students exhibited a wide variety of behaviors during their two minutes of preparation time for each of the sight-read and transposed versions of “Bagpipe” and “Etude.” Due to the assortment of behaviors observed by the researcher, these preparation activities were consolidated into three main categories: (a) aural, (b) visual, and (c) kinesthetic (see Table 2.2, p. 54). To analyze the percentage of time students spent in each category, the researcher first summed the time each student spent in aural, visual, and kinesthetic behavior categories. These totals were then converted to percentages. Figures 3.6 and 3.7 display the percentages of time students spent in each preparation behavior category on the pretest and the posttest, respectively. Additionally, since several students engaged in combinations of these behaviors, it was possible for the sum of students’ percentages to be greater than 100%.
Figure 3.6. Pretest Preparation Behaviors (N = 39).
*Note.* C = Control Group; E-1 = Experimental Group 1; E-2 = Experimental Group 2.

On the pretest, students spent the most time engaged in kinesthetic behaviors, such as shadowing and finding keyboard positions. Score study and writing on the score—which were both coded as visual preparation behaviors—were the second most used preparation activities. Finally, students engaged least in aural and other unrelated
behaviors on the pretest. In contrast, while all students still spent the most time engaged in kinesthetic behaviors on the posttest, Figure 3.7 shows that students spent considerably more time in these kinesthetic activities. In particular, a majority of students engaged in shadowing activities for a large portion of their two-minute preparation segments. Additionally, students frequently employed combinations of shadowing and aural activities, such as humming, counting, or singing while shadowing.

Furthermore, for students in the control group and experimental group 2, aural activities were the second most used preparation behaviors, while students in experimental group 1 found visual preparation, namely score study, more useful than aural or other unrelated behaviors. Notably, however, all students used visual preparation techniques less frequently on the posttest than on the pretest, which suggests that students had possibly become more proficient at reading and understanding the score over the course of the semester. This greater fluency also conceivably enabled students to spend more time engaged in kinesthetic and aural activities. Ultimately, however, these results suggest that students largely preferred kinesthetic preparation behaviors above all other types of activities.

**Results from Pretest and Posttest Questionnaires**

As part of this study, all students completed the same pretest and posttest questionnaires. The researcher designed a majority of the pretest questionnaire to gather information on students’ background in keyboard and aural skills. (See “Participants” section, p. 40–41, for information gathered from the pretest’s Questions 1–12 regarding students’ academic level, degree program, prior piano study, prior singing experiences,
and concurrent enrollment in aural skills and theory classes.) Figure 3.8 displays data gathered from responses to Question 13 of the pretest, which asked students to identify which solmization systems, if any, they had previously used. Many students indicated acquaintance with several solmization systems; it was therefore possible for the sum of students’ percentages to be greater than 100%. As seen in Figure 3.8, the majority of students reported the most familiarity with moveable-do solmization (69%), followed by neutral syllables (46%).

![Student Familiarity with Solmization Systems](image)

*Figure 3.8. Student-Reported Familiarity with Solmization Systems (N = 39).*

Question 14 on the pretest asked students to rate their perceived reading ability on treble and bass clef, as well as on the grand staff, using a six-point Likert Scale. All students reported feeling more comfortable reading from the treble clef ($\bar{M} = 5.3$) than from the bass clef ($\bar{M} = 3.9$). Additionally, students felt least comfortable reading from
the grand staff ($\bar{M} = 2.9$). Question 15 asked students to list any other clefs they could read. Eighteen percent of students indicated additional fluency in alto and/or tenor clef.

Questions 16–19 on the pretest asked students to rate their current sight-reading and transposition abilities both on the keyboard and on their own instrument. Students again rated their abilities using a six-point Likert Scale. The researcher used the Pearson product-moment correlation coefficient to assess the correlation between students’ responses on Questions 16 and 17, which asked students to rate their sight-reading abilities on the keyboard and on their own instrument, respectively. The resulting correlation coefficient, $r = .57$, indicated a moderate positive correlation between students’ perceived sight-reading abilities on the keyboard and on their own instrument. The researcher then used the Pearson product-moment correlation coefficient to assess the correlation between students’ responses on Questions 18 and 19, which asked students to rate their transposition abilities on the keyboard and on their own instrument, respectively. The resulting correlation coefficient, $r = .58$, also indicated a moderate positive correlation between students’ perceived transposition abilities on the keyboard and on their own instrument.

Additionally, the researcher compared response data from Questions 16, 18, and 20 on the pretest to response data from identical questions on the posttest questionnaire (Questions 1–3) to identify if students’ perceptions regarding their sight-reading, transposition, and solmization skills changed between the beginning and end of the study. Table 3.12 lists means and standard deviations for students’ pretest and posttest responses to these questions. As seen in Table 3.12, the average responses to each of the questions increased between the pretest and the posttest, indicating that students felt their abilities
had improved over the course of the study. The researcher then performed a two-way chi-square test to assess if any significant differences existed between the control and experimental groups on their perceived solmization abilities, as well as on their perceived keyboard sight-reading and transposition abilities. Table 3.13 lists the results of the two-

Table 3.12

*Descriptive Statistics for Pretest and Posttest Questionnaires (N = 39)*

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th></th>
<th>Experimental 1</th>
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<td>n = 12</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>How would you currently rate</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>your keyboard sight-reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>skills?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>2.61</td>
<td>0.84</td>
<td>2.85</td>
<td>1.28</td>
<td>2.67</td>
<td>1.37</td>
</tr>
<tr>
<td>Posttest</td>
<td>3.61</td>
<td>0.84</td>
<td>3.69</td>
<td>1.03</td>
<td>3.67</td>
<td>0.89</td>
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<td></td>
</tr>
<tr>
<td>your keyboard transposition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>skills?</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>2.11</td>
<td>1.18</td>
<td>2.62</td>
<td>1.12</td>
<td>1.83</td>
<td>1.34</td>
</tr>
<tr>
<td>Posttest</td>
<td>3.79</td>
<td>0.97</td>
<td>3.46</td>
<td>0.78</td>
<td>3.33</td>
<td>1.07</td>
</tr>
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<td>How would you currently rate</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>your solfège skills?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pretest</td>
<td>4.00</td>
<td>1.30</td>
<td>3.23</td>
<td>1.30</td>
<td>3.67</td>
<td>1.72</td>
</tr>
<tr>
<td>Posttest</td>
<td>4.71</td>
<td>0.83</td>
<td>4.15</td>
<td>0.69</td>
<td>5.33</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Table 3.13

*Results of Two-Way Chi-Square Test for Pretest and Posttest Questionnaires*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>df</th>
<th>χ² Value</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>How would you currently rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>your keyboard sight-reading</td>
<td>14</td>
<td>2</td>
<td>0.05</td>
<td>.98</td>
</tr>
<tr>
<td>skills?</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How would you currently rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>your keyboard transposition</td>
<td>14</td>
<td>2</td>
<td>3.51</td>
<td>.17</td>
</tr>
<tr>
<td>skills?</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How would you currently rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>your solfège skills?</td>
<td>14</td>
<td>2</td>
<td>3.25</td>
<td>.20</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. A p-value less than .05 indicates significance.*
way chi-square test for each of these skills. No significant differences were found between the control and experimental groups.

The researcher designed Part B of the posttest questionnaire to gather students’ opinions on the efficacy of various sight-reading and transposition preparation techniques. The researcher first calculated means and standard deviations for responses to each question (see Appendix L). Then, these means were converted to ranks and compared across groups. Table 3.14 displays the rank-order comparisons for the first section of Part B, which asked students to rate the effectiveness of various sight-reading preparation techniques. All groups, regardless of treatment condition, indicated *shadowing* as the most effective technique. This ranking parallels the observations made by the researcher regarding students’ actual preparation behavior: shadowing was the most frequent activity students engaged in when preparing to sight read and transpose the pretest and posttest examples in this study.

<table>
<thead>
<tr>
<th></th>
<th>Control n = 14</th>
<th>Experimental 1 n = 13</th>
<th>Experimental 2 n = 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silent Score Study</td>
<td>4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Tapping on the Closed Keyboard Cover</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Shadowing on the Keys</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Singing with Solfège</td>
<td>2</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

*Note. A ranking of 1 indicates students’ most preferred technique. A ranking of 4 indicates students’ least preferred technique.*

83
The researcher also gave students the opportunity to list any other techniques they found helpful in preparation to sight read. Students listed options such as practicing hands separately and writing on the score. One student suggested audiation as a more effective preparation technique: “What I find most helpful is to audiate in my head as I shadow. Actual singing divides my attention too much.” Another student suggested that “having a process is key. Check the key, time signature, and rhythms. Find hand placement and shadow the keys. Singing can be useful too because it lets you hear the melody and you can know what to expect.” Appendix M includes the compiled responses to this question.

In the second section of Part B, students were asked to rate the effectiveness of various transposition preparation techniques; Table 3.15 lists the rank-order comparisons for these activities. Regardless of treatment condition, all groups felt that thinking about the scale degrees was most helpful when transposing. Additionally, the second experimental group found singing with solfège the second most helpful technique, while both the control group and experimental group 1 indicated thinking about the intervals as the second most helpful technique when preparing to transpose at the keyboard. Students

<table>
<thead>
<tr>
<th></th>
<th>Control ( n = 14 )</th>
<th>Experimental 1 ( n = 13 )</th>
<th>Experimental 2 ( n = 12 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silent Score Study</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Thinking about the Intervals</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Thinking about the Scale Degrees</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Singing with Solfège</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Thinking the Solfège</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

*Note.* A ranking of 1 indicates students’ most preferred technique. A ranking of 5 indicates students’ least preferred technique.
also had the opportunity to list other techniques they found helpful in preparation to transpose. Students suggested techniques such as shadowing, practicing hands separately, and thinking about the finger numbers. Appendix M also lists compiled responses to this question from Part B.

Finally, the researcher designed Part C of the posttest questionnaire to gather students’ perceptions of the importance of general keyboard skills, keyboard transposition skills, and singing to both their music education and their future careers. Table 3.16 displays means and standard deviations for students’ posttest responses on

<table>
<thead>
<tr>
<th>Question</th>
<th>Control</th>
<th>Experimental 1</th>
<th>Experimental 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) How would you rate the importance of keyboard skills to your music education?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Control (n = 14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.36</td>
<td>0.84</td>
<td>4.69</td>
<td>0.85</td>
</tr>
<tr>
<td>Experimental 1 (n = 13)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.93</td>
<td>0.83</td>
<td>3.85</td>
<td>1.52</td>
</tr>
<tr>
<td>Experimental 2 (n = 12)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.54</td>
<td>1.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) How would you rate the importance of keyboard skills to your future career?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Control (n = 14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.14</td>
<td>0.95</td>
<td>4.08</td>
<td>1.61</td>
</tr>
<tr>
<td>Experimental 1 (n = 13)</td>
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<td></td>
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</tr>
<tr>
<td>4.08</td>
<td>1.61</td>
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</tr>
<tr>
<td>Experimental 2 (n = 12)</td>
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</tr>
<tr>
<td>4.54</td>
<td>1.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) How would you rate the importance of keyboard transposition skills to your music education?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Control (n = 14)</td>
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<td>0.86</td>
<td>4.15</td>
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<td></td>
</tr>
<tr>
<td>4.15</td>
<td>1.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental 2 (n = 12)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4.54</td>
<td>1.37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) How would you rate the importance of keyboard transposition skills to your future career?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Control (n = 14)</td>
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</tr>
<tr>
<td>4.93</td>
<td>0.83</td>
<td>3.85</td>
<td>1.52</td>
</tr>
<tr>
<td>Experimental 1 (n = 13)</td>
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</tr>
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<td>3.85</td>
<td>1.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental 2 (n = 12)</td>
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</tr>
<tr>
<td>4.13</td>
<td>1.73</td>
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</tr>
<tr>
<td>5) How would you rate the importance of singing to your music education?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Control (n = 14)</td>
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</tr>
<tr>
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<td>4.85</td>
<td>0.80</td>
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<tr>
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<td>0.80</td>
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<td></td>
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<tr>
<td>Experimental 2 (n = 12)</td>
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</tr>
<tr>
<td>5.67</td>
<td>0.65</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) How would you rate the importance of singing to your future career?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Control (n = 14)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5.25</td>
<td>1.05</td>
<td>4.46</td>
<td>1.27</td>
</tr>
<tr>
<td>Experimental 1 (n = 13)</td>
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<td></td>
</tr>
<tr>
<td>4.46</td>
<td>1.27</td>
<td></td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>5.25</td>
<td>1.48</td>
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</tr>
<tr>
<td>7) How likely are you to use singing to transpose at the keyboard in the future?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Control (n = 14)</td>
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<tr>
<td>4.14</td>
<td>1.56</td>
<td>3.54</td>
<td>1.27</td>
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<tr>
<td>Experimental 1 (n = 13)</td>
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</tr>
<tr>
<td>3.54</td>
<td>1.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental 2 (n = 12)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3.75</td>
<td>1.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8) How likely are you to use singing to transpose on your own instrument in the future?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Control (n = 14)</td>
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</tr>
<tr>
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<td>1.60</td>
<td>3.38</td>
<td>1.50</td>
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<tr>
<td>5.00</td>
<td>1.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
these questions. The means of experimental group 2 were highest on questions 5 and 8. The control group displayed the highest mean on all other questions. However, students generally rated each skill as moderately to highly important.

The researcher then used the Mann–Whitney $U$ Test to investigate the final two null hypotheses, which stated that there would be no significant differences between the experimental and control groups in posttest Likert Scale responses regarding the perceived value of keyboard skills and singing, respectively, as they relate to students’ overall music education and future careers. Because the two experimental groups in this study received the same treatment—sight singing with moveable-do solmization—responses from the two groups were combined for the purposes of this final statistical test. Results listed in Table 3.17 indicate that only responses to questions 2 and 4 approached significance ($p = .08$). No other statistically significant differences were found between the responses of the control and experimental groups regarding Part C of the posttest questionnaire. Therefore, the sixth and seventh null hypotheses were not rejected.

The final question on the posttest asked students if they had any additional comments. A few students indicated increased confidence in transposing at the keyboard due to their participation in the study. One student commented on his perception of the effectiveness of singing:

Although I dislike the singing, I feel it could be more effective if I was more comfortable on the instrument. A fair amount of my attention is focused on the piano and not on anything else. If it was my primary instrument, singing may be more helpful.

Appendix M lists compiled responses for this final question on the posttest questionnaire.
Table 3.17

Results of the Mann–Whitney U Test for Part C of the Posttest Questionnaire

<table>
<thead>
<tr>
<th>Question</th>
<th>Control</th>
<th>Experimental</th>
<th>n</th>
<th>df</th>
<th>U</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) How would you rate the importance of keyboard skills to your music education?</td>
<td>14</td>
<td>25</td>
<td></td>
<td>37</td>
<td>121.5</td>
<td>0.12</td>
</tr>
<tr>
<td>2) How would you rate the importance of keyboard skills to your future career?</td>
<td>14</td>
<td>25</td>
<td></td>
<td>37</td>
<td>116.0</td>
<td>0.08†</td>
</tr>
<tr>
<td>3) How would you rate the importance of keyboard transposition skills to your music education?</td>
<td>14</td>
<td>25</td>
<td></td>
<td>37</td>
<td>136.0</td>
<td>0.25</td>
</tr>
<tr>
<td>4) How would you rate the importance of keyboard transposition skills to your future career?</td>
<td>14</td>
<td>25</td>
<td></td>
<td>37</td>
<td>115.0</td>
<td>0.08†</td>
</tr>
<tr>
<td>5) How would you rate the importance of singing to your music education?</td>
<td>14</td>
<td>25</td>
<td></td>
<td>37</td>
<td>142.5</td>
<td>0.34</td>
</tr>
<tr>
<td>6) How would you rate the importance of singing to your future career?</td>
<td>14</td>
<td>25</td>
<td></td>
<td>37</td>
<td>149.5</td>
<td>0.46</td>
</tr>
<tr>
<td>7) How likely are you to use singing to transpose at the keyboard in the future?</td>
<td>14</td>
<td>25</td>
<td></td>
<td>37</td>
<td>143.0</td>
<td>0.35</td>
</tr>
<tr>
<td>8) How likely are you to use singing to transpose on your own instrument in the future?</td>
<td>14</td>
<td>25</td>
<td></td>
<td>37</td>
<td>146.0</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Note. A p-value less than .05 indicates significance. †approaches significance.
CHAPTER 4
DISCUSSION AND CONCLUSIONS

Music educators identify proficiency in keyboard transposition as a vital element of group piano classes and of students’ overall music education (Coats, 2006; Crappell, 2009; Fisher, 2010; Karpinski, 2000; Machado, 2009; Webber, 1958). However, little empirical research exists regarding acquisition of this skill in collegiate group piano courses. Additionally, while educators identify the development of functional piano skills as the main purpose of these classes, many also recognize the opportunity for simultaneous aural skills training in group piano courses (Fisher, 2010; Karpinski, 2000; Rogers, 2004). Nevertheless, only a few researchers have systematically examined the effects of aural musicianship experiences in the collegiate group piano setting (Bozone, 1986; Brown, 1990; Hargiss, 1962). Therefore, the main purpose of this study was to examine the effects of sight singing, using moveable-do solmization, on the keyboard transposition performance of undergraduate group piano students. This final chapter includes a discussion of the results of the study, as well as implications for current practice and recommendations for future research.

Achievement in Transposition Performance

Results of the Kruskal–Wallis One-Way Analysis of Variance by Ranks revealed no statistically significant differences between the control and experimental groups in
total transposition scores or in individual scores of pitch accuracy, rhythmic accuracy, continuity, and musical expressivity. The small samples sizes of the control and experimental groups, as well as the short duration of this study, possibly contributed to the lack of significant results. However, descriptive statistics indicated that the two experimental groups did achieve greater pretest-to-posttest gains than the control group on Transposition 2. Additionally, freshmen participants in the experimental groups made substantially larger pretest-to-posttest gains than freshmen in the control group on both transposition performances. These observations suggest that engagement in singing activities positively influenced students’ abilities to transpose at the keyboard. Moreover, these results also suggest that singing instruction may be most beneficial to freshmen students who enter collegiate group piano courses with little prior training in functional keyboard skills.

Due to these observations, the researcher also performed post-hoc Mann–Whitney U tests on students’ gain scores. Results from these tests revealed statistically significant differences between the control group and experimental group 2 on two individual categories of the posttest. Students in experimental group 2 displayed significantly greater gains than the control group on left hand rhythm scores in Transposition 1 on the posttest. Transposition 1, which consisted of the example “Bagpipe,” featured half note rhythms, played on beats 1 and 3 in each measure. Initially, this left hand rhythmic pattern seems quite simple. On the pretest, however, several students only played the open fifth on the first beat of the measure and then sustained it for the duration of a whole note. Others played the fifth on a different beat of the measure than indicated in the score; usually, students played it on beat 4, rather than on beat 3. Some students only sustained
the left hand fifth for the length of a quarter note, rather than a half note. Finally, students often hesitated slightly whenever hands played together in this example. Since hesitations of less than three-quarters of a beat were considered rhythmic errors, the researcher counted these hesitations as rhythmic errors in both hands.

These types of errors are undeniably rhythmic in nature. However, they may also hint at other challenges faced by beginning group piano students, namely reading two clefs simultaneously and the coordination of fine motor skills. These pretest errors therefore could have occurred due to students’ unfamiliarity with reading from the grand staff, as well as from their inexperience with hands-together coordination at the keyboard, rather than from a lack of rhythmic understanding. At the posttest, however, students corrected many of these rhythmic errors in “Bagpipe,” with students in experimental group 2 surpassing the control group in gain scores regarding left hand rhythmic accuracy. It is possible that students who participated in singing instruction learned how to attend to the rhythmic flow of both the right hand and left hand, which also allowed them to more accurately perform the left hand rhythm.

However, since only the second experimental group displayed significant gains in left hand rhythm scores, the researcher cannot say with certainty that the use of singing produced this significant difference between the groups. It is possible that engagement in sight-reading and transposition instruction over the course of the semester helped these students gain greater fluency in reading from the grand staff and in their coordination of kinesthetic movements during performance. Nevertheless, the researcher considers this an important finding. Although group piano students generally enter these courses with weaker left hand playing abilities (Baker, 2008; Betts & Cassidy, 2000; Hanberry, 2004;
Lowder, 1973), researchers previously found that students’ left hand rhythmic accuracy in performance tasks improved as a result of structured training (Baker, 2008; Betts & Cassidy, 2000). The results of this study regarding improvement of left hand rhythmic accuracy corroborate these findings in the literature. Additionally, these results further suggest that participation in guided sight-reading and transposition activities—regardless of the type of instructional techniques used in these activities—may aid students’ proficiency in reading from the grand staff and in hands-together coordination at the keyboard. Acquisition of these basic visual and kinesthetic abilities can then support student achievement in a variety of other functional keyboard skills.

In addition to achievement in left hand rhythmic accuracy, students in experimental group 2 displayed significantly greater gains than the control group on continuity scores in Transposition 2 (‘Etude’) on the posttest. Notably, when students engaged in singing during the treatment phase of this study, they always sang each example with excellent continuity, even though individual pitches and rhythms were not always accurate. It is possible that involvement in these structured group singing activities helped students reinforce for themselves the need for continuity in performance. Additionally, when students recognized the production of a continuous phrase in their own voices, they also possibly identified the need to translate this continuity to subsequent keyboard transposition activities, regardless of other pitch or rhythm errors that occurred during their performance.

Furthermore, group piano educators frequently discuss the necessity of teaching students how to perform with continuity at the keyboard (Beeler, 1995; Kostka, 2000; Lehmann & McArthur, 2002). Researchers have found that use of the metronome (Baker,
2008; Hanberry, 2004), pre-recorded accompaniments (Beeler, 1995), and cognitive chunking drills (Pike & Carter, 2010) help group piano students maintain continuity while performing. Although only one of the experimental groups in this current study evidenced significantly greater gains than the control group on continuity scores, the researcher cautiously suggests that the use of singing may also help students maintain continuity during keyboard transposition performances.

While the researcher found no other significant differences between the control and experimental groups, students nonetheless evidenced significant pretest-to-posttest improvement in transposition proficiency regardless of treatment condition. Results of the Wilcoxon Matched-Pairs Signed-Ranks test for intragroup pretest-to-posttest improvement revealed that all groups significantly improved in total gain scores for Transposition 1. Additionally, the control group and experimental group 2 also significantly improved in total gain scores for Transposition 2, while the total gain scores of experimental group 1 approached significance on this second posttest example. Although the researcher expected to see improvement in students’ scores between the pretest and the posttest as a result of engagement with course material, these findings reaffirm that systemized instruction in keyboard transposition does indeed aid students’ acquisition of this skill.

Notably, while only the experimental groups engaged in preparatory sight singing during the treatment phase, all students participated in guided score study and preparatory exercises—which included shadowing and tapping on the closed keyboard cover—during each treatment lesson. Kostka (2000) found that students who participated in both shadowing and error detection practice evidenced large improvements in a sight-reading
task. Likewise, students in this study shadowed in combination with other preparatory behaviors: students in both experimental groups sang while shadowing in preparation to sight read and transpose the examples, while the researcher instructed students in the control group to shadow while focusing on a particular element of the music or while saying finger numbers. Perhaps shadowing, in connection with some type of directed focus on the score, positively influenced students’ transposition abilities.

Additionally, although the control group did not engage in singing while shadowing, their preparatory exercises often included shadowing while saying finger numbers. It is possible that the sole connection of students’ voices to both the score and their shadowing motions helped these students achieve more accurate transposition performances. However, examples used in this study remained in five-finger patterns. Therefore, it is also possible that students in the control group transposed by thinking of the finger numbers, rather than through an understanding the relationships between the notes. If all students had transposed examples that moved outside of a five-finger pattern, or that included more complex harmonies, it is conceivable that singing may have produced a more notable effect on students’ transposition performance.

**Reflections on Pretest and Posttest Preparation Behaviors**

Observations of students’ pretest and posttest preparation behaviors revealed that all students, regardless of treatment condition, favored kinesthetic activities over aural or visual preparation techniques. Of the kinesthetic behaviors used by students, shadowing was the most frequently observed activity. Perhaps students preferred this activity because it most closely mirrored actual performance on the keyboard. Additionally, all
students participated in shadowing exercises during the treatment phase of this study, which may have contributed to the increase in shadowing behaviors during the posttest.

This finding, however, is consistent with those reported by other researchers: students in studies by Pike and Carter (2010) and Baker (2008) also spent the majority of their preparation time shadowing over the keyboard. However, in Kostka’s (2000) study, students who engaged solely in shadowing behaviors committed the largest number of errors on a sight-reading task. Interestingly, this result was not observed in the current study. Nevertheless, since students in several studies seemingly view shadowing as a valuable preparation technique, researchers may consider further examinations of shadowing behaviors. Students in this study also frequently chose to engage in combinations of kinesthetic and aural behaviors. Future investigations may also examine the types of preparation behaviors that best complement shadowing activities.

In this current study, students also used visual preparation techniques, such as score study and writing on the score, more frequently on the pretest than on the posttest. It is possible that students struggled with reading from the grand staff on the pretest, which resulted in increased time spent studying the score and determining notes and intervallic relationships. By the time of the posttest, however, students likely had gained greater fluency in reading from the grand staff. Additionally, it is also possible that students had become more proficient at decoding the score over the course of the semester. The ability to read more fluently from the grand staff—combined with quicker decipherment of key signatures, five-finger patterns, and intervallic content indicated in the score—likely allowed students to spend more time engaged in kinesthetic and aural preparatory behaviors.
Finally, both experimental groups displayed increased use of aural preparation behaviors on the posttest, while the control group’s participation in aural behaviors fell slightly from the pretest. Interestingly, however, students in experimental group 2 evidenced the largest increase (16.6%) in aural preparatory behaviors from the pretest to the posttest. Notably, while students in experimental group 2 scored lowest on all individual components on the pretest, this particular group of students displayed the greatest pretest-to-posttest gains. Additionally, students in experimental group 2 achieved significantly greater gains than the control group on left hand rhythm and continuity scores. It is possible that students’ increased engagement in aural preparatory behaviors during the posttest contributed to these significant differences between the control group and experimental group 2. While further research would be needed to support this theory, these observations suggest that engagement in aural preparatory behaviors may positively affect student achievement in keyboard transposition performances.

Reflections on Pretest and Posttest Questionnaire Responses

Quantitative data from this study indicated that students’ keyboard skills improved throughout the course of the study. However, the researcher also sought students’ own perceptions of their abilities following treatment. Therefore, three identical questions on the pretest (Questions 16, 18, and 20) and posttest (Questions 1–3) questionnaires asked students to rate their current solmization skills, as well as their keyboard sight-reading and transposition skills. Data regarding these three questions indicated that all students, regardless of treatment conditions, felt their abilities in these areas had improved during the duration of the study. Interestingly, however, all students
rated their solmization skills highest on both the pretest and the posttest. This perception of ability is likely due to students’ prior vocal experiences and, perhaps more importantly, to their concurrent enrollment in aural skills and theory courses. Therefore, this finding further supports the inclusion of aural musicianship experiences within group piano courses (Karpinski, 2000; Larsen, 2007; Rogers, 2004). When instructors of theory, aural skills, and group piano courses synergistically reinforce core concepts, students may experience increased confidence in their abilities, which may in turn positively affect student achievement.

Lastly, the researcher designed the final portion of the posttest questionnaire to gather students’ perceptions of the importance of general keyboard skills, keyboard transposition skills, and singing to both their music education and their future careers. Data indicated that all students, irrespective of treatment conditions, understood the current and future importance of these skills. The researcher considers this an encouraging finding. While music educators identify the implicit necessity of both aural and keyboard skills development (Baker, 2008; Christensen, 2000; Karpinski, 2000; Larsen, 2007; March, 1988; Rogers, 2004), students may not always recognize the indispensableness of these skills (Fisher, 2010). However, it seems that students in this current study had already formed positive views regarding the importance of keyboard skills and singing to their overall music education and their future careers.

**Recommendations for Future Research**

This study sought to examine the effects of sight singing, using moveable-*do* solmization, on the keyboard transposition performance of undergraduate group piano
students. Based on the results of this study, the researcher suggests the following possibilities for future exploration:

1. Replication of this study with a larger sample and for a longer timeframe. If researchers examine students’ engagement in singing instruction for an entire semester, or even for the full length of their enrollment in the group piano sequence, more insight may be gained regarding the efficacy of singing instruction on students’ keyboard transposition performance. Additionally, results from a larger sample size may provide a more holistic picture of the effects of singing in group piano courses.

2. Replication of this study with longer and more difficult musical examples. If researchers investigate the effects of singing on students’ transposition performance using examples that move outside of a five-finger pattern and that include more complex harmonies, more information may be gleaned on specific areas where singing is most effective.

3. Adaptations of this study to other areas of group piano curricula. Researchers may consider examining the effects of singing on skills such as keyboard sight reading, harmonization, and improvisation.

4. Adaptations of this study to other areas of music education. Specifically, researchers may examine the effects of singing on students’ performance achievement on their primary instrument.

5. Explorations of effective sight-reading and transposition preparation behaviors. While students used a variety of preparation behaviors in this study, the majority employed shadowing techniques. Therefore, researchers could further study the
efficacy of shadowing as a preparation technique. Furthermore, researchers may consider examining other aural, kinesthetic, and visual preparation behaviors to quantify the most beneficial types of behaviors to group piano students.

6. Examinations of effective ways to incorporate aural musicianship skills into group piano curricula. Since educators highlight the opportunity for aural skills instruction within collegiate group piano courses, researchers may consider investigating the most practical and efficient ways to correlate instructional goals between these courses.

Conclusions and Implications for Current Practice

Educators frequently cite the importance of keyboard proficiency to students’ overall music education and future careers. Because students typically learn these keyboard skills in collegiate group piano classes, instructors greatly benefit from knowing the results of empirical research that pinpoint effective instructional techniques for each of these functional skills. In this study, the researcher sought to examine the effects of sight singing on the keyboard transposition performance of undergraduate group piano students. Results indicated that the use of singing may help students maintain continuity during keyboard transposition performances. Additionally, students in the two experimental groups evidenced greater pretest-to-posttest gains than students in the control group on the second, more difficult posttest example, which suggests that involvement in singing activities may positively influence student achievement in keyboard transposition performance. Freshmen students in both experimental groups also displayed considerably larger pretest-to-posttest gains than freshmen students in the
control group on both transposition examples. Therefore, engagement in singing activities may be most valuable to first-year students, who may have little prior experience in both aural and functional keyboard skills. Finally, shadowing preparation techniques and engagement in aural preparatory behaviors may also positively affect students’ abilities to transpose at the keyboard. Therefore, instructors may consider incorporating instructional procedures involving singing and shadowing to facilitate student learning and achievement in functional keyboard skills.

While many questions remain, the researcher also hopes that the findings of this study will provide a launching point for discussions regarding the inclusion of aural musicianship skills within the group piano classroom. Much opportunity exists within the group piano class for reinforcement of aural concepts and synchronous development of aural and keyboard skills. Through inclusion of aural skills in course content, instructors of collegiate group piano classes may aid student achievement in keyboard proficiency while simultaneously encouraging the aural understanding necessary for the development of musical literacy—the ultimate goal of music education.
REFERENCES


APPENDIX A
BIBLIOGRAPHY OF SELECTED HISTORICAL TRANSPOSITION TEXTS


APPENDIX B

UNIVERSITY OF SOUTH CAROLINA INSTITUTIONAL REVIEW BOARD (IRB)
APPROVAL FOR EXEMPT STUDY

July 15, 2013

Mrs. Michelle Wachtler
School of Music
813 Assembly Street
Columbia, SC 29080

Re: Pro000027228
Study Title: Effects of Salvia Use on the Transposition Accuracy of Undergraduate Group Piano Students

FYI: University of South Carolina Assurance number: FWA 00000404 IRB Registration number: 00000240

Dear Mrs. Wachtler:

In accordance with 45 CFR 46.101(b)(1), the referenced study received an exemption from Human Research Subject Regulations on 7/12/2013. No further action or Institutional Review Board (IRB) oversight is required, as long as the project remains the same. However, you must inform the Office of any changes in procedures involving human subjects. Changes to the current research protocol could result in a reclassification of the study and further review by the IRB.

Because this project was determined to be exempt from further IRB oversight, consent document(s), if applicable, are not stamped with an expiration date.

Research related records should be retained for a minimum of three years after termination of the study.

The Office of Research Compliance is an administrative office that supports the USC Institutional Review Board. If you have questions, please contact Antone McWhorter at antone@usc.edu or (803) 777-7095.

Sincerely,

Lisa M. Johnson
IRB Manager

cc: Scott Price
AMENDMENT TO STUDY TITLE

This is to certify that the revision(s) to research protocol Amel_Pro00027228
Entitled: Effects of Sight Singing Using Moveable-do Solmization on the Transposition Performance of
Undergraduate Group Piano Students
Requested on 11/3/2014 by:
Principal Investigator: Michelle Wachter
College: School of Music
Department: 813 Assembly Street
Address: Columbia, SC 29208

was reviewed and approved by the University of South Carolina Institutional Review Board (USC IRB) on
11/4/2014. The requested revision(s) do not change the current Exempt status; therefore further IRB
oversight is not required unless additional changes are requested. Because changes could result in a
reclassification of the study, you must inform the IRB of any changes in procedures involving humans.

Note: All research-related records, including informed Consent document(s), if applicable, are to be
retained for at least three (3) years after termination of the study.

The Office of Research Compliance is an administrative office that supports the USC Institutional
Review Board. If you have questions, contact Arlene McWhorter at arleneem@usc.edu or
(803) 777-7095.

Sincerely,

Lisa M. Johnson
IRB Manager
APPENDIX C
LETTER OF CONSENT

University of South Carolina
School of Music

EFFECTS OF SIGHT SINGING USING MOVEABLE-DO SOLMIZATION ON THE
TRANSPOSITION PERFORMANCE OF UNDERGRADUATE GROUP PIANO STUDENTS

Michelle I. Wachter, principal investigator

Completion and return of this form will constitute consent to participate in this research project.

You are invited to participate in a research study conducted by Michelle I. Wachter, a graduate student in the School of Music at the University of South Carolina. The results of this study will be compiled in a dissertation in partial fulfillment of the requirements for the Doctor of Musical Arts degree in piano pedagogy. The purpose of this study is to investigate the effects of solfège use on the transposition performance of students enrolled in undergraduate group piano classes. This form explains what you will be asked to do if you decide to participate in this study. Please read it carefully and feel free to ask any questions you like before you make a decision about participating.

Description of the Study
Over the course of approximately six weeks, you will receive instruction in keyboard sight reading and transposition during your regular class time. As the researcher, I will lead the ten- to fifteen-minute instruction sessions, while your primary group piano instructor will teach all other course material.

All students will participate in a videotaped transposition pretest and posttest that will occur on two separate days outside of your normal class time. The pretest will take place on September 6, 2013, and the posttest will take place on October 23 and October 25, 2013. You will have the opportunity to choose your pretest and posttest times on those days. You will also fill out pretest and posttest questionnaires as part of the study. Pretests should take no more than 5 minutes to complete, and posttest performances and questionnaires should take no more than 15 minutes to complete. Pretests and posttests will not factor into your grade for this course. Videos will be destroyed following completion of the study and compilation of results.

Potential Risks and Discomforts
There are no anticipated risks to your participation.
Potential Benefits to Participants and/or Society
You may not directly benefit from your participation in this study, but this may assist you in preparing for future exams. In addition, this research may help us understand what types of instruction are effective in helping group piano students transpose at the keyboard.

Compensation for Participation
You will not be reimbursed for your time and participation in this study.

Confidentiality
Participation in this study will be confidential. A number will be assigned to each participant at the beginning of the project. This number will be used on project records rather than your name, and no one other than the researcher will be able to link your information with your name. Study records and data will be stored in locked filing cabinets and protected computer files owned by the researcher. The results of this study may be published or presented at professional meetings, but your identity will not be revealed.

Voluntary Participation
Participation in this study is voluntary. You are free not to participate or to withdraw at any time, for whatever reason, without negative consequences. In the event that you do withdraw from this study, the information you have already provided will be kept in a confidential manner. Your participation is not related to regular course work and participation or withdrawal will have no impact on grades.

Contact Persons
Participants may contact Michelle Wachter at michelle.i.wachter@gmail.com or (908) 692-9673 or Dr. Scott Price at sprice@mozart.sc.edu or (803) 777-1870 with questions about the study.

If you have any questions about your rights as a research participant, you may contact Thomas Coggins, Director, Office of Research Compliance, University of South Carolina, Columbia, SC 29208; Phone: (803) 777-7095; Fax: (803) 576-5589; Email: tcoggins@mailbox.sc.edu.

Consent
I have read the contents of this consent form and have been encouraged to ask questions. I have received answers to my questions. I give my consent to participate in this study, although I have been told that I may withdraw at any time without negative consequences. I have received a copy of this form for my records and future reference.

__________________________  ____________________________
Signature of Participant       Date

__________________________  ____________________________
Printed Name of Participant   Researcher Signature
### FALL 2013 SEMESTER CALENDAR AND LESSON SEQUENCE

<table>
<thead>
<tr>
<th>WEEK</th>
<th>DATE</th>
<th>UNIT</th>
<th>LESSON SEQUENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>August 26</td>
<td>Unit 1: <em>Keyboard Basics / Intervals</em></td>
<td>Study verbally explained; consent form distributed, signed, and collected; pretest questionnaire administered.</td>
</tr>
<tr>
<td></td>
<td>August 28</td>
<td>Unit 1: <em>Keyboard Basics / Intervals</em></td>
<td>Students sign up for pretest times.</td>
</tr>
<tr>
<td>2</td>
<td>September 2</td>
<td>No classes (Labor Day)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>September 4</td>
<td>Unit 2: <em>Keyboard Basics / Intervals</em></td>
<td>Students reminded of pretest times.</td>
</tr>
<tr>
<td></td>
<td>September 6</td>
<td>Video taped pretests administered</td>
<td><em>Piano Repertoire</em>, Preparatory Level (Snell), page 4, “Bagpipe”</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Study Week 1</strong></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>September 9</td>
<td>Unit 3: <em>Major Five-Finger Patterns / Major Triads</em></td>
<td><em>Piano Repertoire</em>, Preparatory Level (Snell), page 4, “Bagpipe”</td>
</tr>
<tr>
<td></td>
<td>September 11</td>
<td>Video taped pretests administered</td>
<td></td>
</tr>
</tbody>
</table>
|      | September 11| Unit 3: *Major Five-Finger Patterns / Major Triads* | Sight-reading/transposition materials:  
|      |            |                                           | 1. *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 37, #5          |
|      |            |                                           | 2. *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 50, #2          |
|      |            | **Study Week 2**                          |                                                                                  |
| 4    | September 16| Unit 4: *Major Five-Finger Patterns / Major Triads* | Sight-reading/transposition materials:  
<p>|      |            |                                           | 1. <em>Group Piano for Adults</em>, Book 1 (Lancaster &amp; Renfrow), page 51, #3          |
|      |            |                                           | 2. <em>Group Piano for Adults</em>, Book 1 (Lancaster &amp; Renfrow), page 51, #4          |</p>
<table>
<thead>
<tr>
<th>Date</th>
<th>Unit</th>
<th>Sight-reading/transposition materials:</th>
</tr>
</thead>
</table>
| September 18 | Unit 4: Major Five-   | 1. *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 62, #1  
|             | Finger Patterns / Major | 2. *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 62, #2                                  |
| September 23 | Unit 5: Minor Five-   | 1. *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 63, #3  
|             | Finger Patterns / Minor | 2. *Masterwork Technical Skills*, Level 1–2 (Magrath), page 13, Etude (Köhler)                           |
| September 25 | Unit 5: Minor Five-   | 1. *Progressive Class Piano* (Heerema), page 61, “Toy Piano”  
|             | Finger Patterns / Minor | 2. *Masterwork Technical Skills*, Level 1–2 (Magrath), page 13, Etude (Berens)                          |
| September 30 | Six-Week Exam         |                                                                                                          |
| October 2   | Unit 6: Minor Five-   | 1. *Keyboard Strategies*, Master Text I (Stecher and Horowitz), page 118, Texture 21  
|             | Finger Patterns / Minor | 2. *Keyboard Musicianship*, Book 1 (Lyke), page 81, “Folk Song”                                        |
| October 7   | Unit 6: Minor Five-   | 1. *Masterwork Technical Skills*, Level 1–2 (Magrath), page 14, Etude (Köhler)  
|             | Finger Patterns / Minor | 2. *Contemporary Class Piano* (Mach), page 166, Study 1                                               |
| October 9   | Unit 7: Chord Qualities |                                                                                                          |
| October 14  | Unit 7: Chord Qualities | 1. *Contemporary Class Piano* (Mach), page 117, “Calypso Beat”  
|             |                        | 2. *First Series of Graded Pianoforte Studies*, Preliminary (ABRSM), #53, Gurlitt, Op. 82, No. 29    |
| October 16  | Unit 7: Chord Qualities | 1. *Masterwork Classics*, Level 1–2 (Magrath), page 5, Melody (Köhler)  
|             |                        | 2. *Keyboard Strategies*, Master Text I (Stecher and Horowitz), page 116, Texture 18                  |
| October 21  | Unit 8: Major Scales  | 1. *Keyboard Musicianship*, Book 1 (Lyke), page 47, #3  
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>October 23</td>
<td>Unit 8: <em>Major Scales</em> Videotaped posttest and posttest questionnaire administered</td>
<td>Sight-reading/transposition materials:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. <em>Group Piano for Adults</em>, Book 1 (Lancaster &amp; Renfrow), page 63, #4</td>
</tr>
<tr>
<td>October 28</td>
<td>Videotaped posttest and posttest questionnaire administered</td>
<td>1. <em>Piano Repertoire</em>, Preparatory Level (Snell), page 4, “Bagpipe”</td>
</tr>
<tr>
<td>October 30</td>
<td>Videotaped posttest and posttest questionnaire administered</td>
<td>2. <em>Masterwork Technical Skills</em>, Level 1–2 (Magrath), page 14, Etude (Köhler)</td>
</tr>
</tbody>
</table>
APPENDIX E
LESSON PLANS

LESSON PLANS, STUDY WEEK 1

Week 1/Day 1: Wednesday, September 11, 2013

Example 1: *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 37, #5

1) Greet the class. Ask students to turn to page 37, #5, and close their keyboard lids.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. *(F major)*
   b. Ask students if the example is in a five-finger pattern. *(Yes)*
   c. Ask students to identify the meter. *(6/8)*
   d. Ask students to take their pencils and add the dynamic marking of *mp* at m. 5 (to add dynamic contrast).

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics**
   a. Ask students to tap the rhythm of the example with the correct finger numbers and dynamics on the closed keyboard lid. *Students say (chant) finger numbers out loud in rhythm.*
      i. *Model* four measures of this technique for students, and then prompt them to begin by counting one measure of rest out loud.
   b. **Control Group** receives one minute of individual preparation time.
   c. **Experimental Groups** now sing the example on moveable-*do* solfège while tapping rhythm with correct finger numbers.
      i. Play a cadence in F major for students. Ask students to tonicize the key (singing *do-mi-sol-mi-do*).
      ii. Ask students to sing the starting pitch (*do*) of the example.
      iii. Prompt students by counting one measure of rest. Students tap on closed keyboard cover and sing the example on solfège.
4) **Sight Reading**
   a. Students open keyboard lids and find the correct position on the keyboard.
   b. Remind students of the B-flat in the key signature.
   c. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to D major** (minor third below)
   a. Students find the new position on the keyboard. Remind students of the F-sharp in the key signature.
      i. Remind students that fingering and intervallic content will be the SAME as in the original.
   b. Play a cadence in D major for experimental groups ONLY and ask them to tonicize the new key. Ask students to sing the starting pitch (do) in the new key. Experimental groups ONLY will sing solfège of new key while playing in the new key.
   c. Prompt students by counting one measure of rest. Students perform example, transposed.
Example 2: *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 50, #2

1) Next, ask students to turn to page 50, #2.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. (G major)
   b. Ask students if the example is in a five-finger pattern. (Yes)
   c. Ask students to identify the meter. ($\frac{3}{4}$)

3) **Sight-Reading Preparation: Fingering / Rhythm / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys. Students say (chant) finger numbers out loud.
      i. Explain shadowing as “silently playing the notes on top of the keys” (Kostka, 2000). **Model** two measures of this technique for students, and then prompt them to begin by counting two measures of rest out loud.
   c. **Control Group** receives one minute of individual preparation time.
   d. **Experimental Groups** now sing the example on moveable-do solfège while shadowing example with correct finger numbers.
      i. Play a cadence in G major for students. Ask students to tonicize the key (singing do-mi-sol-mi-do).
      ii. Ask students to sing the starting pitch (do) of the example.
      iii. Prompt students by counting two measures of rest. Students shadow and sing the example on solfège.

4) **Sight Reading**
   a. Prompt students by counting two measures of rest. Students perform example on keys.

5) **Transpose to F major** (major second below)
   a. Students find the new position on the keyboard. Remind students of the B-flat in the key signature.
      i. Remind students that fingering and intervallic content will be the SAME as in the original.
   b. Give the **Control Group** approximately 20 seconds to shadow the example in the new key.
c. Experimental Groups now sing the example on moveable-\textit{do} solfège in the new key while shadowing.

i. Play a cadence in F major for experimental groups ONLY. Ask students to tonicize the new key.

ii. Ask students to sing the starting pitch (\textit{do}) in the new key.

iii. Experimental groups sing solfège in the new key \textit{while shadowing} in the new key.

d. Prompt students by counting two measures of rest. Students perform example, transposed, on the keyboard.

\textbf{ESTIMATED TIME: 12 MINUTES}
LESSON PLANS, STUDY WEEK 2

Week 2/Day 2: Monday, September 16, 2013

Example 1: Group Piano for Adults, Book 1 (Lancaster & Renfrow), page 51, #3

1) Greet the class. Ask students to turn to page 51, #3.

2) Sight-Reading Preparation: Score Study
   a. Ask students to identify the key of the example. (E-flat major)
   b. Ask students if the example is in a five-finger pattern. (Yes)
   c. Ask students to identify the meter. (\( \frac{3}{8} \))

3) Sight-Reading Preparation: Fingering / Rhythm / Keyboard Position
   a. Ask students to find the correct position on the keyboard. Remind students of the B-flat, E-flat, and A-flat in the key signature.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys. Students say (chant) finger numbers out loud.
      i. Remind students that shadowing requires silent playing of the notes on top of the keys. Prompt students to begin by counting two measures of rest out loud.
   c. Control Group receives one minute of individual preparation time.
   d. Experimental Groups now sing the example on moveable-do solfège while shadowing example with correct finger numbers. Ask students to sing with staccato articulations.
      i. Play a cadence in E-flat major for students. Ask students to tonicize the key (singing do-mi-sol-mi-do).
      ii. Ask students to sing the starting pitch (sol) of the example.
      iii. Prompt students by counting two measures of rest. Students shadow and sing the example on solfège.

4) Sight Reading
   a. Prompt students by counting two measures of rest. Students perform example on keys, with staccato articulations where indicated.

5) Transpose to B-flat major (perfect fourth below)
   a. Students find the new position on the keyboard. Remind students of the B-flat and E-flat in the key signature.
b. Play a cadence in B-flat major for experimental groups ONLY and ask them to tonicize the new key. Ask students to sing the starting pitch (sol) in the new key. Experimental groups ONLY will sing solfège of new key while playing in the new key.

   i. Ask students to play the new sol, and then sing the new sol. Do the same with the new do and the new mi so students map the new solfège syllables to the fingers that will play them.

c. Prompt students by counting two measures of rest. Students perform example, transposed, on the keyboard.
Example 2: *Group Piano for Adults, Book 1* (Lancaster & Renfrow), page 51, #4

1) Next, ask students to look at page 51, #4, and close their keyboard lids.

2) **Sight-Reading Preparation: Score Study**
   
   a. Ask students to identify the key of the example. (**A major**)
   
   b. Ask students if the example is in a five-finger pattern. (**Yes**)
   
   c. Ask students to identify the meter. (**$\frac{4}{4}$**)

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics**

   a. Ask students to tap the rhythm of the example with the correct finger numbers and dynamics on the closed keyboard lid. **Students say (chant) finger numbers out loud in rhythm, with dynamics.** Prompt students to begin by counting one measure of rest out loud.
   
   b. **Control Group** receives one minute of individual preparation time.
   
   c. **Experimental Groups** now sing the example on moveable-do solfège while tapping rhythm with correct finger numbers. Ask students to sing with **dynamics** and **phrasing**.
      
      i. Play a cadence in A major for students. Ask students to tonicize the key (singing do-mi-sol-mi-do).
      
      ii. Ask students to sing the starting pitch (do) of the example.
      
      iii. Prompt students by counting one measure of rest. Students tap on closed keyboard cover and sing the example on solfège.

4) **Sight Reading**

   a. Students open keyboard lids and find the correct position on the keyboard.
   
   b. Remind students of the C-sharp in the key signature.
   
   c. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to D major** (perfect fifth below)

   a. Students find the new position on the keyboard. Remind students of the F-sharp in the key signature.
   
   a. Give the **Control Group** approximately 20 seconds to shadow the example in the new key.
   
   b. **Experimental Groups** now sing the example on moveable-do solfège in the new key while shadowing.
      
      i. Play a cadence in D major for **experimental groups ONLY**. Ask students to tonicize the new key.
ii. Ask students to sing the starting pitch *(do)* in the new key.

iii. Experimental groups sing solfège in the new key *while shadowing* in the new key.

c. Prompt students by counting two measures of rest. Students perform example, transposed, on the keyboard.

**ESTIMATED TIME: 12 MINUTES**
**Week 2/Day 3: Wednesday, September 18, 2013**

**Example 1:** *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 62, #1: “Study” by Béla Bartók

1) Greet the class. Ask students to turn to page 62, #1, and close their keyboard lids.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. *(C major)*
   b. Ask students if the example is in a five-finger pattern. *(Yes)*
   c. Ask students to identify the meter. *(4/4)*
   d. Ask students if LH and RH play the same notes, two octaves apart. *(Yes)*

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics**
   a. Ask students to tap the rhythm of the example with the correct finger numbers and dynamics on the closed keyboard lid. Students count out loud using Takadimi. Tell students we are tapping to work out coordination between the hands. Prompt students to begin by counting one measure of rest out loud. Instructor walks around the room to observe students’ fingerings.
   b. After about 30–60 seconds of self-study, the control group goes straight to performing the example on the keyboard.
   c. Experimental Groups now sing the example on moveable-do solfège while tapping rhythm with correct finger numbers. Ask students to follow the phrasing as they sing.
      i. Play a cadence in C major for students. Ask students to tonicize the key (singing do-mi-sol-mi-do).
      ii. Ask students to sing the starting pitch (do) of the example.
      iii. Prompt students by counting one measure of rest. Students tap on closed keyboard cover and sing the example on solfège.

4) **Sight Reading**
   a. Students open keyboard lids and find the correct position on the keyboard.
   b. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to B-flat major** (major second below)
   a. Students find the new position on the keyboard. Remind students of the B-flat and E-flat in the key signature, and ask students to move their hands (especially RH) closer into the keys so RH thumb can reach the B-flat comfortably.
b. Play a cadence in B-flat major for experimental groups ONLY and ask them to
tonicize the new key. Ask students to sing the starting pitch (do) in the new key.
Experimental groups ONLY will sing solfège of new key while playing in the
new key.

c. Prompt students by counting two measures of rest. Students perform example,
transposed, on the keyboard.
Example 2: Group Piano for Adults, Book 1 (Lancaster & Renfrow), page 62, #2:
“March” by Daniel Gottlob Türk

1) Next, ask students to look at page 62, #2.

2) Sight-Reading Preparation: Score Study
   a. Ask students to identify the key of the example.  
      (G major)
   b. Ask students if the example is in a five-finger pattern.  
      (Yes)
   c. Ask students to identify the meter.  
      (\(\frac{4}{4}\))

3) Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys. Students say (chant) finger numbers out loud. Prompt students to begin by counting one measure of rest out loud. Use the following sequence:
      i. Control and experimental groups shadow RH alone, saying finger numbers.
      ii. Control and experimental groups shadow LH alone, saying finger numbers.
   c. Control Group takes 30–60 seconds to shadow hands together on keyboard, and then goes straight to performing the example on the keyboard.
   d. Experimental Groups now sing the example on moveable-do solfège while shadowing example HANDS TOGETHER with correct finger numbers. Ask students to sing with dynamics and phrasing.
      i. Play a cadence in G major for students. Ask students to tonicize the key (singing do-mi-sol-mi-do).
      ii. Ask students to sing the starting pitch of the RH (mi).
      iii. Prompt students by counting one measure of rest. Students shadow hands together and sing RH on solfège.
      iv. Ask students to sing the starting pitch of the LH (do).
      v. Prompt students by counting one measure of rest. Students shadow hands together and sing LH on solfège.

4) Sight Reading
   a. Prompt students by counting one measure of rest. Students perform example.

5) Transpose to E major (perfect fifth below)
   a. Students find the new position on the keyboard. Remind students of the F-sharp and G-sharp in the key signature.
b. **Experimental Groups** now sing the example on moveable-do solfège in the new key *while playing*.

   i. Play a cadence in E major for **experimental groups ONLY**. Ask students to tonicize the new key.

   ii. Ask half of students in the class to sing the starting pitch of RH (*mi*) in the new key; ask the other half of students to sing the starting pitch of LH (*do*).

   iii. While split into these groups, **experimental groups** sing solfège in the new key *while playing* in the new key.

   iv. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

   v. If necessary (and time allows), play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Ask the **Control Group** to focus on *intervallic content* or *scale degrees* as they perform the example transposed.

d. Prompt students by counting one measure of rest. Students perform example, transposed, on the keyboard.

**ESTIMATED TIME: 14 MINUTES**
LESSON PLANS, STUDY WEEK 3


Example 1: *Group Piano for Adults*, Book 1 (Lancaster & Renfrow), page 63, #3

1) Greet the class. Ask students to turn to page 63, #3, and close their keyboard lids.

2) Sight-Reading Preparation: Score Study
   a. Ask students to identify the key of the example.  
      (G major)
   b. Ask students if the example is in a five-finger pattern.  
      (Yes)
   c. Ask students to identify the meter.  
      (2/4)
   d. Ask students to take their pencils and add the dynamic marking of *mp* at m. 5 (to add dynamic contrast).

3) Sight-Reading Preparation: Fingering / Rhythm / Dynamics
   a. Ask students to tap the rhythm of the example with the correct finger numbers and dynamics on the closed keyboard lid.
      i. **Control Group** taps hands together TWICE. Ask students to focus their attention on right hand the first time, and left hand the second time, as they tap hands together. Students do not say anything out loud.
      ii. **Experimental Groups** tap hands together TWICE while singing using solfège.
         1. Play a cadence in G major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the right hand (*mi*). The second time, ask students to sing the starting pitch of the left hand (*do*).
         3. Prompt students by counting two measures of rest. Students tap hands together and sing right hand melody on solfège. Tap hands together again and have students sing the left hand harmony on solfège.

4) Sight Reading
   a. Students open keyboard lids and find the correct position on the keyboard.
   b. Prompt students by counting two measures of rest. Students perform example.

5) Transpose to D major (perfect fourth below)
   a. Students find the new position on the keyboard. Remind students of the F-sharp in the key signature.
b. **Control Group** shadows the example TWICE in the new key. Ask students to focus on hands-together coordination, as well as intervallic content.

c. **Experimental Groups** now sing the example on moveable-*do* solfège in the new key *while shadowing*.
   
   i. Play a cadence in D major for experimental groups ONLY. Ask students to tonicize the new key.

   ii. Ask half of students in the class to sing the starting pitch of RH (*mì*) in the new key; ask the other half of students to sing the starting pitch of LH (*do*). While split into these groups, experimental groups sing solfège in the new key *while shadowing* in the new key.

   iii. Sing example on moveable-*do* solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

d. Prompt students by counting two measures of rest. Students perform example, transposed, on the keyboard.
Example 2: Masterwork Technical Skills, Level 1–2 (Magrath), page 13, “Etude”  
(Köhler)

1) Next, ask students to look at the given handout and close their keyboard lids.

2) Sight-Reading Preparation: Score Study
   a. Ask students to identify the key of the example. (C major)
   b. Ask students if the example is in a five-finger pattern. (Yes)
   c. Ask students to identify the meter. (\(\frac{4}{4}\))
   d. Ask students to note clef for left hand. (Treble Clef)

3) Sight-Reading Preparation: Fingering / Rhythm / Dynamics
   a. Ask students to tap the rhythm of the example with the correct finger numbers and dynamics on the closed keyboard lid.
      i. Control Group taps hands together TWICE. Ask students to focus their attention on right hand the first time, and left hand the second time, as they tap hands together. Students do not say anything out loud.
      ii. Experimental Groups tap hands together TWICE while singing using solfège.
         1. Play a cadence in C major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the right hand (\(\text{mi}\)). The second time, ask students to sing the starting pitch of the left hand (\(\text{do}\)).
         3. Prompt students by counting one measure of rest. Students tap hands together and sing right hand melody on solfège. Tap hands together again and have students sing the left hand harmony on solfège.

4) Sight Reading
   a. Students open keyboard lids and find the correct position on the keyboard.
   b. Prompt students by counting one measure of rest. Students perform example.

5) Transpose to F major (perfect fifth below)
   a. Students find the new position on the keyboard. Remind students of the B-flat in the key signature.
   b. Experimental Groups now sing the example on moveable-do solfège in the new key while playing.
vi. Play a cadence in F major for experimental groups ONLY. Ask students to tonicize the new key.

i. Ask half of students in the class to sing the starting pitch of RH (mi) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

ii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iii. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.

ESTIMATED TIME: 14 MINUTES
Week 3/Day 5: Wednesday, September 25, 2013

**Example 1: Progressive Class Piano (Heerema), page 61, “Toy Piano”**

1) Greet the class. Ask students to look at the given handout.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. (E major)
   b. Ask students if the example is in a five-finger pattern. (Yes)
   c. Ask students to identify the meter. (\( \frac{4}{4} \))
   d. Ask students to note the pedal and 8va markings in the score.
   e. Ask students to identify scale degrees / solfège syllables for LH.
      (1 and 5 / Do and sol)

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE. Ask students to identify the scale degrees used in the LH (I and V—Tonic and Dominant), and then ask them to focus on RH melody and hands-together coordination as they tap hands together. Students do not say anything out loud.
      ii. **Experimental Groups** shadow hands together TWICE while singing using solfège.
         1. Play a cadence in E major for students. Ask students to tonicize the key.
         2. Ask half of students in the class to sing the starting pitch of RH (do); ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while shadowing.
         3. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

4) **Sight Reading**
   a. Prompt students by counting one measure of rest. Students perform example.
5) **Transpose to A major** (perfect fifth below)

a. Students find the new position on the keyboard. Remind students of the **C-sharp** in the key signature.

b. Experimental Groups now sing the example on moveable-**do** solfège in the new key while playing.

   i. Play a cadence in A major for experimental groups ONLY. Ask students to tonicize the new key.

   ii. Ask half of students in the class to sing the starting pitch of RH (**do**) in the new key; ask the other half of students to sing the starting pitch of LH (**do**). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

   iii. Sing example on moveable-**do** solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

   iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.
Example 2: *Masterwork Technical Skills, Level 1–2 (Magrath), page 13, “Etude” (Berens)*

1) Next, ask students to look at the second example on the given handout.

2) **Sight-Reading Preparation: Score Study**
   
a. Ask students to identify the key of the example. *(G major)*
   
b. Ask students if the example is in a five-finger pattern. *(Yes)*
   
c. Ask students to identify the meter. *(3/4)*

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   
a. Ask students to find the correct position on the keyboard.
   
b. Ask students to “shadow” the example with the correct finger numbers on the keys. Students say (chant) finger numbers out loud. Prompt students to begin by counting two measures of rest out loud. Use the following sequence:
   
   i. Control and experimental groups shadow RH alone, saying finger numbers.
   
   ii. Control and experimental groups shadow LH alone, saying finger numbers.
   
   c. Control Group takes 30–60 seconds to shadow hands together on keyboard, and then goes straight to performing the example on the keyboard.
   
   d. Experimental Groups now sing the example on moveable-*do* solfège while shadowing example HANDS TOGETHER with correct finger numbers. Ask students to sing with dynamics and phrasing.
   
   i. Play a cadence in G major for students. Ask students to tonicize the key.
   
   ii. Ask students to sing the starting pitch of the RH (*do*).
   
   iii. Prompt students by counting two measures of rest. Students shadow hands together and sing RH on solfège.
   
   iv. Ask students to sing the starting pitch of the LH (*do*).
   
   v. Prompt students by counting two measures of rest. Students shadow hands together and sing LH on solfège.

4) **Sight Reading**
   
a. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to D major** (perfect fourth below)
   
a. Students find the new position on the keyboard. Remind students of the F-sharp in the key signature.
b. **Experimental Groups** now sing the example on moveable-*do* solfège in the new key *while playing*.

   i. Play a cadence in D major for **experimental groups** ONLY. Ask students to tonicize the new key.

   ii. Ask students to play up and down a D major five-finger pattern while singing solfège so students map the solfège syllables to their fingers.

   iii. Ask half of students in the class to sing the starting pitch of RH (*do*) in the new key; ask the other half of students to sing the starting pitch of LH (*do*). While split into these groups, **experimental groups** sing solfège in the new key *while playing* in the new key.

   iv. Sing example on moveable-*do* solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

   v. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. **Control Group** performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.

**ESTIMATED TIME: 14 MINUTES**
Example 1: *Keyboard Strategies*, Master Text I (Stecher and Horowitz), page 118, “Texture 21”

1) Greet the class. Ask students to look at the first example on the given handout.

2) **Sight-Reading Preparation: Score Study**

   a. Ask students to identify the key of the example.  
      (E major)
   b. Ask students if the example is in a five-finger pattern.  
      (Yes)
   c. Ask students to identify the meter.  
      ($\frac{6}{2}$)
   d. Ask students to identify scale degrees / solfège syllables for LH.
      (1 and 5 / Do and sol)

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**

   a. Ask students to find the correct position on the keyboard.
   
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      
         ii. **Experimental Groups** shadow hands together TWICE while singing using solfège.

         1. Play a cadence in E major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH (mi). Prompt students by counting one measure of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH (do). Prompt students by counting one measure of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**

   a. Prompt students by counting one measure of rest. Students perform example.
5) **Transpose to G major** (minor third above)

   a. Students find the new position on the keyboard.

   b. **Experimental Groups** now sing the example on moveable-*do* solfège in the new key **while playing**.

      i. Play a cadence in G major for experimental groups ONLY. Ask students to tonicize the new key.

      ii. Ask half of students in the class to sing the starting pitch of RH (*mi*) in the new key; ask the other half of students to sing the starting pitch of LH (*do*). While split into these groups, experimental groups sing solfège in the new key **while playing** in the new key.

      iii. Sing example on moveable-*do* solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

      iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

   c. **Control Group** performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.
Example 2: *Keyboard Musicianship, Book 1* (Lyke), page 81, “Folk Song”

1) Next, ask students to look at the second example on the given handout.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. (A major)
   b. Ask students if the example is in a five-finger pattern. (Yes)
   c. Ask students to identify the meter. (\(\frac{3}{4}\))

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. **Experimental Groups** shadow hands together TWICE while singing using solfège.
          1. Play a cadence in A major for students. Ask students to tonicize the key.
          2. Ask students to sing the starting pitch of the RH (do).
          3. Prompt students by counting five beats of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
          4. Ask students to sing the starting pitch of the LH (do).
          5. Prompt students by counting five beats of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Prompt students by counting five beats of rest. Students perform example.

5) **Transpose to B major** (major second above)
   a. Students find the new position on the keyboard.
   b. **Experimental Groups** now sing the example on moveable-do solfège in the new key while playing.
      i. Play a cadence in B major for experimental groups ONLY. Ask students to tonicize the new key.
ii. Ask half of students in the class to sing the starting pitch of RH (do) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.

**ESTIMATED TIME: 14 MINUTES**
Week 4/Day 7: Wednesday, October 9, 2013

Example 1: *Masterwork Technical Skills, Level 1–2* (Magrath), page 14, “Etude” (Köhler)

1) Greet the class. Ask students to look at the first example on the given handout.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. (C major)
   b. Ask students if the example is in a five-finger pattern.
      (Yes, RH is in a five-finger pattern, but LH is in a different position!)
   c. Ask students to identify the meter. ($\frac{4}{4}$)

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. **Experimental Groups** shadow hands together TWICE while singing using solfège.
         1. Play a cadence in C major for students. Ask students to tonicize the key. *Do a short call-and-response exercise with solfège syllable “ti” so students have it in their ears.*
         2. Ask students to sing the starting pitch of the LH (do).
         3. Prompt students by counting one measure of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.
         4. Ask students to sing the starting pitch of the RH (do).
         5. Prompt students by counting one measure of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to B-flat major** (major second below)
a. Students find the new position on the keyboard.

b. **Experimental Groups** now sing the example on moveable-do solfège in the new key while playing.

   i. Play a cadence in B-flat major for experimental groups ONLY. Ask students to tonicize the new key.

   ii. Ask half of students in the class to sing the starting pitch of RH (do) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

   iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

   iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. **Control Group** performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.
Example 2: Contemporary Class Piano (Mach), page 166, “Study 1”

1) Next, ask students to look at the second example on the given handout.

2) Sight-Reading Preparation: Score Study
   a. Ask students to identify the key of the example. (D-flat major)
   b. Ask students if the example is in a five-finger pattern. (Yes)
   c. Ask students to identify the meter. (\(\frac{2}{4}\))

3) Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. Control Group shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. Experimental Groups shadow hands together TWICE while singing using solfège.
         1. Play a cadence in D-flat major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH (do). Prompt students by counting two measures of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH (do). Prompt students by counting two measures of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) Sight Reading
   a. Prompt students by counting two measures of rest. Students perform example.

5) Transpose to E-flat major (major second above)
   a. Students find the new position on the keyboard.
   b. Experimental Groups now sing the example on moveable-do solfège in the new key while playing.
      i. Play a cadence in E-flat major for experimental groups ONLY. Ask students to tonicize the new key.
ii. Ask half of students in the class to sing the starting pitch of RH (do) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.

ESTIMATED TIME: 14 MINUTES
LESSON PLANS, STUDY WEEK 5

Week 5/Day 8: Monday, October 14, 2013

Example 1: Contemporary Class Piano (Mach), page 117, “Calypso Beat”

1) Greet the class. Ask students to look at the first example on the given handout.

2) Sight-Reading Preparation: Score Study
   a. Ask students to identify the key of the example. (F major)
   b. Ask students if the example is in a five-finger pattern. (Yes)
   c. Ask students to identify the meter. (\( \frac{4}{4} \))

3) Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. Control Group shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. Experimental Groups shadow hands together TWICE while singing using solfège.

1. Play a cadence in F major for students. Ask students to tonicize the key.

2. Ask students to sing the starting pitch of the RH (sol). Prompt students by counting one measure of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.

3. Ask students to sing the starting pitch of the LH (do). Prompt students by counting one measure of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) Sight Reading
   a. Prompt students by counting one measure of rest. Students perform example.

5) Transpose to D major (minor third below)
   a. Students find the new position on the keyboard.
b. **Experimental Groups** now sing the example on moveable-*do* solfège in the new key *while playing*.

   i. Play a cadence in D major for **experimental groups ONLY**. Ask students to tonicize the new key.

   ii. Ask half of students in the class to sing the starting pitch of RH (*sol*) in the new key; ask the other half of students to sing the starting pitch of LH (*do*). While split into these groups, **experimental groups** sing solfège in the new key *while playing* in the new key.

   iii. Sing example on moveable-*do* solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

   iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. **Control Group** performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.
Example 2: *First Series of Graded Pianoforte Studies*, Preliminary (ABRSM), #53, Gurlitt, Op. 82, No. 29

1) Next, ask students to look at the second example on the given handout.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. (C major)
   b. Ask students if the example is in a five-finger pattern. (Mostly; m.7 moves slightly outside of pattern.)
   c. Ask students to identify the meter. (\(\frac{4}{2}\))

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. **Experimental Groups** shadow hands together TWICE while singing using solfège.
         1. Play a cadence in C major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH (mi). Prompt students by counting one measure of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH (do). Prompt students by counting one measure of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to B-flat major** (major second below)
   a. Students find the new position on the keyboard.
   b. **Experimental Groups** now sing the example on moveable-do solfège in the new key while playing.
i. Play a cadence in B-flat major for experimental groups ONLY. Ask students to tonicize the new key.

ii. Ask half of students in the class to sing the starting pitch of RH (mí) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.

ESTIMATED TIME: 14 MINUTES
Example 1: *Masterwork Classics, Level 1–2* (Magrath), page 5, “Melody” (Köhler)

1) Greet the class. Ask students to look at the first example on the given handout.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. \(\text{(G major)}\)
   b. Ask students if the example is in a five-finger pattern. \(\text{(Yes)}\)
   c. Ask students to identify the meter. \(\left(\frac{3}{4}\right)\)

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. **Experimental Groups** shadow hands together TWICE while singing using solfège.
         1. Play a cadence in G major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH (mi). Prompt students by counting one measure of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH (do). Prompt students by counting one measure of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to A major** (major second above)
   a. Students find the new position on the keyboard.
   b. **Experimental Groups** now sing the example on moveable-do solfège in the new key *while playing.*
i. Play a cadence in A major for experimental groups ONLY. Ask students to tonicize the new key.

ii. Ask half of students in the class to sing the starting pitch of RH (mi) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.
Example 2: *Keyboard Strategies*, Master Text I (Stecher and Horowitz), page 116, “Texture 18”

1) Next, ask students to look at the second example on the given handout.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. *(A major)*
   b. Ask students if the example is in a five-finger pattern. *(Yes)*
   c. Ask students to identify the meter. *(2/4)*

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. **Experimental Groups** shadow hands together TWICE while singing using solfège.
         1. Play a cadence in A major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH *(sol)*. Prompt students by counting two measures of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH *(do)*. Prompt students by counting two measures of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Prompt students by counting two measures of rest. Students perform example.

5) **Transpose to E major** (perfect fourth below)
   a. Students find the new position on the keyboard.
   b. **Experimental Groups** now sing the example on moveable-*do* solfège in the new key *while playing*.
      i. Play a cadence in E major for experimental groups ONLY. Ask students to tonicize the new key.
ii. Ask half of students in the class to sing the starting pitch of RH (sol) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.

ESTIMATED TIME: 14 MINUTES
LESSON PLANS, STUDY WEEK 6

Week 6/Day 10: Monday, October 21, 2013

Example 1: *Keyboard Musicianship*, Book 1 (Lyke), page 47, #3

1) Greet the class. Ask students to look at the first example on the given handout and close their keyboard lids.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. \( \text{(C major)} \)
   b. Ask students if the example is in a five-finger pattern. \( \text{(Yes)} \)
   c. Ask students to identify the meter. \( \text{\( \frac{2}{3} \)} \)
   d. Ask students to note the different articulations for each hand.

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to tap the rhythm of the example with the correct finger numbers on the closed keyboard lid.
      i. **Control Group** taps hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while tapping hands together.
      ii. **Experimental Groups** tap hands together TWICE while singing using solfège.
         1. Play a cadence in C major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH (sol). Prompt students by counting two measures of rest. Students tap hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH (mi). Prompt students by counting two measures of rest. Students tap hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Students open keyboard lids and find the correct position on the keyboard. Prompt students by counting two measures of rest. Students perform example.

5) **Transpose to F major** (perfect fourth above)
   a. Students find the new position on the keyboard.
b. **Experimental Groups** now sing the example on moveable-do solfège in the new key *while playing*.

   i. Play a cadence in F major for **experimental groups ONLY**. Ask students to tonicize the new key.

   ii. Ask half of students in the class to sing the starting pitch of RH (*sol*) in the new key; ask the other half of students to sing the starting pitch of LH (*mi*). While split into these groups, **experimental groups** sing solfège in the new key *while playing* in the new key.

   iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

   iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. **Control Group** performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.
Example 2: *Progressive Class Piano* (Heerema), page 61, “Fast Dance”

1) Next, ask students to look at the second example on the given handout.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example.  
      \( \text{(D major)} \)
   b. Ask students if the example is in a five-finger pattern.  
      \( \text{(Yes)} \)
   c. Ask students to identify the meter.  
      \( \left( \frac{3}{4} \right) \)

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. **Experimental Groups** shadow hands together TWICE while singing using solfège.
         1. Play a cadence in D major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH (sol). Prompt students by counting two measures of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH (do). Prompt students by counting two measures of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Prompt students by counting two measures of rest. Students perform example.

5) **Transpose to A major** (perfect fourth below)
   a. Students find the new position on the keyboard.
   b. **Experimental Groups** now sing the example on moveable-do solfège in the new key while playing.
      i. Play a cadence in A major for experimental groups ONLY. Ask students to tonicize the new key.
ii. Ask half of students in the class to sing the starting pitch of RH (sol) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.

ESTIMATED TIME: 14 MINUTES
Example 1: *Progressive Class Piano* (Heerema), page 31, “Simple Song”

1) Greet the class. Ask students to look at the first example on the given handout.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example. (C major)
   b. Ask students if the example is in a five-finger pattern. (Yes)
   c. Ask students to identify the meter. (4/4)

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. Control Group shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while shadowing hands together.
      ii. Experimental Groups shadow hands together TWICE while singing using solfège.
         1. Play a cadence in C major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH (do). Prompt students by counting one measure of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH (do). Prompt students by counting one measure of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to A major** (minor third below)
   a. Students find the new position on the keyboard.
   b. Experimental Groups now sing the example on moveable-do solfège in the new key while playing.
i. Play a cadence in A major for experimental groups ONLY. Ask students to tonicize the new key.

ii. Ask half of students in the class to sing the starting pitch of RH (do) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.
Example 2: *Group Piano for Adults, Book 1* (Lancaster & Renfrow), page 63, #4

1) Now, ask students to turn to page 63, #4.

2) **Sight-Reading Preparation: Score Study**
   a. Ask students to identify the key of the example.  
      (D major)
   b. Ask students if the example is in a five-finger pattern.  
      (Yes)
   c. Ask students to identify the meter.  
      (6/8)

3) **Sight-Reading Preparation: Fingering / Rhythm / Dynamics / Keyboard Position**
   a. Ask students to find the correct position on the keyboard.
   b. Ask students to “shadow” the example with the correct finger numbers on the keys.
      i. **Control Group** shadows hands together TWICE while saying finger numbers in rhythm. Ask students to say RH finger numbers the first time, and then say LH finger numbers the second time while tapping hands together.
      ii. **Experimental Groups** taps hands together TWICE while singing using solfège.
         1. Play a cadence in D major for students. Ask students to tonicize the key.
         2. Ask students to sing the starting pitch of the RH (mi). Prompt students by counting one measure of rest. Students shadow hands together and sing RH on solfège. Instructor plays LH on instructor keyboard as students sing.
         3. Ask students to sing the starting pitch of the LH (do). Prompt students by counting two measures of rest. Students shadow hands together and sing LH on solfège. Instructor plays RH on instructor keyboard as students sing.

4) **Sight Reading**
   a. Prompt students by counting one measure of rest. Students perform example.

5) **Transpose to E major** (major second above)
   a. Students find the new position on the keyboard.
   b. **Experimental Groups** now sing the example on moveable-do solfège in the new key while playing.
      i. Play a cadence in E major for experimental groups ONLY. Ask students to tonicize the new key.
ii. Ask half of students in the class to sing the starting pitch of RH (mī) in the new key; ask the other half of students to sing the starting pitch of LH (do). While split into these groups, experimental groups sing solfège in the new key while playing in the new key.

iii. Sing example on moveable-do solfège again, and have students switch parts (i.e. those who sang RH will now sing LH, and those who sang LH will now sing RH).

iv. Play once more hands together, without singing. Have students focus on dynamics and phrasing in their playing.

c. Control Group performs transposed example TWICE. Ask students to play hands together both times. The second time, ask students to add phrasing and dynamics.

ESTIMATED TIME: 14 MINUTES
APPENDIX F

OBSERVATION FORM FOR PRETESTS AND POSTTESTS

Observation Form for Pretest

Participant No. ____________________

Score _____ /162

© 1997 Neil A. Kjos Music Company
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Bagpipe
(Transposed)

Anonymous
17th c.

Participant No. _______________________
Score ______/162

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Observation Form for Posttest

Example 1

Participant No. ______________________

Score ______ /162

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Observation Form for Posttest
Example 2

Participant No. ______________________
Score _______/164

Etude

Louis Köhler (1820–1886)
Op. 190, No. 15

1 2 3 4
PR PR PR PR
RR RR RR RR
PL PL PL PL
RL RL RL RL
C C C C
D

1 2 3 4
PR PR PR PR
RR RR RR RR
PL PL PL PL
RL RL RL RL
C C C C

1 2 3 4
PR PR PR PR
RR RR RR RR
PL PL PL PL
RL RL RL RL
C C C C
D

1 2 3 4
PR PR PR PR
RR RR RR RR
PL PL PL PL
RL RL RL RL
C C C C

1 2 3 4
PR PR PR PR
RR RR RR RR
PL PL PL PL
RL RL RL RL
C C C C
D
Participant No. ______________________
Score ______ /164

Etude
(Transposed)  Louis Köhler (1820-1886)
Op. 190, No. 15
APPENDIX G
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Michelle Wachter
DMA Candidate in Piano Pedagogy
University of South Carolina
909-692-9673

Dear Ms. Wachter,

This letter will serve as permission to reproduce Bagpipe from Piano Repertoire, Preparatory Level, pg 4 (GP606) by Keith Snell, and to include them in your doctoral document entitled, "Effects of Sight Singing Using Moveable-Do Solmization on the Transposition Performance of Undergraduate Group Piano Students", provided you agree to the following terms:

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Ms. Michelle Wachter
[Date: 10/21/14]

[Signature]
Carla Tason, Copyrights & Licensing
[Date: 10/21/14]
Copyright Permission Request for Doctoral Dissertation

Michelle Wachter <michelle.i.wachter@gmail.com>  Oct 15

to permissions

To whom it may concern,

I am writing to inquire about securing copyright permission for use of a musical example in my doctoral dissertation. The dissertation will appear in the ProQuest Dissertations and Theses Database but will otherwise remain unpublished.

I would like to include Louis Kohler’s Etude, Op. 190, No. 15, found in Jane Magrath’s Technical Skills, Level 1–2, p. 14. This piece was used in my doctoral experimental study titled “Effects of Sight Singing Using Moveable-Do Solmization on the Transposition Performance of Undergraduate Group Piano Students.” I would like to include the piece in an appendix so readers can see how data was gathered from students’ performances of this piece.

I have attached the piece as it would appear in the appendix of the dissertation. Please let me know if you need any further information.

Thank you for your time and consideration.

Michelle Wachter
DMA Candidate in Piano Pedagogy, University of South Carolina

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Print_141015_6

Michael Worden <mworden@alfred.com>  Oct 16

to me

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APPENDIX H
PRETEST AND POSTTEST SCORING INSTRUCTIONS

Dear Independent Observer,

Thank you so much for your willingness to help with this project! Please score students’ pretests and posttests using the enclosed observation forms. Evaluate both the sight-read and transposed versions of “Bagpipe” and “Etude” for pitch accuracy, rhythmic accuracy, continuity, and dynamics. Students can receive up to five points per beat:

1. Pitch accuracy for right hand (PR)
2. Pitch accuracy for left hand (PL)
3. Rhythmic accuracy for right hand (RR)
4. Rhythmic accuracy for left hand (RL)
5. Continuity (C)

On the first beat in measures 1 and 5 of “Bagpipe,” and the first beat in measures 1, 5, 7, and 8 of “Etude,” students can receive another point for observation of the indicated dynamic marks (D). Students can receive a maximum of 162 points for the sight-read version of “Bagpipe,” and a maximum of 162 points for the transposed version of “Bagpipe.” Students can receive a maximum of 164 points for the sight-read version of “Etude,” and a maximum of 164 points for the transposed version of “Etude.”

TYPES OF ERRORS

1. Pitch errors can be any of the following items:
   - A note added or omitted.
   - A note played on the wrong pitch.

   If a student plays one or both hands in the wrong register, please do not deduct any points for pitch errors. Instead, please score the example as if it were in the correct

---

14 Scoring procedures and definitions were taken from the Watkins–Farnum Performance Scale, Form A (1954), and Baker’s (2008) adapted version of the Watkins–Farnum Performance Scale.
register, and indicate, beside the student’s total score, which hand(s) was played in the wrong register.

2. **Rhythm errors** can be any of the following items:
   - Any note not held for its full value.
   - Any note held longer than its full value (up to three-quarters of a beat longer).
   - Any note held when it should be repeated.
   - Any omitted note.

3. Please mark **dynamic errors** if a student fails to observe any indicated dynamic marks.

4. Please score **continuity errors** in the following way:
   - If a pause or hesitation occurs at the bar line, mark a continuity error on the first beat of the measure *after* the pause.
   - If a hesitation of *more* than three-quarters of a beat occurs at any point, mark a continuity error for the beat that was delayed due to the hesitation.
   - If a student moves backwards to replay any portion of the music, mark a continuity error for the beat that did not occur at the correct time.

*If a student moves backwards to replay any portion of the exercise, please score only the first performance of any repeated material.*
APPENDIX I
PRETEST AND POSTTEST QUESTIONNAIRES

PRETEST QUESTIONNAIRE

GENERAL INFORMATION

1) Name: ____________________________________________________________

2) Email: _____________________________________________________________

3) Year in College: ____________________________________________________

4) Degree Program: ____________________________________________________

5) Primary Instrument: ________________________________________________

6) Other Instrument(s): ________________________________________________

7) Theory Classes Taken: ______________________________________________

8) Aural Skills Classes Taken: _________________________________________

SKILLS

9) How many years have you played the piano? ____________________________

10) How many years have you taken formal piano lessons? __________________

11) How long has it been since your last formal piano lesson? _______________

12) Briefly describe any prior singing experiences including years of involvement (if applicable): __________

__________________________________________
13) Circle the solfège system(s), if any, you have used:

(a) Moveable-\textit{do} 
(b) \textit{Do}-based minor 
(c) \textit{La}-based minor 
(d) Fixed-\textit{do} 
(e) Pitch letter names 
(f) Scale degree numbers 
(g) Neutral syllables 
(h) None of the above 
(i) Other (Please specify ____________________________ )

READING ABILITY

14) How would you currently rate your reading ability on the following clefs?

(a) \textbf{Treble Clef} 

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Excellent</td>
</tr>
</tbody>
</table>

(b) \textbf{Bass Clef} 

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Excellent</td>
</tr>
</tbody>
</table>

(c) \textbf{Grand Staff} 

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Excellent</td>
</tr>
</tbody>
</table>

15) List any other clefs you can read: ____________________________

16) How would you currently rate your keyboard \textit{sight-reading} skills?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Excellent</td>
</tr>
</tbody>
</table>

17) How would you currently rate your \textit{sight-reading} skills on your own instrument?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Excellent</td>
</tr>
</tbody>
</table>
18) How would you currently rate your keyboard *transposition* skills?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Excellent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19) How would you currently rate your *transposition* skills on your own instrument?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Excellent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

20) How would you currently rate your *solfège* skills?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>Excellent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
POSTTEST QUESTIONNAIRE

Name: ________________________________

Part A

1) How would you currently rate your keyboard sight-reading skills?

1  2  3  4  5  6
Poor  Excellent

2) How would you currently rate your keyboard transposition skills?

1  2  3  4  5  6
Poor  Excellent

3) How would you currently rate your solfège skills?

1  2  3  4  5  6
Poor  Excellent

Part B

How effective do you find the following preparation techniques for sight reading at the keyboard?

Silent Score Study

1  2  3  4  5  6
Not effective  Extremely effective

Tapping on the Closed Keyboard Cover

1  2  3  4  5  6
Not effective  Extremely effective

Shadowing on the Keys

1  2  3  4  5  6
Not effective  Extremely effective

Singing with Solfege

1  2  3  4  5  6
Not effective  Extremely effective

Please list other techniques you find helpful for sight reading: ____________________________
Part B (continued)

How effective do you find the following preparation techniques for transposition at the keyboard?

<table>
<thead>
<tr>
<th>Technique</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silent Score Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not effective</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Extremely effective</td>
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<td></td>
</tr>
<tr>
<td>Thinking about the Intervals</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Not effective</td>
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<td></td>
</tr>
<tr>
<td>Extremely effective</td>
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</tr>
<tr>
<td>Thinking about the Scale Degrees</td>
<td></td>
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</tr>
<tr>
<td>Not effective</td>
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<td></td>
</tr>
<tr>
<td>Extremely effective</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Singing with Solfège</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Not effective</td>
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<tr>
<td>Extremely effective</td>
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<tr>
<td>Thinking the Solfège</td>
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<tr>
<td>Not effective</td>
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<tr>
<td>Extremely effective</td>
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</tbody>
</table>

Please list other techniques you find helpful for transposition: ________________________________________________________________


Part C

1) How would you rate the importance of keyboard skills to your music education?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not important</td>
<td>Very important</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2) How would you rate the importance of keyboard skills to your future career?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not important</td>
<td>Very important</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3) How would you rate the importance of keyboard transposition skills to your music education?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not important</td>
<td>Very important</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Part C (continued)

4) How would you rate the importance of *keyboard transposition skills* to your future career?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Not important</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Very important</em></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

5) How would you rate the importance of *singing* to your music education?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Not important</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Very important</em></td>
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<td></td>
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</tbody>
</table>

6) How would you rate the importance of *singing* to your future career?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Not important</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Very important</em></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

7) How likely are you to use singing to transpose at the keyboard in the future?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Not likely</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Very likely</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8) How likely are you to use singing to transpose on your own instrument in the future?

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Not likely</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Very likely</em></td>
<td></td>
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</tr>
</tbody>
</table>

Any additional comments:
APPENDIX J

INSTRUCTIONS FOR VIDEOTAPED PRETESTS AND POSTTESTS

INSTRUCTIONS FOR PRETEST
September 6 and 9, 2013

Thank you for your participation in this pretest.

Today you will receive an eight-measure piece to sight read and transpose at the piano. You will have two minutes to study the score and to prepare to sight read and transpose. During these two minutes, you may use any type of preparation you find beneficial to help you sight-read and transpose the piece. However, you may not play the piano during these two minutes.

I will tell you when two minutes have passed. You will then sight read the piece at the piano. You will sight read it only once. Even if errors occur, please attempt to sight read the example without stopping and restarting.

Once you sight read the piece, you will then transpose the piece to the key of E major. You will play the piece, transposed, only once. Even if errors occur, please attempt to transpose the example without stopping and restarting.

15 Instructions for videotaped pretests and posttests were adapted from Baker (2008), p. 165.
INSTRUCTIONS FOR POSTTEST
October 23, 28, and 30, 2013

Thank you for your participation in this posttest.

Today you will receive two eight-measure pieces to sight read and transpose at the piano. For each piece, you will have two minutes to study the score and to prepare to sight read and transpose. During these two minutes, you may use any type of preparation you find beneficial to help you sight read and transpose the piece. However, you may not play the piano during these two minutes.

I will tell you when two minutes have passed. Then, you will sight read the piece at the piano. You will sight read it only once. Even if errors occur, please attempt to sight read the example without stopping and restarting.

Once you sight read the piece, you will then transpose the first piece to the key of E major. You will play the piece, transposed, only once. Even if errors occur, please attempt to transpose the example without stopping and restarting.

You will then receive the second piece and will repeat the same procedure. Once you have spent two minutes preparing and then sight reading the second piece, you will transpose it to the key of F major. You will play the piece, transposed, only once. Even if errors occur, please attempt to transpose the example without stopping and restarting.

The researcher will also provide students with a paper that includes the following written steps:

1) Prepare (but don’t play!) — 2 minutes per example
2) Sight read once
3) Transpose the first example, “Bagpipe,” to E major
   Transpose the second example, “Etude,” to F major 3 minutes per example
APPENDIX K

BOXPLOTS OF PRETEST AND POSTTEST SIGHT-READING SCORES

Figure K.1. Boxplot of Pretest Sight-Reading 1 Scores of Total Sample (N = 39).
Note. C = Control Group; E-1 = Experimental Group 1; E-2 = Experimental Group 2; ▲ = Mean.
Figure K.2. Boxplot of Posttest Sight-Reading 1 Scores of Total Sample ($N = 39$). Note. C = Control Group; E-1 = Experimental Group 1; E-2 = Experimental Group 2; ▲ = Mean.

Figure K.3. Boxplot of Posttest Sight-Reading 2 Scores of Total Sample ($N = 39$). Note. C = Control Group; E-1 = Experimental Group 1; E-2 = Experimental Group 2; ▲ = Mean.
How effective do you find the following preparation techniques for sight reading at the keyboard?

Table L.1

Descriptive Statistics for the Efficacy of Sight-Reading Preparation Techniques (N = 39)

<table>
<thead>
<tr>
<th>Technique</th>
<th>Control</th>
<th>Experimental 1</th>
<th>Experimental 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n = 14$</td>
<td>$n = 13$</td>
<td>$n = 12$</td>
</tr>
<tr>
<td>Silent Score Study</td>
<td>3.57</td>
<td>4.46</td>
<td>4.42</td>
</tr>
<tr>
<td>SD</td>
<td>1.16</td>
<td>1.13</td>
<td>1.00</td>
</tr>
<tr>
<td>Tapping on the Closed Keyboard Cover</td>
<td>3.93</td>
<td>3.54</td>
<td>3.92</td>
</tr>
<tr>
<td>SD</td>
<td>1.00</td>
<td>1.27</td>
<td>1.73</td>
</tr>
<tr>
<td>Shadowing on the Keys</td>
<td>4.71</td>
<td>4.85</td>
<td>5.00</td>
</tr>
<tr>
<td>SD</td>
<td>1.07</td>
<td>1.21</td>
<td>1.04</td>
</tr>
<tr>
<td>Singing with Solfege</td>
<td>4.64</td>
<td>3.46</td>
<td>4.67</td>
</tr>
<tr>
<td>SD</td>
<td>1.08</td>
<td>1.33</td>
<td>1.37</td>
</tr>
</tbody>
</table>
How effective do you find the following preparation techniques for transposition at the keyboard?

Table L.2

Descriptive Statistics for the Efficacy of Transposition Preparation Techniques (N = 39)

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Experimental 1</th>
<th>Experimental 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 14</td>
<td>n = 13</td>
<td>n = 12</td>
</tr>
<tr>
<td>Silent Score Study</td>
<td>3.43</td>
<td>4.08</td>
<td>3.75</td>
</tr>
<tr>
<td></td>
<td>1.28</td>
<td>0.86</td>
<td>1.22</td>
</tr>
<tr>
<td>Thinking about the Intervals</td>
<td>4.93</td>
<td>4.54</td>
<td>4.17</td>
</tr>
<tr>
<td></td>
<td>1.14</td>
<td>1.45</td>
<td>1.19</td>
</tr>
<tr>
<td>Thinking about the Scale Degrees</td>
<td>5.21</td>
<td>4.92</td>
<td>4.83</td>
</tr>
<tr>
<td></td>
<td>0.80</td>
<td>1.38</td>
<td>1.03</td>
</tr>
<tr>
<td>Singing with Solfège</td>
<td>4.50</td>
<td>3.46</td>
<td>4.79</td>
</tr>
<tr>
<td></td>
<td>1.09</td>
<td>1.61</td>
<td>1.37</td>
</tr>
<tr>
<td>Thinking the Solfège</td>
<td>4.43</td>
<td>3.23</td>
<td>4.42</td>
</tr>
<tr>
<td></td>
<td>1.28</td>
<td>1.64</td>
<td>1.31</td>
</tr>
</tbody>
</table>
Please list other techniques you find helpful for sight-reading:

- Singing / beating out rhythms.
- Practicing hands separate before together.
- Being able to write in my starting notes, or reference notes in the middle.
- Play the five-finger pattern to hear what the key sounds like, to hear in my head what we are sight reading.
- Having a process is key. Check the key, time signature, and rhythms. Find hand placement and shadow the keys. Singing can be useful too because it lets you hear the melody and you can know what to expect.
- I can't really think of any, but I guess shadowing the melody and saying solfège stuff.
- None.
- Recognizing patterns, harmonies.
- I think that singing the solfège with the keys is the most helpful technique because I'm a singer.
- Sometimes using solfège hand signs helps solidify it.
- Knowing the intervals between notes.
- Focus on hard parts.
- I like to write in things that might trip me up so I'm paying attention to them.
- What I find most helpful is to audiate in my head as I shadow. Actual singing divides my attention too much.
- One hand at a time.
- Think of intervals and solfège of notes when transposing.

**Please list other techniques you find helpful for transposition:**

- Practicing hands separate.
- Playing my transposed scale to orient myself.
- Knowing the right finger and intervals.
- Playing five-finger patterns.
- Find tonic in new key and use scale degrees or intervals to transpose it.
- Thinking about the finger numbers.
- No other techniques.
- None.
- Shadowing.
- Remembering the melody.
- Solfège is the easiest technique for me.
- Writing in my starting pitches before I play.
- Shadowing.
Any additional comments:

- Thank you! I've become much better at transposing!

- Very well at teaching; I'm way better now than I was ever at transposition on any instrument. Because of my participation in this study, I have gained more confidence in my playing on the piano.

- The techniques that you taught really help a lot. Me especially with my struggling over sight reading.

- I'm a vocalist, so singing everything helps a lot.

- Although I dislike the singing, I feel it could be more effective if I was more comfortable on the instrument. A fair amount of my attention is focused on the piano and not on anything else. If it was my primary instrument, singing may be more helpful.
APPENDIX N
GRADUATE RECITAL PROGRAMS

UNIVERSITY OF SOUTH CAROLINA
School of Music

MICHELLE L. WACHTER, piano
in
GRADUATE RECITAL

Tuesday, October 16, 2012
4:30 PM • Recital Hall

Partita No. 5 in G major, BWV 829
Praeambulum
Allemande
Corrente
Sarabande
Tempo di Minuetta
Passepied
Gigue

Johann Sebastian Bach
(1685-1750)

Ballade No. 4 in F minor, Opus 52

Frédéric Chopin
(1810-1849)

Mitroirs
Une barque sur l’océan
La vallée des cloches

Maurice Ravel
(1875-1937)

From Musica ricercata
I. Sostento - Misurato - Prestissimo
II. Allegro con spirito
IV. Tempo di Valse (poco vivace - “à l’orgue de Barbarie”)
VI. Allegro molto capriccioso
VIII. Vivace. Energico

György Ligeti
(1923-2006)

Ms. Wachter is a student of Dr. Joseph Rackers.
This recital is presented in partial fulfillment of the requirements for the Doctor of Musical Arts degree in piano pedagogy.
MICHELLE L. WACHTER, piano
in
GRADUATE RECITAL

Thursday, December 5, 2013
7:30 PM • Recital Hall

Sonata No. 18 in D Major, K. 576
Wolfgang Amadeus Mozart
(1756-1791)
Allegro
Adagio
Allegretto

From Twenty-Four Preludes, Op. 53
Nikolai Kapustin
(b. 1937)
No. 4 in E Minor: Allegretto
No. 5 in D Major: Largo
No. 10 in C-Sharp Minor: Allegro

Variations and Fugue on a Theme by Handel, Op. 24
Johannes Brahms
(1833-1897)

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the Doctor of Musical Arts degree in piano pedagogy.